Lecture Notes in Educational Technology

Dejian Liu · Paul Prinsloo ·
Asha Singh Kanwar · Usama Kalim ·
Yifan Zhang *Editors*

On-Demand Learning for Lifelong and Responsive Education

Philosophical, Technological, and Practical Perspectives

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Preface

Dear readers,

I am Dejian Liu, from the Smart Learning Institute at Beijing Normal University. My work has focused on smart learning environments and design methodology. One core question has guided much of this work: How can technology improve the way people learn, work, and develop? This question gradually led to the concept of On-Demand Learning, the central focus of this book. Education is shaped by many forces—social, economic, institutional, and cultural conditions all define what is possible in different contexts, and in many parts of the world, far more basic challenges remain. Yet across these diverse contexts, the rapid advancement of artificial intelligence is raising questions that no education system can afford to ignore. These changes are happening quickly, and many of our existing educational models must evolve to meet them.

I would first like to express my sincere gratitude to all the authors who contributed to this book. They brought knowledge, experience, and different points of view to a fast-moving field. Their work has made this book much richer than I first imagined. I also thank the editorial and publishing teams. Their guidance and patience helped turn an early idea into an international project. I would also like to acknowledge the reviewers, colleagues, and collaborators who offered thoughtful advice during the preparation of the book.

The chapters cover a wide range of subjects. They include educational philosophy, artificial intelligence, vocational education, public policy, and Global South perspectives on equity and development. Together, they show that On-Demand Learning is not a single teaching method. It is part of a wider change in the relationship between education, work, and technology. Learning is no longer limited to classrooms, semesters, or degree programs. It now takes place across digital platforms, workplaces, and everyday life. It is becoming more flexible, more personal, and more closely linked to real tasks.

Within this broader transformation, On-Demand Learning offers a different way to think about the individual learning experience. It starts with the idea that people may not need to master every technical process before they can act. With the support of AI, they can complete many tasks while focusing their learning on higher levels

of understanding and decision-making. This invites us to ask not only how people should learn but also what knowledge and capabilities remain uniquely important for people in an age of AI. This does not make learning less important. It changes its focus. Learners still need sufficient knowledge to understand problems, set goals, evaluate results, identify errors, and take responsibility for their decisions. They will increasingly work with AI to complete tasks and solve problems, learn how to guide intelligent systems, assess their outputs, and integrate different forms of support. At the same time, these new possibilities also require careful attention to risks: loss of foundational skills, diminished learner autonomy, and new forms of dependency. It is equally important to preserve human agency, ethical judgment, and critical thinking. In this setting, communication, creativity, critical thinking, ethical judgment, and collaboration become even more important.

These changes will also affect educational institutions. Schools, universities, and training providers may need to reconsider what they teach and how they assess learning. Traditional knowledge and professional expertise will remain essential. At the same time, learners will need new opportunities to develop practical skills in working with AI. Educational institutions may also need to make thoughtful use of emerging teaching technologies to help learners build the knowledge, judgment, and skills required in an AI-rich environment. The ways in which these changes unfold will inevitably differ across contexts, depending on local infrastructure, resources, policy priorities, and community needs. On-Demand Learning may widen access to knowledge and professional support. However, these benefits will not be shared equally unless questions of access, governance, culture, and inclusion are taken seriously.

The chapters in this book examine these opportunities and challenges from different perspectives. Together, they show that On-Demand Learning is not simply a new use of technology. It is part of a broader reconsideration of knowledge, competence, work, and the purpose of education. As the first editor of this volume, I hope the book contributes to a thoughtful discussion about what people should learn, what they can do with the support of AI, and what educational institutions should provide in response.

I hope this book encourages readers not only to better understand On-Demand Learning, but also to critically reflect on the broader educational futures now being shaped across different societies and contexts. More importantly, I hope it opens space for continued dialogue among researchers, educators, policymakers, industry leaders, and learners seeking to create learning systems that are not only flexible and innovative, but also equitable, sustainable, and deeply human-centered.

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Part I
Foundations and Frameworks

Philosophical and Epistemological Underpinnings, Historical Trajectories, and Political Economy of On-Demand Learning

Chapter 1
Introduction: Reimagining On-Demand Learning in a Changing World

Dejian Liu, Paul Prinsloo, Asha Singh Kanwar, Usama Kalim, Yifan Zhang, and Joe Chen

Abstract This edited volume examines On-Demand Learning as a rapidly evolving paradigm reshaping Technical and Vocational Education and Training under conditions of artificial intelligence, platformization, and global labour market restructuring. It conceptualizes On-Demand Learning as a socio-technical formation in which vocational education is reorganized through modular credentials, AI-mediated systems, and flexible, demand-responsive learning pathways. Across five sections, the book integrates philosophical, socio-technical, equity, governance, and future-oriented perspectives to examine how vocational learning is being reconfigured in relation to work, skills formation, and lifelong learning. Rather than treating On-Demand Learning as a neutral innovation, the volume highlights persistent tensions between flexibility and coherence, scalability and situated vocational practice, and economic responsiveness and educational purpose. Drawing on diverse international cases, the chapters show how On-Demand Learning expands opportunities for upskilling and mobility while also raising concerns about fragmentation, unequal access, and shifts in professional formation. By foregrounding Technical and Vocational Education and Training as the primary analytical focus, the book develops a cross-cutting lens for understanding how vocational systems are adapting to AI-driven change across diverse contexts. It argues that the future of On-Demand Learning depends on balancing technological innovation with institutional coherence, ethical governance, and the sustained development of human capabilities within vocational pathways.

Keywords On-Demand Learning · Vocational education and training · Artificial intelligence in education · Micro-credentials · Digital transformation

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The global education landscape is undergoing a profound structural transformation, reshaping not only how knowledge is produced and accessed, but also how learning is governed, platformized, and connected to work (Barnett, 2023). Digitalization has reorganized educational institutions around data infrastructures, algorithmic analytics, and automated workflows, eroding long-standing boundaries between formal schooling and lifelong learning (Williamson et al., 2023). At the same time, generative AI and accelerating labor-market restructuring have destabilized traditional assumptions about teaching, assessment, qualifications, and professional preparation (Kovalchuk et al., 2023). Emerging research in vocational education suggests suggest that AI-driven transformation is reshaping workforce preparation, reskilling, and competency development across rapidly evolving labor markets (Prasetya et al., 2025). These dual shifts have created unprecedented demand for flexible, modular, and continuously accessible forms of learning, giving rise to the emerging paradigm of On-Demand Learning.

Defined by immediacy, contextual responsiveness, and learner-centered modularity, On-Demand Learning enables individuals to access targeted knowledge and skills precisely when and where they are needed, often in direct response to immediate professional or situational demands (Ahsan et al., 2023). Enabled by AI tutoring systems, digital learning platforms, and stackable micro-credentials, this paradigm increasingly links learning, credentialing, and employability through modular and platform-mediated systems. Research on micro-credentials similarly positions modular learning pathways as mechanisms for lifelong learning and workforce adaptability within rapidly changing economies (Gamage & Dehideniya, 2025). International policy frameworks from the European Commission and OECD have positioned modular learning and lifelong upskilling as core mechanisms for enhancing workforce mobility and economic resilience (European Commission, 2022; OECD, 2023).

These transformations carry particular significance for Technical and Vocational Education and Training (TVET), where learning and work are most directly connected. Across national contexts, TVET systems face mounting pressure to adapt rapidly to technological innovation, automation, and workforce restructuring (World Economic Forum, 2020). UNESCO-UNEVOC has emphasized that AI and digitalization are fundamentally reshaping vocational skills development and reskilling systems, demanding new approaches to vocational preparation and workforce adaptation (Shiohira, 2021). Research on workforce transformation similarly highlights growing organizational demand for continuous upskilling and reskilling under conditions of technological disruption (Morandini et al., 2023). At the same time, infrastructural inequality, uneven institutional capacity, and persistent digital divides continue to shape participation in emerging learning ecosystems, particularly across marginalized and Global South contexts (Brown, 2022). Studies of AI ecosystems in low-income regions likewise demonstrate that digital transformation remains heavily conditioned by governance capacity, infrastructure, and access inequalities (Heng et al., 2022; Khan et al., 2024). On-Demand Learning therefore raises not only technological and pedagogical questions, but also broader concerns regarding governance, equity, professional identity, and institutional legitimacy.

Despite its growing global relevance, scholarly engagement with the full epistemological, socio-technical, political, and institutional implications of On-Demand Learning remains fragmented. Existing research has largely focused on isolated technological tools, narrow program evaluations, or debates about labor-market alignment. Scholarship on educational technology and platformization similarly notes that digital transformation is often examined through fragmented technological or policy perspectives rather than broader systemic analysis (Selwyn, 2021). This volume addresses these gaps by bringing together scholars, practitioners, policymakers, and learning designers to examine On-Demand Learning through a distinctly global and TVET-centered lens. Drawing on research from diverse regional and institutional contexts, the volume offers a globally grounded and critically balanced understanding of On-Demand Learning that avoids both technological utopianism and deterministic pessimism.

The volume proceeds in five interconnected parts that collectively unpack this central argument. Part I establishes the conceptual foundations of On-Demand Learning by situating it within broader crises of educational time and structure. Part II examines how On-Demand Learning is enacted through socio-technical infrastructures that mediate between technology and human practice. Part III challenges universalist narratives by centering equity and Global South perspectives. Part IV addresses the governance challenges involved in scaling flexible learning systems beyond isolated initiatives. Finally, Part V looks toward the future, arguing that sustainable and inclusive forms of On-Demand Learning must prioritize human flourishing alongside economic adaptability.

1.1 Conceptual Foundations: Time, Modularity, and the Crisis of Traditional Education

On-Demand Learning emerges within broader transformations in the temporal and structural organization of education. Drawing on Rosa's (2013) theory of social acceleration, rapid technological innovation and institutional change have destabilized long-standing assumptions underpinning formal education. Educational systems organized around sequential progression and delayed knowledge application appear increasingly misaligned with a world characterized by rapidly changing skills demands and non-linear occupational trajectories (Morandini et al., 2023). Barnett's (2000) concept of "supercomplexity" further highlights how uncertainty and continuous change challenge the stability of traditional educational and professional knowledge structures. Within this context, On-Demand Learning reflects a broader shift toward modular, continuously updated, and demand-responsive forms of learning, particularly within TVET and workforce education. Enabled through stackable credentials, competency-based pathways, and modular certification systems, these models prioritize "just-in-time" capability formation over "just-in-case" knowledge

accumulation (Ahsan et al., 2023; Orman et al., 2023). On-Demand Learning therefore represents not simply a technological innovation, but a broader reorganization of educational time, progression, and professional formation.

The Crisis of Learning and the Loss of the World: Reinterpreting On-Demand Learning through Hannah Arendt's Vita Activa by Harun Serpil addresses a critical gap in existing critiques of educational acceleration, which often emphasize structural harms without offering constructive alternatives. Drawing on Hannah Arendt's concepts of *vita activa*, natality, and worldliness, the chapter develops a framework for distinguishing between productive adaptability and compulsive adaptation. Rather than rejecting immediacy outright, it identifies conditions under which modular On-Demand Learning systems can still preserve reflection, judgment, and shared meaning. In doing so, the chapter clarifies what must be protected if On-Demand Learning is to support not only skills acquisition, but also durable knowledge and professional formation.

Complementing this philosophical perspective, *When Flexibility Becomes the Problem: Discourses, Educational Ideals and Individuals as Obstacles to On-Demand Learning* by Mia Thyrre Sørensen and Maria Hvid Stenalt examines flexibility as a contested discourse within contemporary higher education reform. Through qualitative analysis of Danish university stakeholders, the chapter demonstrates that flexibility is not a neutral design principle, but a multidimensional construct shaped by policy agendas, institutional structures, market logics, and educational ideals. Its value therefore depends on which dimensions are prioritized and who holds decision-making power. Rather than simply expanding learner freedom, uncritical forms of flexibility may generate tensions between accessibility and coherence, autonomy and structure, and market responsiveness and educational responsibility.

Extending these conceptual discussions, *On-Demand Learning and Epistemic Justice: A Global South Critique of Demand, Platformisation, and Skill Formation* by Chunni Gao, Endale Tadesse, and Sabika Khalid examines the assumptions embedded within contemporary discourses of demand-responsive learning. Through the lens of epistemic justice, the chapter questions how platformization, competency-oriented frameworks, and globally circulating models of skill formation shape what counts as valuable knowledge and whose expertize is recognized. While acknowledging the opportunities created by flexible and workforce-responsive learning systems, the authors argue that On-Demand Learning must remain attentive to diverse forms of knowledge, local contexts, and alternative pathways of learning that may not align neatly with dominant platform and labor-market logics.

Together, these contributions foreground the central tensions shaping On-Demand Learning in accelerated and platform-mediated educational environments. How should educational systems balance flexibility with coherence, responsiveness with reflection, and workforce relevance with broader forms of knowledge and human development? As learning becomes increasingly modular, personalized, and demand-driven, what kinds of educational values, identities, and ways of knowing should remain central? The chapters in this section offer diverse philosophical, institutional, and epistemological perspectives through which readers can explore these foundational questions.

1.2 Socio-Technical Realities: Platforms, Data, and Embodied Practice

On-Demand Learning increasingly operates through interconnected socio-technical infrastructures that reshape how learning is accessed, governed, credentialed, and embedded within professional practice. Rather than functioning simply as a flexible delivery mechanism, it reflects broader transformations in how knowledge, labor, and professional competence are organized within AI-driven and platform-mediated societies (Selwyn et al., 2023). Recent scholarship on educational platformization argues that digital technologies are increasingly reorganizing education through data infrastructures, algorithmic governance, and automation (Williamson et al., 2023). Parallel research on digitalized higher education similarly suggests that universities and training systems are becoming more data-driven, modularized, and platform-dependent in response to rapidly changing labor markets and workforce expectations (Komljenovic et al., 2025). These developments are especially significant within TVET and workforce education, where learning is increasingly expected to remain continuously responsive to technological change, reskilling demands, and evolving forms of professional practice (Prasetya et al., 2025). This section therefore moves beyond abstract conceptual debates to examine how these infrastructures are enacted within concrete professional and educational settings.

One major theme emerging across the chapters concerns the relationship between digital infrastructures and professional practice. Chapter *From Heat to Headset: Virtual Firefighting and the Lived Body in Training* by Charlott Sellberg and Martin Viktorelius critically examines VR-based firefighting training through a phenomenological and practice-based lens, demonstrating that expertize in safety-critical contexts remains deeply tied to embodied coordination, tacit judgment, and collaborative interaction, even within immersive technological environments. Complementing this perspective, Chapter *Seeing and Being Seen: How Might On-Demand Learning Be Reimagined through AI-Enabled Smart Glasses?* by Bec Marland, J. Andrew Welsman, and Janine Arantes examines AI-enabled smart glasses as wearable systems that integrate real-time guidance and feedback directly into workplace practice. The chapter highlights how AI-mediated wearable technologies transform learning into a continuous and context-aware process while raising concerns regarding surveillance, privacy, and professional autonomy. Together, these chapters demonstrate that professional learning cannot be reduced to technologically mediated information delivery alone.

Building on these workplace-centered perspectives, *AI-Guided Reflection to Bridge Formal Learning and Work* by Viktoria Pammer-Schindler, Eileen Kennedy, Vanessa Echeverria, and Allison Littlejohn, *Microcredentialing Framework for On-Demand Learning: Easing Tensions and Expanding Learning Pathways* by Melinda Bandalaria and Myra Almodiel, and *On-Demand Learning as a Catalyst for Inclusive, Scalable, and Sustainable Transformation in AI-Driven Education Policy and Practice* by Ebba Ossiannilsson examine how On-Demand Learning is increasingly institutionalized through AI-supported reflection, modular credential systems,

and governance-oriented learning infrastructures. Pammer-Schindler and colleagues demonstrate how AI-guided reflective practice can support workplace learning and knowledge transfer while emphasizing that professional agency and reflective competence remain central to meaningful learning. Bandalaria and Almodiel examine how stackable micro-credentials can provide flexible lifelong learning pathways while preserving institutional legitimacy and curricular coherence within rapidly changing labor markets. Extending these concerns to governance, Ossiannilsson argues that On-Demand Learning should be understood as public educational infrastructure rather than merely a market-oriented convenience.

Taken together, these chapters position On-Demand Learning as a multi-layered socio-technical ecology shaped by the ongoing tension between technological scalability and human practice. While AI-enabled systems, modular pathways, and immersive technologies promise personalization and workforce responsiveness, to what extent can professional learning remain embodied, relational, and socially situated within increasingly platform-mediated environments? As educational systems become more data-driven and automated, how should institutions balance innovation with ethical governance, privacy, professional autonomy, and human judgment? The chapters in this section explore these questions through diverse cases of immersive, AI-supported, and workplace-based learning environments.

1.3 Equity and Global Justice: Demand, Agency, and Inclusive Infrastructure

Mainstream accounts of On-Demand Learning often frame flexibility, personalization, and technological scalability as broadly beneficial. Policy narratives, largely shaped by Global North frameworks, tend to present On-Demand Learning as a response to labor-market transformation and economic competitiveness (OECD, 2019). The chapters in this section offer a complementary Global South perspective, emphasizing how "demand" is shaped not only by infrastructure and institutional capacity, but also by private-sector innovation, platform-driven learning ecosystems, workforce realities, and epistemic authority. Across many Global South contexts, On-Demand Learning is increasingly being advanced through industry-led upskilling initiatives, entrepreneurial technology platforms, employer-responsive competency frameworks, and hybrid public-private partnerships designed to expand workforce participation and economic opportunity. For TVET systems closely connected to local livelihoods and informal economies, flexibility and access are therefore intertwined not only with justice and participation, but also with employability, entrepreneurship, and social mobility. Research on AI ecosystems in low-income contexts similarly shows that digital transformation depends heavily on locally adaptive innovation and cross-sector collaboration (Heng et al., 2022).

One major theme emerging across the chapters concerns the infrastructural and economic conditions required for equitable participation in On-Demand Learning.

On-Demand Learning to Address Gender Disparities in the Drone Economy—A Case Study from South Africa by Annemarie Davis, Tapiwa Muzata, and Raphael T. Mpofu explores this through South Africa's Drone Divas Programme, a TVET initiative designed to address gender disparities within the emerging drone economy. The chapter shows that meaningful participation depends not only on flexible delivery, but also on mentorship, reliable digital access, private-sector innovation ecosystems, industry collaboration, and institutional coordination. Positioned within an entrepreneurial and technology-driven workforce sector, the program demonstrates how On-Demand Learning can support pathways toward employability, entrepreneurship, and economic participation for historically underrepresented groups.

Extending these concerns from workforce participation to public systems, *On-Demand Learning in Health: Lifelong Learning for Public Systems in the Global South* by Carlos Alberto Pereira de Oliveira, Bruno Miranda Neves, and Marcelo Ubal examines technology-mediated lifelong learning within Global South public health systems. The chapter argues that scalable lifelong learning functions most effectively when embedded within broader ecosystems connecting public infrastructures, digital platforms, workforce-development strategies, and long-term governance support rather than treated as isolated technological interventions. In doing so, it broadens the discussion of On-Demand Learning from private-sector and entrepreneurial innovation to public-sector capacity building and institutional resilience.

A further perspective is offered by *A Praxis of Emergence and Intentional Adaptation at Equity Unbound* by Maha Bali, Mia Zamora, Nadine Aboulmagd, Yasmine Abulfadl, Yasser Tamer Atef, and Irene Maweu, which presents Equity Unbound as a community-centered model of On-Demand Learning grounded in self-determined learning, intercultural dialog, and equitable hospitality. Drawing on implementation across more than 20 countries, the chapter conceptualizes learning as relational and participatory while also demonstrating how digitally connected learning communities can expand opportunities for collaboration, visibility, and cross-cultural participation beyond traditional institutional boundaries. This perspective reminds us that inclusive On-Demand Learning is not only about employability and infrastructure, but also about agency, belonging, and community-led educational practice.

Taken together, these chapters suggest that equitable On-Demand Learning depends not only on digital access or platform scalability, but also on community participation, institutional support, private-sector innovation, public infrastructure, and recognition of diverse knowledge systems. Across many Global South contexts, flexible and competency-oriented learning models are increasingly connected to workforce participation, entrepreneurship, economic mobility, and locally responsive innovation. At the same time, important questions remain regarding how such systems can balance employability, inclusion, public responsibility, and broader goals of human development. Whose knowledge and experiences are recognized within emerging learning ecosystems, and how might On-Demand Learning create more inclusive pathways for participation, innovation, and opportunity across diverse social and economic contexts?

1.4 Global Scaling and Governance: From Models to Public Learning Infrastructures

As On-Demand Learning expands across vocational, higher, and lifelong education systems, a central challenge emerges: how can flexible and modular learning move beyond isolated, small-scale initiatives to function at systemic scale? The chapters in this section shift attention from individual learning experiences toward the institutional, policy, and governance arrangements required to sustain large-scale implementation across national and global contexts. Rather than treating On-Demand Learning as a universally transferable model, the contributions demonstrate that scaling depends on how learning systems negotiate tensions between flexibility and coherence, responsiveness and credible progression, and local adaptation and institutional standardization (OECD, 2023; Van der Hijden & Martin, 2023).

One major theme concerns the emergence of distinct global pathways through which On-Demand Learning becomes institutionalized within national skills ecosystems. *Global Pathways to Skills on Demand: Practical Models and Toolkits for On-Demand Learning Across Vocational, Higher, and Lifelong Education* by Phuc Tran Quang Bao and Duyen Tran Thi Truc addresses a critical gap in comparative research by examining how modular learning systems evolve differently according to governance capacity, labor-market structures, qualification frameworks, and infrastructural conditions. Through comparative case studies across countries (three Global North and five Global South), the chapter demonstrates that scalable On-Demand Learning depends not only on technological expansion, but also on sustained institutional coordination, policy coherence, and adaptive governance structures.

Closely connected to these systemic questions are issues of policy alignment and national lifelong learning frameworks. *On-Demand Learning for the Workforce in the Organised Sector: Mapping India's National Policies, Provisions, and the Futures* by Santosh Panda and Sanjaya Mishra examines the Indian context through an analysis of recent vocational education reforms, national qualification frameworks, and credit-based lifelong learning infrastructures. The chapter positions On-Demand Learning as part of a broader ecosystem supporting workforce mobility, vocational progression, and reskilling across formal and non-formal pathways. It offers actionable recommendations for policymakers seeking to align national education systems with the demands of a rapidly changing economy while addressing structural inequalities.

Together, these chapters position On-Demand Learning as a systemic governance challenge rather than merely a pedagogical or technological innovation. Scalability emerges not as simple replication, but as ongoing negotiation among governments, institutions, employers, and learners operating across uneven social and infrastructural conditions. While modular pathways and flexible delivery models promise responsiveness and expanded access, how can education systems maintain coherence, trusted recognition, and long-term legitimacy across diverse contexts? What forms of governance, public investment, and institutional coordination are necessary for flexible learning systems to remain both scalable and equitable? Through comparative

and policy-oriented analyses, the chapters in this section explore possible pathways for building sustainable lifelong learning infrastructures.

1.5 Future Horizons: Learning, Policy, and Human Flourishing

The preceding sections have examined On-Demand Learning through philosophical, socio-technical, equity, and governance perspectives. Together, these chapters suggest that On-Demand Learning is no longer simply a supplementary delivery mechanism, but part of a broader transformation reshaping vocational education, work, and lifelong learning under conditions of technological acceleration and social uncertainty (Rosa, 2013). For TVET systems, these shifts raise fundamental questions about the future purposes of education, particularly as vocational learning increasingly operates within environments shaped by automation, rapid skill obsolescence, and continuous reskilling demands (Morandini et al., 2023). This section therefore looks ahead to how On-Demand Learning may evolve in the coming decades and what forces may shape its future trajectory.

A central theme emerging across the chapters concerns the growing instability of traditional educational and occupational structures. *Vocational Education in Transition: Conceptualizing On-Demand Learning for the Future of Skills and Work* by Khalida Parveen and Muhammad Shafiq extends Rosa's theory of social acceleration to argue that vocational learning increasingly operates within conditions of perpetual reskilling and shifting occupational identities. The chapter develops a typology of adaptive vocational learning models that balance responsiveness to technological change with durable professional formation. At the same time, it warns that unregulated flexibility may create tensions between personalization and fragmentation, efficiency and human judgment, and employability and precarity. These concerns resonate with broader debates surrounding platform-mediated labor and modularized workforce preparation (Wilkins et al., 2022).

Complementing this broader analysis, *Microcredentials as Catalysts for Skills Transformation: Trends and Developments in Mauritius and Namibia* by Romeela Mohee, Maggy Beukes-Amiss, Noshmee D. Baguant, and Vishwa Vibhakar Maghoo examines how micro-credentials are increasingly positioned as instruments for lifelong learning, workforce alignment, and modular upskilling. The chapter highlights a broader shift in which credential value is increasingly evaluated through demonstrable skills, workplace relevance, and program-specific return on investment (Robert et al., 2026). At the same time, the authors emphasize that the effectiveness and legitimacy of micro-credential ecosystems depend on governance coherence, quality assurance systems, institutional trust, and cross-institutional recognition architectures (Van der Hijden & Martin, 2023; Varadarajan et al., 2023).

Bringing these themes together, the *Concluding Chapter* by Paul Prinsloo, Asha Kanwar, Usama Kalim, Yifan Zhang, and Joe Chen situates On-Demand Learning

within a broader landscape of educational transformation shaped by technological disruption, evolving forms of accreditation, public-private collaboration, artificial intelligence, and planetary challenges. Rather than presenting On-Demand Learning as a predetermined solution, the chapter frames it as an evolving response to profound questions regarding the future relationship between learning, work, knowledge, and society. It highlights the need to balance responsiveness and innovation with equity, sustainability, quality assurance, and human flourishing, while recognizing that many of the institutional, ethical, and governance questions surrounding On-Demand Learning remain unresolved.

Together, these chapters suggest that the future of On-Demand Learning depends on how education systems negotiate the relationship between flexibility, institutional coherence, and human development. As lifelong reskilling becomes increasingly normalized and new forms of credentials, platforms, and AI-supported learning continue to emerge, what should remain at the center of education? How can learning systems remain responsive to changing economic realities while also supporting critical reflection, ethical judgment, social responsibility, and meaningful vocational identities? Rather than offering definitive answers, the chapters in this section encourage readers to consider how future learning ecosystems might balance adaptability, legitimacy, and human flourishing in an increasingly uncertain world.

1.6 Conclusion: Toward Human-Centered Futures of On-Demand Learning

Across this volume, On-Demand Learning emerges not as a single educational model, but as a complex socio-technical paradigm reshaping how learning is organized, governed, credentialed, and connected to work and social life. The original contribution of this volume lies in bringing together perspectives that are often examined separately—philosophical critiques of acceleration and modularity, socio-technical analyses of platforms and AI, Global South perspectives on equity and innovation, governance debates around scaling and recognition, and future-oriented reflections on human flourishing. Together, these perspectives offer an integrated framework for understanding On-Demand Learning as simultaneously an educational, technological, economic, and social transformation.

Across the chapters, several recurring tensions define this landscape: scalability and situated practice, flexibility and coherence, personalization and collective responsibility, workforce responsiveness and educational meaning. These tensions suggest that the future of On-Demand Learning will depend less on technological advancement alone than on the values, governance arrangements, and institutional choices that shape its development. The central question, then, is not simply how learning can become more flexible or accessible, but how On-Demand Learning can support inclusive participation, professional integrity, social responsibility, and human flourishing in an increasingly uncertain world.

References

Ahsan, K., Akbar, S., Kam, B., & Abdulrahman, M. D. A. (2023). Implementation of micro-credentials in higher education: A systematic literature review. *Education and Information Technologies, 28*(10), 13505–13540. https://doi.org/10.1007/s10639-023-11739-z

Barnett, R. (2000). University knowledge in an age of supercomplexity. *Higher Education, 40*(4), 409–422. https://doi.org/10.1023/A:1004159513741

Barnett, R. (2023). Only connect: Designing university futures. *Quality in Higher Education, 29*(1), 116–131. https://doi.org/10.1080/13538322.2023.2181827

Brown, T. (2022). Skill ecosystems in the global south: Informality, inequality, and community setting. *Geoforum, 132*, 10–19. https://doi.org/10.1016/j.geoforum.2022.03.019

European Commission. (2022). Council recommendation on a European approach to micro-credentials for lifelong learning and employability (2022/C 243/02). *Official Journal of the European Union, C243*, 10–25. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2022_243_R_0002

Gamage, K. A., & Dehideniya, S. C. (2025). Unlocking career potential: How micro-credentials are revolutionising higher education and lifelong learning. *Education Sciences, 15*(5), 525. https://doi.org/10.3390/educsci15050525

Heng, S., Tsilionis, K., Scharff, C., & Wautelet, Y. (2022). Understanding AI ecosystems in the global south: The cases of Senegal and Cambodia. *International Journal of Information Management, 64*, 102454. https://doi.org/10.1016/j.ijinfomgt.2021.102454

Khan, M. S., Umer, H., & Faruqe, F. (2024). Artificial intelligence for low income countries. *Humanities and Social Sciences Communications, 11*(1), 1–13. https://doi.org/10.1057/s41599-024-03947-w

Komljenovic, J., Sellar, S., & Birch, K. (2025). Turning universities into data-driven organisations: Seven dimensions of change. *Higher Education, 89*(5), 1369–1386. https://doi.org/10.1007/s10734-024-01277-z

Kovalchuk, V. I., Maslich, S. V., & Movchan, L. H. (2023). Digitalization of vocational education under crisis conditions. *Educational Technology Quarterly, 2023*(1), 1–17. https://doi.org/10.55056/etq.49

Morandini, S., Fraboni, F., De Angelis, M., Puzzo, G., Giusino, D., & Pietrantoni, L. (2023). The impact of artificial intelligence on workers' skills: Upskilling and reskilling in organisations. *Informing Science, 26*, 39–68. https://doi.org/10.28945/5078

OECD. (2019). *Future of education and skills 2030/2040*. Organisation for Economic Co-operation and Development. https://www.oecd.org/en/about/projects/future-of-education-and-skills-2030.html

OECD. (2023). *Micro-credentials for lifelong learning and employability: Uses and possibilities*. OECD Publishing. https://www.oecd.org/en/publications/micro-credentials-for-lifelong-learning-and-employability_9c4b7b68-en.html

Orman, R., Şimşek, E., & Kozak Çakır, M. A. (2023). Micro-credentials and reflections on higher education. *Higher Education Evaluation and Development, 17*(2), 96–112. https://doi.org/10.1108/HEED-08-2022-0028

Prasetya, F., Fortuna, A., Samala, A. D., Latifa, D. K., Andriani, W., Gusti, U. A., Raihan, M., Criollo-C, S., Kaya, D., & García, J. L. C. (2025). Harnessing artificial intelligence to revolutionize vocational education: Emerging trends, challenges, and contributions to SDGs 2030. *Social Sciences & Humanities Open, 11*, 101401. https://doi.org/10.1016/j.ssaho.2025.101401

Robert, J., Muscanell, N., McCormack, M., & Arnold, K. (2026). 2026 *EDUCAUSE Horizon Report: Teaching and learning edition*. EDUCAUSE. https://library.educause.edu/-/media/files/library/2026/5/2026hrteachinglearning.pdf

Rosa, H. (2013). *Social acceleration: A new theory of modernity*. Columbia University Press. https://doi.org/10.7312/rosa14834

Selwyn, N. (2021). *Education and technology: Key issues and debates*. Bloomsbury Publishing.

Selwyn, N., Hillman, T., Bergviken Rensfeldt, A., & Perrotta, C. (2023). Digital technologies and the automation of education—Key questions and concerns. *Postdigital Science and Education, 5*(1), 15–24. https://doi.org/10.1007/s42438-021-00263-3

Shiohira, K. (2021). *Understanding the impact of artificial intelligence on skills development. Education 2030*. UNESCO-UNEVOC International Centre for Technical and Vocational Education and training. UN campus, Hermann-Ehlers-Strasse 10, 53113 Bonn, Germany.

Van der Hijden, P., & Martin, M. (2023). *Short courses, micro-credentials, and flexible learning pathways: A blueprint for policy development and action*. International Institute for Educational Planning.

Varadarajan, S., Koh, J. H. L., & Daniel, B. K. (2023). A systematic review of the opportunities and challenges of micro-credentials for multiple stakeholders: Learners, employers, higher education institutions and government. *International Journal of Educational Technology in Higher Education, 20*(1), 13. https://doi.org/10.1186/s41239-023-00381-x

Wilkins, D. J., Hulikal Muralidhar, S., Meijer, M., Lascau, L., & Lindley, S. (2022). Gigified knowledge work: Understanding knowledge gaps when knowledge work and on-demand work intersect. *Proceedings of the ACM on Human-Computer Interaction, 6*(CSCW1), 1–27. https://doi.org/10.1145/3512940

Williamson, B., Komljenovic, J., & Gulson, K. (Eds.). (2023). *World yearbook of education 2024: Digitalisation of education in the era of algorithms, automation and artificial intelligence*. Taylor & Francis. https://doi.org/10.4324/9781003359722

World Economic Forum. (2020). *The future of jobs report 2020*. World Economic Forum.

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Chapter 2
The Crisis of Learning and the Loss of the World: Reinterpreting On-Demand Learning Through Hannah Arendt's *Vita Activa*

Harun Serpil

Abstract This chapter critically examines On-Demand Learning through the philosophical lens of Hannah Arendt's *vita activa*, arguing that its dominant logics of immediacy, personalization, and automation constitute not merely a pedagogical shift but a deeper civilizational crisis. Drawing on Arendt's tripartite distinction between labor, work, and action, the chapter contends that platform-driven, modular learning increasingly reduces education to the mode of labor: cyclical, consumptive, and oriented toward perpetual reskilling, while eroding the worldly durability associated with *work* and the relational, political dimensions of *action.* In dialogue with contemporary critics of educational technology, platform capitalism, and social acceleration, the chapter traces how On-Demand Learning contributes to *worldlessness*: the dissolution of the shared, durable spaces in which meaning, authority, and common judgment can take form. Particular attention is given to the displacement of educational responsibility onto algorithmic systems, the privatization of learning experience, and the attrition of *sensus communis* through hyper-personalized pathways. Against this diagnosis, the chapter turns to Arendt's concept of *natality*, the human capacity to begin anew, as a basis for reclaiming the educational possibilities within On-Demand Learning. It concludes with concrete pedagogical proposals for reintroducing interruption, dialogue, judgment, and collective responsibility into digitally mediated learning environments, insisting that the future of On-Demand Learning depends not on technological sophistication but on the ethical and political will to sustain education as a distinctly human practice.

Keywords On-Demand Learning · Hannah Arendt · Vita Activa · Worldlessness · Natality · Platform Capitalism

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2.1 Introduction: Thinking What We Are Doing

Hannah Arendt opens The Human Condition with a question that is at once disarmingly simple and philosophically devastating: "What are we doing?" (Arendt, 1958). The force of this question lies not in its abstraction, but in its insistence that modern societies have become increasingly unable to reflect on the meaning of their own activities. Arendt's concern was not technology as such, but a growing thoughtlessness accompanying unprecedented human powers. This concern speaks directly to contemporary discussions of *On-Demand Learning,* a paradigm widely celebrated for its efficiency, flexibility, and responsiveness, yet rarely interrogated in terms of what it is doing to education as a human and worldly practice. In its contemporary form, On-Demand Learning is often associated with just-in-time learning, modular content delivery, and learner-driven pathways—features that emphasize immediacy and responsiveness but also risk narrowing the temporal and conceptual horizons of education.

On-Demand Learning has emerged as a compelling response to accelerating social and economic conditions, often operating within the logic of what Srnicek (2017) calls *platform capitalism.* In this framework, learning is not merely a response to need, but a data-driven service optimized for market responsiveness rather than intellectual depth. It promises learning that is immediate rather than delayed, adaptive rather than stable, and personalized rather than institutionally standardized. In this sense, it appears as an opportunity in a world marked by uncertainty, volatility, and continuous reskilling. However, Arendt's question invites us to approach this development more cautiously. If learning is increasingly organized around immediacy and demand, what happens to education as a space of judgment, responsibility, and shared meaning?

Arendt warns that modernity tends to subordinate thinking to functionality. She observes that technological and organizational advances often outpace our capacity to reflect on their consequences, producing a condition in which human beings become highly capable actors without a corresponding depth of understanding. The danger is not that we know too much, but that we act without thinking. This insight is especially relevant to On-Demand Learning systems that emphasize speed, optimization, and continuous availability. When learning becomes something that must always be ready, useful, and immediately applicable, reflection risks being experienced as inefficiency rather than necessity. Education thus becomes embedded in infrastructures whose primary logic is extraction rather than understanding. Contemporary professional life increasingly takes the form of labor and work rather than action, as practitioners become absorbed into cycles of performance, accountability, and technical delivery, which signals not merely changing workloads but a deeper loss of freedom, as spaces for judgment, plurality, and public appearance are crowded out by managerial rationalities (Kreber, 2016).

Komljenovic (2021) argues that the real value of educational data lies not in information itself but in its predictive capacity—the ability to shape future behavior through personalization, nudging, and automated decision-making. What is at stake, then, is not merely privacy but power over educational trajectories. This resonates

with Arendt's warning that when action is replaced by calculation, human beginnings are subordinated to systems that pre-empt possibility. While On-Demand Learning reflects a world in total motion, it ultimately fails by prioritizing narrow instrumentality over a deeper ethic of collective care. Barnett (2023) argues that by reducing education to a series of fragmented, market-driven modules, universities fall into the trap of academic capitalism, ignoring their profound entanglement with broader ecosystems such as the natural environment, the polity, and culture. Rather than a "vending machine" model that treats knowledge as a commodity to satisfy individual or corporate demand, Barnett envisions an "eco-university" that utilizes transdisciplinarity to address the world's malformations. Further, Selwyn's critique of educational technology reveals that the On-Demand Learning is less a pedagogical breakthrough and more an "automation charade" that masks hidden human labor while reducing teaching to mere algorithmic management (Selwyn et al., 2023). By prioritizing "frictionless" efficiency and lower unit costs, these platforms align education with a neoliberal, individualistic logic that transforms the student into a consumer and the public good into a private, optimized transaction (Selwyn, 2014). This shift toward hyper-personalization creates a curated echo chamber that silences the difficult questions and radical pluralism found in traditional classrooms, ultimately killing the natality and critical discomfort necessary to sustain a democratic, human future.

Byung-Chul Han offers a chilling diagnosis of our digital age that extends from education to democracy itself. In *The Transparency Society* (2015), he provides a philosophical framework that illuminates what is troubling about On-Demand Learning, even though he does not address it directly. Han argues that our culture has become obsessed with making everything smooth, immediate, and trackable, stripping experiences of the friction, mystery, and difficulty where real transformation happens. Applied to education, this means we have replaced the trust inherent in traditional teacher-student relationships with algorithmic surveillance that monitors every click and second spent learning, turning students into data points rather than developing minds. Even more troubling, we participate willingly in this system, posting our certificates and learning streaks online in what Han calls "auto-exploitation," mistaking consumption for growth and voluntarily turning ourselves into marketable products. On-demand courses promise knowledge without the slow, challenging journey of genuine understanding, delivering answers "pornographically" (everything exposed at once) rather than erotically, through gradual, relationship-based discovery. This educational critique expands dramatically in Han's *Infocracy* (2022), where he outlines how digitalization is dismantling Western democracy altogether. We have transitioned, he argues, from a disciplinary regime that controlled bodies to an information regime that seizes the psyche through "psychopolitics," reducing humans to "consumer cattle" voluntarily shackling themselves in a transparent digital prison. Rational discourse and grand narratives have given way to ephemeral, captivating information and performance-driven politics, where influencers and viral tweets wield more power than reasoned arguments. Han warns that this data-driven "post-democracy," marked by algorithmic management, the death of factual truth, and the collapse of genuine public discourse, threatens to replace human freedom with automated systems management, silencing the difficult questions democracy

requires to survive. Our pursuit of transparency and convenience is costing us the very capacity for deep thought, genuine relationship, and collective self-determination.

Arendt situates education at a fragile threshold between past and future. Education, she argues, is the sphere in which adults assume responsibility for a world they did not make alone but must nonetheless preserve and renew. Education is the point at which we decide whether we love the world enough to assume responsibility for it, and whether we love our children enough not to expel them from that world (Arendt, 1954). Education, in this sense, is not primarily about adaptation to change, but bringing newcomers into a shared, durable world.

By shifting emphasis toward individual choice, personalized pathways, and platform-mediated delivery, On-Demand Learning risks dissolving the very idea of a common world into a series of individualized learning experiences. Authority becomes procedural rather than relational, and knowledge becomes something to be accessed rather than something to be handed down, questioned, and renewed. Arendt explicitly cautions against this erosion of educational responsibility, arguing that when adults refuse authority in education, they also refuse responsibility for the world as it is. Her concept of natality (the fact that each human being enters the world as a new beginning) grounds education in the possibility of renewal rather than repetition. Action is the capacity to begin something unforeseen, to appear among others as a distinct and responsible being. Education, then, prepares not compliant learners, but future actors capable of judgment and initiative. The question raised by On-Demand Learning is whether its structures cultivate such action or they quietly train learners to respond endlessly to external demands. Thus, On-Demand Learning can be both an opportunity and a crisis. It is an opportunity as it can expand access and enable lifelong engagement with learning. But it is a crisis as it accelerates a shift away from education as a world-building practice toward learning as continuous adaptation. When learning is reduced to immediacy, education risks losing what Arendt called worldliness: the durable, shared space in which meaning, authority, and responsibility can take shape. In an era of algorithmic personalization, modular credentials, and just-in-time learning, thinking becomes an ethical and pedagogical act. To rethink On-Demand Learning, we must ask not only how efficiently learning can be delivered, but what kinds of human beings such systems are shaping and what kind of world they presuppose.

This chapter adopts a conceptual and interpretive approach grounded in Arendtian hermeneutics. Rather than offering empirical analysis, it engages in a close reading of Arendt's key concepts (labor, work, action, and natality) and brings them into dialogue with contemporary developments in On-Demand Learning. The aim is not to apply Arendt as a fixed framework, but to think with her, using her distinctions to illuminate tensions, contradictions, and possibilities within current educational practices. In this sense, the chapter proceeds as a form of critical conceptual analysis, attentive to how shifts in educational form also signal deeper transformations in how we understand learning, agency, and the human condition. On-Demand Learning is understood not only as a flexible delivery model, but as a reconfiguration of the relationship between knowledge, time, and human activity.

While this chapter draws on Arendt's analysis of modernity, it is important to acknowledge that dominant accounts of modernity have been critiqued for overlooking the constitutive role of colonialism, racial capitalism, and the transatlantic slave trade. Scholars have argued that what is often framed as a universal and neutral project of modernity is more accurately understood as "white modernity," historically produced through processes of dispossession, extraction, and the exploitation of the Majority world (Bhambra, 2014; Robinson, 2023). From this perspective, modernity cannot be disentangled from the global hierarchies that enabled its development. This does not invalidate Arendt's insights, but it does place limits on their scope and calls for a more historically situated reading in contemporary analyses.

2.2 The Vita Activa in the Age of Platforms

In *The Human Condition*, Hannah Arendt proposes the concept of the *vita activa* as a way of distinguishing fundamental modes of human activity: labor, work, and action. These are not merely descriptive categories, but analytic tools for understanding how human beings relate to necessity, durability, and plurality. Reading contemporary educational transformations through this framework allows us to move beyond technical descriptions of digital learning and toward a deeper understanding of how the *purposes of learning* are being reconfigured under conditions of platformization and acceleration. For Arendt (1958), human activity takes three fundamental forms: labor, tied to necessity and repetition; work, oriented toward durability and world-building; and action, through which individuals disclose themselves in relation to others.

Labor refers to activities bound to biological necessity and repetition. Labor produces nothing lasting; its products are immediately consumed, and the activity itself must be endlessly renewed. *Work*, by contrast, is the activity through which humans create a durable world of objects, institutions, and meanings. It introduces stability and relative permanence into human affairs. *Action*, finally, is the most distinctly human activity: it unfolds between people, through speech and interaction, and makes possible freedom, plurality, and new beginnings. Action is unpredictable, irreversible, and deeply relational. Recent interpretations of Arendt's vita activa further clarify its relevance for understanding contemporary educational transformations. Jansson and Wagman (2017) and Serpil (2026) emphasize that Arendt's tripartite distinction between labor, work, and action provides a powerful framework for examining how human activities shape identity, meaning, and participation in the world. They argue that these categories reveal not only different forms of doing, but fundamentally different ways of being, highlighting how the dominance of labor-oriented activities risks marginalizing both world-building and relational meaning-making. Applied to On-Demand Learning, this perspective underscores how platform-mediated education increasingly privileges repetitive, necessity-driven engagement over durable educational practices and dialogical forms of learning.

These distinctions are especially illuminating when applied to contemporary On-Demand Learning environments. Much of today's digitally mediated learning increasingly resembles what Arendt described as *labor*. Learning activities are fragmented into short, repeatable units; knowledge is consumed rather than dwelt upon; and educational engagement is organized around continuous updating rather than lasting formation. Platform-based systems reward speed, responsiveness, and completion, reinforcing a cycle of perpetual activity without durability. Learning risks becoming an endless task of maintenance: necessary, efficient, and exhausting, yet rarely transformative. Komljenovic (2021) reframes platformized education not as innovation but as a form of digital rentiership, where value is increasingly extracted through ownership and control of platforms and data rather than through teaching or learning itself. Universities and learners are recast as rentees, paying not only monetary fees but also "data rents," as everyday educational activity is captured, enclosed, and transformed into proprietary intelligence. From an Arendtian perspective, this shift marks a further displacement of action by labor: learning becomes something performed within assetized systems rather than enacted in a shared world. Drawing on Birch and Muniesa (2020)'s concept of assetization, Komljenovic (2021) shows how educational practices are being transformed into financialized assets. What once belonged to the common world—knowledge, interaction, learning itself—is reconfigured as something owned, enclosed, and monetized, further undermining education's capacity to create durable meanings across generations. Situating these developments within a broader political economy, Williamson et al. (2024) warn that platformized education increasingly serves commercial and governmental interests while weakening education's public character. As learning is reorganized around proprietary systems and market logics, the common world that education once helped sustain becomes fragmented.

Digitalization intensifies this tendency by aligning learning with the logics of automation and optimization. Personalized recommendations, adaptive pacing, and modular credentials promise efficiency and relevance, but they also subtly redefine learning as a response to external demand rather than an internally meaningful pursuit. The learner is positioned less as a participant in a shared world of knowledge and more as a user navigating individualized pathways. From an Arendtian perspective, this represents a shift toward the dominance of labor within education: learning as something one must continually *do*, rather than something through which one *builds* or *acts*.

At the same time, the category of *work*—so central to education's traditional role—is increasingly destabilized. Educational institutions have historically functioned as spaces of world-building, producing relatively durable forms of knowledge, disciplinary traditions, and shared standards of judgment. Degrees, curricula, and scholarly canons served not merely as credentials, but as stabilizing structures through which learners could situate themselves within a broader intellectual world. On-Demand Learning, particularly in its most modular and platform-driven forms, challenges this durability. Micro-credentials, stackable units, and just-in-time content privilege flexibility over continuity, making it increasingly difficult to sustain a shared educational world that outlasts immediate utility. Komljenovic (2021) shows how

education is increasingly governed through platform contracts and opaque terms of use, producing what she calls a rise in "contractual governance." As digital platforms quietly set the conditions under which teaching and learning occur, authority shifts away from educational communities toward private infrastructures that are largely unaccountable to the public. This rearrangement weakens collective judgment and deepens *worldlessness*, as educators and students alike are drawn into systems they did not design and cannot meaningfully contest.

For Arendt, a world without relative permanence is not simply inconvenient; it is uninhabitable as a *common* world. When educational meanings become transient and endlessly replaceable, learners are deprived of stable reference points through which judgment and orientation become possible. Education, under these conditions, risks losing its worldliness—its capacity to situate individuals within something larger than themselves. Yet the most significant loss concerns *action.* Education has traditionally been one of the primary spaces in which action is prepared, even if not fully realized. Through dialogue, disagreement, interpretation, and shared inquiry, learners encounter plurality and develop the capacity to appear before others as thinking and responsible beings. Platform-based learning environments, however, tend to minimize this dimension. Interaction is often reduced to feedback loops, analytics, or asynchronous participation, while uncertainty and disagreement are treated as inefficiencies to be managed rather than conditions of freedom to be sustained. This does not mean that digital learning environments are incapable of supporting action. Rather, it suggests that without deliberate design choices and pedagogical responsibility, the logic of platforms will default toward labor and away from action. Arendt reminds us that action cannot be automated or optimized without losing its essence. It depends on unpredictability, presence, and plurality that resist algorithmic control.

Viewed through the lens of the *vita activa*, then, the transformation of learning in the age of platforms is not neutral. Digitalization does not simply add new tools to education; it reshapes the balance between labor, work, and action. When learning is reorganized primarily around immediacy, efficiency, and demand, education risks becoming labor without world, activity without meaning, and adaptation without renewal. The task, therefore, is not to reject On-Demand Learning, but to ask how its structures might be reoriented toward the creation of durable meaning and the cultivation of human plurality.

2.3 Learning as Labor: The Automation of Thought

If the *vita activa* provides a framework for understanding what kinds of activities education sustains, then contemporary On-Demand Learning environments increasingly reveal a decisive shift toward labor as the dominant educational mode. This shift is not accidental. It reflects a broader political and economic rationality in which learning is reorganized around efficiency, personalization, and continuous consumption. Within this rationality, education is no longer oriented toward durability or action, but toward uninterrupted performance. As Jansson (2020) cautions,

when social arrangements prioritize labor and consumption alone, there is a danger that people are reduced to *homo consumens* rather than recognized as active citizens capable of participation and judgment. Rae (2024) also warns that when human activity is absorbed into predictable systems of production and management, freedom is displaced by behavioral regularity. What is lost is not merely spontaneity but the very possibility of meaningful beginning, as action becomes replaced by process (pp. 14–16). Williamson et al. (2024) further argue that contemporary education is increasingly organized through digital infrastructures that operate as systems of governance rather than neutral tools. These infrastructures quietly shape what counts as knowledge, participation, and success, relocating educational authority from pedagogical communities to technical architectures. Datafication narrows educational horizons by translating learning into measurable signals designed for prediction and optimization. What is lost in this process is not only complexity but possibility: when learners are rendered as data subjects, education risks becoming a system of behavioral management rather than a space for appearance, initiative, and unexpected beginnings (Williamson et al., 2024).

Arendt's notion of labor captures this condition with striking precision. Labor, as she defines it, is bound to necessity and repetition. It produces no lasting object and leaves behind no durable trace. Its logic is cyclical: what is consumed must be produced again. When learning is organized according to this logic, it becomes an activity that must never stop because skills must be updated, competencies refreshed, and credentials stacked indefinitely. On-Demand Learning platforms embody this logic by design. Their promise lies not in completion, but in perpetual availability. The contemporary economy of learning thus mirrors what Arendt described as the rise of the *animal laborans*: a condition in which activity itself becomes the highest value, detached from reflection or purpose. Efficiency replaces meaning as the primary criterion of educational success. Learning is evaluated by speed, completion rates, and measurable outcomes rather than by understanding or judgment. In such systems, to pause is to fall behind; to reflect is to risk inefficiency. Jansson and Wagman's (2017) reading of Arendt helps illuminate how labor, when elevated above other forms of human activity, leads to a narrowing of existential and educational horizons. They note that labor's cyclical character absorbs individuals into continuous activity while offering little opportunity for reflection or transformation. Within On-Demand Learning environments, this manifests as perpetual reskilling and content consumption, where learners are kept active yet rarely invited to engage with knowledge in ways that foster lasting understanding or self-formation.

Personalization, often presented as the humanizing feature of On-Demand Learning, plays a paradoxical role in this process. Algorithmic personalization promises relevance by tailoring content to individual needs, preferences, and performance histories. Yet this tailoring often narrows rather than expands the learner's horizon. By continuously aligning learning with what is immediately useful or already preferred, platforms reduce exposure to difficulty, alterity, and uncertainty—the very conditions under which thinking becomes necessary. What appears as learner-centered design thus risks becoming a subtle form of enclosure. When learning is reorganized primarily around efficiency and consumption, it reduces

educational activity to cycles of production and use rather than processes of becoming and world-making (Lima, 2020).

Arendt repeatedly warned that the greatest danger of modern conditions lies not in domination, but in *thoughtlessness*: the inability or unwillingness to think critically about what one is doing. Automation intensifies this danger. When learning paths are pre-structured, optimized, and recommended in advance, the learner's role shifts from judgment to compliance. Choice remains, but it is increasingly procedural rather than substantive. One chooses *within* systems rather than *about* them. This is where the automation of learning becomes inseparable from the automation of thought. On-Demand Learning systems do not simply deliver content; they shape cognitive habits. They train learners to respond, adapt, and perform, rather than to dwell, question, or resist. Reflection becomes an optional add-on rather than a constitutive dimension of learning. In Arendtian terms, thinking, as understood as the silent dialogue one has with oneself, is displaced by continuous activity. This displacement of thinking by continuous activity culminates in what is increasingly recognized as performative learning. In these systems, knowledge is demonstrated rather than inhabited, and competence is displayed rather than developed. This shift aligns with Ball's (2003) critique of the "terrors of performativity," wherein the soul of the learner and the educator is reconfigured to meet the demands of external metrics. When learning is reduced to a series of badges, micro-credentials, and dashboard visualizations, it becomes a performance for the system rather than an undertaking with others. In this environment, the *animal laborans* is not merely working to survive, but is laboring to produce the data-points that signify "success," effectively decoupling educational achievement from the internal cultivation of judgment. Arendt's concern here would not be that learning becomes practical, but that it becomes *unthinking*. She was deeply critical of educational models that reduce judgment to rule-following or intelligence to problem-solving. In such models, individuals may become highly competent without becoming reflective. This danger is amplified in On-Demand Learning environments where adaptability is prized above orientation and responsiveness above responsibility. Higgins (2010) emphasizes that teaching cannot be reduced to procedural competence without undermining its ethical core. Pedagogy, he argues, involves the teacher's own ongoing self-formation and public responsibility, a dimension that resists automation by design. Thus, educational practices oriented primarily toward optimization and personalization risk hollowing out the pedagogical relation itself, replacing world-sharing with content delivery and judgment with compliance.

Moreover, when learning is reduced to labor, exhaustion becomes normalized. Continuous upskilling is framed as empowerment, yet it often masks a deeper precarity. Learners are made responsible for remaining employable in systems that continuously shift their demands. The burden of adaptation is individualized, while the structural forces driving acceleration remain unquestioned. From this perspective, On-Demand Learning does not simply respond to change; it helps stabilize a world in which constant change becomes inevitable. The disappearance of reflection is therefore not an unintended side effect but a structural consequence. Reflection interrupts cycles of consumption; it introduces delay, doubt, and judgment. In

systems governed by efficiency, such interruption appears as waste. Arendt reminds us, however, that thinking has no immediate product and no measurable outcome. Its value lies precisely in its refusal to be instrumentalized. Thus, the central problem of On-Demand Learning is not technological sophistication, but the colonization of education by the logic of labor. When learning is organized exclusively around immediacy, personalization, and performance, it risks producing capable individuals who are increasingly unable to ask whether what they are doing is worth doing at all.

Yet, it would be reductive to treat On-Demand Learning as inherently confined to labor. In certain configurations, On-Demand Learning can also open spaces for work and even action. Collaborative platforms, peer-driven learning communities, and dialogic forms of engagement can support the co-construction of knowledge and the emergence of shared meanings. When learners are not merely consuming content but contributing, questioning, and responding to others, learning begins to move beyond repetition toward world-building and, potentially, toward action. The challenge, then, is not whether On-Demand Learning can support such possibilities, but under what conditions these spaces are sustained rather than overridden by logics of efficiency, personalization, and continuous optimization.

What remains less visible in many On-Demand Learning environments is what Arendt calls work—the form of human activity oriented toward durability, coherence, and the creation of a shared world (1958). Unlike labor, which is cyclical and necessity-driven, work produces relatively stable artifacts, practices, and meanings that outlast immediate use. In educational terms, work can be understood as the process through which learners do not merely acquire skills, but shape them into something more enduring: a structured understanding, a crafted product, or a contribution that can be revisited, shared, and built upon. Yet, the logic of immediacy that defines much of On-Demand Learning often leaves little room for such durability. Modular, just-in-time content encourages use rather than construction, completion rather than consolidation. As a result, learning risks remaining at the level of activity without becoming something that takes form and enters a shared world. Reintroducing work into On-Demand Learning would therefore mean designing for continuity, revisability, and the production of meaningful outputs—forms of learning that persist, circulate, and invite engagement beyond the moment of acquisition.

2.4 Losing the World: Durability, Authority, and the Erosion of Meaning

For Arendt, the gravest danger of modern conditions is not chaos but *worldlessness*—the gradual disappearance of a shared, durable space in which human meaning can appear. A world, in Arendt's sense, is not simply the physical environment or a collection of information. It is the *in-between* that both connects and separates people: a relatively stable web of institutions, traditions, objects, and narratives that outlast individual lives. Education has historically played a central role in sustaining

this world. When education loses this function, the crisis is not pedagogical but civilizational. On-Demand Learning, particularly in its platform-based and modular forms, intensifies this loss of worldliness. By privileging flexibility over continuity and immediacy over durability, it undermines the temporal structures through which meaning is formed and transmitted. Knowledge becomes transient, endlessly updatable, and easily replaceable. What endures is not understanding, but access; not judgment, but connectivity. In Arendtian terms, learning increasingly takes place *without a world*. Lima (2020) argues that activities gain meaning only within relational assemblages involving bodies, language, histories, and shared spaces. When these assemblages are disrupted—as in highly individualized, platform-mediated learning—educational practices risk severing learners from durable worlds of significance, leaving them with isolated experiences rather than collective horizons of meaning. Rosa (2013)'s theory of *social acceleration* suggests that On-Demand Learning is a primary symptom of a "runaway world" where the pace of life outruns our ability to find meaning. While these platforms promise efficiency, they often trap us in a cycle of technological acceleration and the contraction of the present, where we frantically collect skills just to keep from falling behind. This creates a state of social alienation; we become worldless because we are too busy processing bitesize content to actually resonate with the world or others. If education is meant to be a space for Arendt's action and natality, On-Demand Learning risks turning it into mere labor. Instead of the "pedagogy of interruption" that Biesta (2006) calls for, which forces us to slow down and respond to difference, On-Demand Learning accelerates us further into a void where we have nothing in common but our shared rush toward an unreachable finish line.

Durability is essential to meaning because meaning requires time. For Arendt, the activity of *work* (i.e., the creation of relatively lasting objects and institutions) provides the stability necessary for human orientation. Educational traditions, disciplines, and curricula once functioned as such stabilizing structures. They did not merely transmit information; they offered learners a place from which to see the world and themselves within it. On-Demand Learning, however, tends to fragment these structures into discrete, context-free units. Learning is no longer situated within a coherent intellectual landscape, but distributed across platforms that prioritize relevance to immediate demand. This fragmentation has consequences. When knowledge is no longer embedded in durable forms, it becomes difficult to distinguish what matters from what merely functions. Educational meaning is reduced to utility, and orientation gives way to navigation. Learners move efficiently through content, but rarely dwell within it. The result is not ignorance, but a form of disorientation masked by constant activity. Drawing on Arendt, Jansson and Wagman (2017) stress that work plays a crucial role in creating a shared and durable world, one in which individuals can locate themselves and their actions. When educational practices lose this world-building dimension, learners are left without stable reference points for judgment or belonging. On-Demand Learning's emphasis on flexibility and modularity risks weakening this sense of durability, replacing educational continuity with fragmented experiences that privilege immediacy over meaning.

Closely tied to this loss of durability is the erosion of *authority* in education. Arendt's account of authority is frequently misunderstood as conservative or hierarchical. In fact, she insists that authority in education does not rest on coercion or expertise alone, but on *responsibility for the world*. Authority exists when adults are willing to stand between the past and the future and say: *this world is worth introducing to you.* When such responsibility is refused, authority collapses. Not because learners rebel, but because no one claims the right to guide. On-Demand Learning environments often displace this responsibility. Authority is transferred from teachers and institutions to platforms, metrics, and market signals. What counts as valuable knowledge is increasingly determined by employability data, algorithmic rankings, or user demand. This shift does not eliminate authority; it renders it opaque and impersonal, manifesting as what Selwyn (2014) describes as the "automated authority" of the algorithm. When the teacher's pedagogical judgment is replaced by a platform's dataset, the relational "responsibility for the world" that Arendt championed is lost to a procedural logic that cannot be held to account. Learners are governed not by persons who can be questioned, but by systems that present themselves as neutral and inevitable. For Arendt, this is a particularly dangerous development. Authority that cannot be named or contested cannot educate. It produces compliance without understanding and adaptation without judgment. In such conditions, learners are trained to accept the world as given, even as it continually changes beneath their feet. Education loses its capacity to mediate between stability and renewal, becoming instead a mechanism for managing perpetual transition. Higgins (2010) further clarifies Arendt's notion of educational authority by framing teaching as a mediating practice between inherited worlds and emerging subjectivities. Rather than exercising control, the teacher assumes responsibility for representing the world to newcomers while remaining open to its transformation. As such, authority is not domination but stewardship—a fragile ethical stance that becomes increasingly difficult to sustain in data-driven educational systems that prioritize efficiency over worldliness.

The erosion of authority also undermines the conditions for meaning. Meaning arises in a world where speech and action can appear before others and be taken seriously. It requires a public space structured by shared reference points. On-Demand Learning, however, increasingly privatizes learning. Personalized pathways isolate learners from one another, reducing opportunities for genuine plurality, disagreement, and common judgment. Learning becomes an individual project rather than a collective endeavor.

A further consequence of this transformation is the erosion of what Arendt calls "common sense" (*sensus communis*)—not as shared opinion, but as the human capacity to orient oneself in a common world. Common sense enables individuals to judge reality by taking into account the perspectives of others; it is what allows us to distinguish appearance from meaning and fact from mere information (through symbolic interactionism). Education plays a crucial role in cultivating this faculty by situating learners within shared traditions, languages, and standards of judgment. On-Demand Learning, however, increasingly undermines common sense by isolating learners within personalized informational environments. Algorithmic filtering, adaptive pathways, and individualized pacing fragment the experiential

ground on which shared judgment depends. When learning is tailored primarily to individual profiles and immediate utility, the capacity to "see the world as others see it" weakens. The result is not simply disagreement, but a thinning of reality itself, as learners lose the common reference points necessary for meaningful judgment. In Arendtian terms, the danger is not pluralism but *disintegration*—a condition in which individuals coexist without genuinely sharing a world.

This privatization is often justified in the language of empowerment. Yet from an Arendtian perspective, a world in which everyone learns alone is not a more inclusive world, but a thinner one. Without shared experiences and common standards, education loses its political dimension, its capacity to prepare individuals to appear among others as responsible and articulate beings. What remains is competence without voice.

In this sense, the crisis of On-Demand Learning mirrors the crisis Arendt diagnosed in mid-twentieth-century education. Then, as now, the refusal of authority and the abandonment of tradition were presented as progressive moves. Arendt warned, however, that such refusals leave newcomers exposed to a world they are expected to navigate without guidance. Today's learners face a similar predicament, but with far greater speed and complexity.

The loss of worldliness, durability, and authority does not mean that learning ceases. On the contrary, learning proliferates. But it does so in a vacuum of meaning. When education no longer offers a world to inherit, learners are left with skills to perform but no common horizon within which those skills acquire significance. But, if On-Demand Learning contributes to the erosion of the educational world, under what conditions might it instead support its renewal? This question leads us to Arendt's concept of *natality*.

2.5 Natality and Renewal: Reclaiming the Human in Learning

Arendt's concept of *natality* provides the most important counterpoint to the crises diagnosed in the previous sections. In *The Human Condition*, Arendt argues that the defining feature of the human condition is not mortality, but natality—the fact that human beings are born into the world as beginnings (Arendt, 1958). Natality names the capacity to initiate, to start something unforeseen, and to interrupt what appears inevitable. Education, for Arendt, is inseparable from this capacity because it stands at the threshold between the old and the new. Even in times of profound disorientation, the presence of newcomers means that the future remains open, not determined by existing systems or historical trajectories. Building on Arendt, Jansson and Wagman (2017) link action to human agency and renewal, showing how it allows individuals to appear before others as unique beings capable of initiating change. From this perspective, education is not simply about acquiring skills, but about creating spaces for judgment, responsibility, and meaningful relationships. Only by moving beyond

efficiency-driven models and intentionally making room for dialogue, plurality, and reflection can On-Demand Learning support such renewal.

The erosion of durability, authority, and common sense does not foreclose the possibility of meaningful education, but it radically conditions it. Arendt is clear that education is never simply about preparing individuals to fit into the world as it is. Rather, it involves introducing them to that world so that they may one day assume responsibility for it and, potentially, change it (Arendt, 1954). When learning environments are designed exclusively around efficiency, adaptability, and demand, they risk neutralizing natality by channeling learners into pre-scripted pathways of optimization. Renewal becomes unlikely not because change stops, but because genuine beginnings are no longer supported. The possibility of renewal depends, for Arendt, on the preservation of *action*. Action is the only human activity that cannot be reduced to necessity or instrumentality (Arendt, 1958). Unlike labor, it does not satisfy biological needs; unlike work, it does not aim at producing durable objects. It unfolds between people through speech and interaction, revealing who someone is rather than what they can do. Educational renewal requires learning environments that make room for action—spaces where learners can speak, judge, and appear before others as plural beings. On-Demand Learning can support such action only if it resists the impulse to eliminate uncertainty, disagreement, and risk in the name of personalization and control.

This has direct implications for the design and pedagogy of On-Demand Learning systems. Arendt repeatedly warns against confusing predictability with stability. Systems that function smoothly may nonetheless undermine freedom if they leave no room for initiative (Arendt, 1958). A human-centered approach to On-Demand Learning would therefore treat *reflection not as inefficiency, but as a condition of freedom*. It would deliberately interrupt cycles of continuous activity, creating moments where learners are invited to pause, question, and reconsider. Such interruptions are not failures of design; they are pedagogical necessities if learning is to remain connected to thinking rather than mere functioning. Rae (2024) emphasizes that for Arendt, freedom is not an inner capacity but something that appears in the world through action, emerging when individuals interrupt necessity and begin something new (pp. 11–12). Thinking, in this sense, is not preparatory to action but inseparable from it, grounding human responsibility in the public realm rather than private intention alone.

Reclaiming natality also requires the restoration of educational responsibility. Arendt argues that adults must assume responsibility for the world as it is, even when they do not fully approve of it (Arendt, 1954). Authority in education emerges from this willingness to stand before the young and say: *this is our world*. In many On-Demand Learning environments, this responsibility is displaced onto platforms, algorithms, or individualized choice. Learners are encouraged to chart their own paths, yet often without guidance regarding why certain knowledge matters or how it relates to a shared world. Arendt would see this not as empowerment, but as abandonment. Restoring responsibility does not mean reasserting rigid hierarchies or fixed traditions. Arendt explicitly rejects education as indoctrination. Rather, responsibility involves mediation: interpreting the past without freezing it, and opening

the future without abandoning the present. In digital and on-demand contexts, this means educators must remain visible as world-interpreters, not merely facilitators of content delivery. Their task is to help learners situate knowledge within broader narratives of meaning, judgment, and consequence. Arendtian action is an ethical way of being in the world, grounded in plurality and lived through thought, speech, and practice. Action is tied to responsibility for shared life and cannot be reduced to individual performance. Educational renewal depends less on technology and more on creating spaces where learners can appear before others, begin anew, and care for the world together (Lima, 2020). Kreber (2016) argues that action is what enables learners to become civic agents rather than service providers. She emphasizes that renewal depends on preserving opportunities for collective deliberation, representative thinking, and the courage to act amid uncertainty. Without such spaces, education risks producing technically competent individuals who are increasingly detached from responsibility for the common world.

To reclaim natality within the automated structures of On-Demand Learning, it is essential to move beyond the narrow "language of learning" toward what Biesta (2006) identifies as a relational process of education. Biesta's work emphasizes that education is not merely the acquisition of skills—a process that aligns with Arendt's definition of repetitive labor—but the "coming into the world" of unique human subjects. In this view, the educator's primary responsibility is to "give the world" to the newcomer, presenting it as a shared and durable space worth assuming responsibility for. This involves embracing what Biesta (2006) calls the "beautiful risk" of education: the inherent unpredictability of human action that resists algorithmic optimization and pre-scripted pathways. For On-Demand Learning to support renewal, its platforms must be designed not just for efficient consumption, but as spaces where learners can appear before one another through speech and judgment, revealing "who" they are in the context of a common world. Higgins (2010) argues that pedagogy itself can become a site of action when teaching is understood as a relational and world-oriented practice rather than mere instructional labor. While Arendt emphasizes students' natality as the primary source of educational renewal, Higgins extends this insight by showing that teachers must also remain in touch with their own capacity to begin anew. Otherwise, pedagogy risks collapsing into technical delivery or bureaucratic maintenance, leaving educators estranged from the very generativity they are meant to foster. As Higgins (2010) asks, "How can a teacher preserve her own natality if the central activity of her life is not a form of action? And how would someone distanced from her own natality hope to recognize, preserve, and stimulate that quality in others?" (p. 410).

Natality also challenges deterministic narratives about technology and acceleration. Arendt consistently resists historical inevitability. Action, she reminds us, always introduces contingency into human affairs (Arendt, 1958). Applied to On-Demand Learning, this insight undermines claims that automation, personalization, or constant reskilling are unavoidable futures to which education must simply adapt. Education, as a space oriented toward natality, retains the capacity to question not only *how* learning is organized, but *why* it is organized in particular ways. On-Demand Learning's emancipatory or exploitative potential depends on whether it is oriented

toward labor alone or whether it also sustains work and action. When learning environments are designed to cultivate judgment, plurality, and responsibility, they can support beginnings rather than merely manage transitions. When they fail to do so, they risk producing highly capable individuals who are increasingly disconnected from a shared world.

This cautious hope does not deny the depth of the crisis. Arendt herself never offers easy optimism. Yet she insists that as long as human beings are born into the world, the possibility of renewal remains. Education, even under conditions of acceleration and automation, can still function as a space where newcomers are prepared not only to adapt, but to act. The challenge of On-Demand Learning, then, is not to keep pace with change, but to preserve the human capacity to begin anew within it. Developing all modalities of vita activa creates conditions for occupational justice, inclusion, and citizenship. Renewal depends not merely on freeing time from necessity but on sustaining spaces where people can act together, disclose who they are, and contribute to a shared world (Jansson, 2020). If On-Demand Learning is a frictionless drive-thru for skills, Biesta (2006)'s "pedagogy of interruption" is the speed bump that acts as a philosophical safeguard for Arendt's natality—that radical spark of bringing something "unforeseen" into a shared world. By "interrupting" our pre-packaged identities, it forces us out of our worldless consumer bubbles and into action, the highest domain of the vita activa, where we must engage with plurality and difference. While on-demand platforms focus on the smooth acquisition of content, true education is an intervention that creates worldly spaces where we appear as unique beings rather than just efficient, autonomous learners.

2.6 Toward an Arendtian Approach to On-Demand Learning

If On-Demand Learning is to move beyond labor and support work and action, its design must deliberately create visible, structured moments of interruption, judgment, and shared responsibility. In vocational and workforce contexts, this can be built directly into modular systems. For example, instead of allowing learners to move linearly from one unit to the next, platforms can require short "pause points" every few modules where progression is temporarily suspended. At these points, learners might be asked to respond to prompts such as: What assumptions does this skill rely on? Where might it fail in practice? Who is affected by how this skill is used? These interruptions matter because they break the cycle of labor and open a space where learners can step back from repetition and begin to exercise judgment. In these moments, learning starts to move toward work, as learners organize and give form to their understanding, and potentially toward action, as they position themselves in relation to others and the shared world.

Dialogue must also be designed, not assumed. Rather than optional discussion boards that are rarely used, programs can include mandatory, small-group exchanges

tied to real tasks. For instance, learners in a technical training program might be given a shared case such as a workplace error, an ethical dilemma, or a failed project and asked to propose different responses, challenge each other's reasoning, and revise their positions. What matters here is not consensus, but the experience of encountering other perspectives and having to justify one's own. Such exchanges move learning beyond labor as individual task completion and toward action, where individuals appear before others, disclose their thinking, and engage in a plurality of viewpoints. At the same time, the collaborative construction of responses reflects elements of work, as learners collectively build more durable and meaningful understandings.

Micro-credentials can also be redesigned in concrete ways. Alongside skill demonstration, each credential might include a "judgment component": a short reflective statement, scenario-based response, or oral explanation in which learners articulate not only how they perform a task, but when, why, and whether it should be performed. For example, a credential in data analysis could require learners to interpret a dataset and discuss potential misuses or ethical risks. This shifts credentials away from certifying labor (the ability to perform a task repeatedly) toward recognizing work (the capacity to produce meaningful, situated outcomes) and, crucially, action (the ability to judge and take responsibility for the consequences of one's actions in a shared world).

In workplace learning, an Arendtian approach would introduce regular, facilitated inquiry sessions alongside skill training. These could be short, recurring meetings (e.g., monthly 30-min sessions) where employees bring real challenges from their practice and examine them collectively. The goal is not efficiency or immediate solutions, but deliberation: considering alternatives, questioning routines, and making visible the assumptions embedded in everyday work. Such practices interrupt the dominance of labor as continuous productivity and create space for action, where participants engage with one another as thinking and judging subjects. At the same time, the collective effort to interpret and respond to shared problems contributes to work, as a more durable and shared understanding of practice begins to take shape.

Even small design changes can make a difference. For example:

- replacing auto-graded quizzes with one open-ended question per module,
- requiring learners to respond to a peer before submitting their own answer,
- including "slow tasks" that cannot be skipped or accelerated,
- or asking learners to revisit and revise earlier responses in light of new understanding.

These interventions do not eliminate labor, nor should they; repetition and practice remain necessary. But they prevent labor from becoming totalizing. By introducing friction, they create openings for work (the shaping of meaning over time) and action (the expression of judgment in relation to others). These examples do not resolve the tensions within On-Demand Learning, but they show that its trajectory is not fixed. Even within highly technologized systems, it is possible to design for reflection, plurality, and beginning. The question is not whether such possibilities exist, but whether educational systems are willing to sustain the delicate balance between labor, work, and action and to recognize that education loses its meaning when any

one of these comes to dominate the others. These proposals are necessarily partial and illustrative, but they suggest that even within constrained systems, educational design remains a site of meaningful intervention.

2.7 Conclusion

By treating education as a frictionless service, On-Demand Learning fuels a cycle of social acceleration that isolates us in a "contracted present," stripping away the pedagogy of interruption and the ethic of care needed to resist worldlessness and reclaim action as a collective responsibility for our shared world. Arendt famously described thinking as the activity through which human beings come to terms with what they are doing. This deceptively simple formulation provides a fitting lens through which to assess On-Demand Learning. On-Demand Learning is not merely a technological innovation or pedagogical strategy, but a condition that reshapes the meaning, purpose, and temporality of education itself. To ask whether On-Demand Learning is efficient, scalable, or flexible is insufficient. The more urgent question is whether we are still thinking what we are doing as education is increasingly reorganized around demand, immediacy, and automation.

Arendt's work reminds us that crises become dangerous not when change accelerates, but when reflection disappears. In *The Human Condition* and *The Crisis in Education*, she repeatedly warns against substituting functioning for thinking and adaptation for judgment. On-Demand Learning risks precisely this substitution when learning is reduced to responsiveness and success is measured by speed, engagement metrics, or alignment with market signals rather than by the cultivation of understanding. In such conditions, education continues to operate, yet loses its capacity to orient human beings within a shared world.

The core tension of On-Demand Learning lies in its ambiguous relation to the *vita activa.* When learning is treated primarily as labor, it becomes continuous, consumptive, and governed by necessity. When it abandons the stabilizing dimensions of work, it loses durability and coherence. When it marginalizes action, it forecloses the possibility of judgment, plurality, and political appearance. These are not peripheral losses. For Arendt, they signal the erosion of the very conditions under which meaning can arise.

At the same time, Arendt's concept of *natality* prevents this critique from hardening into fatalism. The presence of newcomers means that education can never be fully captured by systems, however sophisticated. As long as learning environments allow space for interruption, reflection, and responsibility, they can still support beginnings rather than merely manage transitions. On-Demand Learning, then, is not inherently dehumanizing but neither is it neutral. Its human significance depends on whether it sustains or suppresses the capacities that make thinking and action possible.

To think what we are doing in On-Demand Learning therefore requires resisting the naturalization of speed, personalization, and constant availability. It requires

asking not only how learning can be delivered more efficiently, but what kind of world such delivery practices presuppose and reproduce. Are learners being prepared to inhabit a common world, or merely to navigate individualized streams of information? Are they invited to judge, or only to perform? Are they being introduced to what endures, or trained to cope with what constantly changes?

Arendt insists that education is the place where society decides whether it loves the world enough to assume responsibility for it, and whether it loves the young enough not to abandon them to it. This insight is especially urgent in the context of On-Demand Learning. When education is reorganized without reflection, responsibility is quietly displaced from educators to platforms, from judgment to metrics, from meaning to demand. Thinking what we are doing means reclaiming that responsibility.

In this sense, the challenge posed by On-Demand Learning is not primarily technological, but ethical and political. It concerns how we understand the purposes of education in a world increasingly shaped by automation and acceleration. To think rather than merely function, to educate rather than optimize, and to preserve spaces where new beginnings can appear. These are not nostalgic ambitions but the conditions under which education remains a human practice. What is ultimately at stake is whether On-Demand Learning remains confined to labor or makes room for work and action, where learners not only perform tasks but come to exercise judgment and appear before others as responsible actors in a shared world. Thinking what we are doing, in this context, is not an abstract philosophical exercise but a practical necessity.

If On-Demand Learning is to become more than a mechanism of adaptation, it must be embedded within an educational imagination that values durability, plurality, and judgment. Only then can it contribute not to the loss of the world, but to its renewal.

References

Arendt, H. (1954). The crisis in education. In H. Arendt (Ed.), *Between past and future: Eight exercises in political thought* (pp. 173–196). Penguin Books.

Arendt, H. (1958). *The human condition.* University of Chicago Press.

Ball, S. J. (2003). The teacher's soul and the terrors of performativity. *Journal of Education Policy, 18*(2), 215–228. https://doi.org/10.1080/0268093022000043065

Barnett, R. (2023). Only connect: Designing university futures. *Quality in Higher Education, 29*(1), 116–131. https://doi.org/10.1080/13538322.2022.2100627

Bhambra, G. K. (2014). Postcolonial entanglements. *Postcolonial Studies, 17*(4), 418–421. https://doi.org/10.1080/13688790.2014.963926

Biesta, G. J. J. (2006). *Beyond learning: Democratic education for a human future.* Paradigm Publishers.

Birch, K., & Muniesa, F. (Eds.). (2020). *Assetization: Turning things into assets in technoscientific capitalism.* MIT Press.

Han, B. C. (2015). *The transparency society.* Stanford University Press.

Han, B. C. (2022). *Infocracy: Digitization and the crisis of democracy.* Wiley.

Higgins, C. (2010). Human conditions for teaching: The place of pedagogy in Arendt's vita activa. *Teachers College Record, 112*(2), 407–445. https://doi.org/10.1177/016146811011200208
Jansson, I. (2020). Occupation and basic income through the lens of Arendt's vita activa. *Journal of Occupational Science, 27*(1), 125–137. https://doi.org/10.1080/14427591.2019.1646161
Jansson, I., & Wagman, P. (2017). Hannah Arendt's vita activa: A valuable contribution to occupational science. *Journal of Occupational Science, 24*(3), 290–301. https://www.tandfonline.com/doi/full/10.1080/14427591.2016.1277780
Komljenovic, J. (2021). The rise of education rentiers: Digital platforms, digital data and rents. *Learning, Media and Technology, 46*(3), 320–332. https://doi.org/10.1080/17439884.2021.1891422
Kreber, C. (2016). The 'civic-minded' Professional? An exploration through Hannah Arendt's 'vita activa'. *Educational Philosophy and Theory, 48*(2), 123–137. https://doi.org/10.1080/00131857.2014.963492
Lima, E. M. F. A. (2020). Activities, common world, and forms of life: Contributions of Hannah Arendt's thought to occupational therapy. *Cadernos Brasileiros de Terapia Ocupacional, 28*(3), 1037–1050. https://doi.org/10.4322/2526-8910.ctoARF1995
Rae, G. (2024). Arendt, free will, and action. *Philosophy & Social Criticism*, 1–20. https://doi.org/10.1177/01914537241284547
Robinson, C. (2023). Black marxism. In *Social theory re-wired* (pp. 156–164). Routledge.
Rosa, H. (2013). *Social acceleration: A new theory of modernity*. Columbia University Press.
Selwyn, N. (2014). *Distrusting educational technology: Critical questions for changing times*. Routledge.
Selwyn, N., Hillman, T., Bergviken Rensfeldt, A., & Perrotta, C. (2023). Digital technologies and the automation of education—Key questions and concerns. *Postdigital Science and Education, 5*(1), 15–24. https://doi.org/10.1007/s42438-021-00263-3
Serpil, H. (2026). Beyond post-work digital labor: Fostering Arendtian action in the metaverse. In J. Thomason, M. H. Baturay, R. Jain, & F. Çelik (Eds.), *Metaverse, metaintelligence and infinite worlds with AI*. https://doi.org/10.5772/intechopen.1013241. https://www.intechopen.com/chapters/1237712
Srnicek, N. (2017). *Platform capitalism*. Polity Press.
Williamson, B., Komljenovic, J., & Gulson, K. (2024). *World yearbook of education 2024: Digitalisation of education in the era of algorithms, automation and artificial intelligence*. Taylor & Francis.

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Chapter 3
When Flexibility Becomes the Problem: Discourses, Educational Ideals, and Individuals as Obstacles to On-Demand Learning



Mia Thyrre Sørensen and Maria Hvid Stenalt

Abstract In this chapter, we consider the tensions between On-Demand Learning and its different contours of flexibility in the context of university's education programmes. Specifically, the chapter critically examines how flexibility, framed as a foundational aspect of On-Demand Learning, is constructed and negotiated by higher education stakeholders, following a national reform to increase On-Demand Learning. Contrasting common understandings of flexibility focusing on the "*when*" of learning (temporal flexibility) and the "*where*" of learning (spatial flexibility), this chapter renders flexibility the "*why*", according to the ways flexibility is shaped by and embedded in policies, infrastructures, and cultural practices. A qualitative research approach was developed, combining constructivist grounded theory, as outlined by Charmaz, with discourse-analytic perspectives inspired by Laclau and Mouffe and Fairclough. Through analysis of semi-structured interviews with 12 Danish educational leaders and higher education teachers, the chapter delineates six distinct discourses on flexibility. Based on this, we consider three obstacles to On-Demand Learning, focusing on discourses, educational ideals, and individuals as problems. The chapter also offers a framework for the highly flexible learner and teacher, opening up for considerations of flexibility as a temporal and labour-oriented construct.

Keywords Flexible education · Discourse · Higher education · Epistemic mobility · Teaching · Learning

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3.1 Introduction

Flexibility, in one way or another, is a concept that pervades On-Demand Learning (Chen, 2025). On-Demand Learning, which broadly refers to methods and tools supporting learners to access knowledge at their own pace and just-in-time (Aida, 2023; Sampson et al., 2002), is, in fact, intertwined with flexibility, often understood as the underpinning feature of personalised and sequential learning schemes in contrast to traditionally structured ones (EUA, 2024; UNESCO, 2022). Moreover, flexibility is often associated with multimodal delivery methods, effectively supporting just-in-time learning (EUA, 2024). That is, to cater for individual topical needs along the whole life cycle, education itself must be flexible. At other times, however, the *On-Demand,* flexible agenda is interpreted as one of less (Trondsen & Vickery, 1997), focusing on developing just-in-time skills and competences through cost-effective training methods, rather than building and academic growth.

In turbulent times, flexibility is often called for by international and national organisations to tackle societal problems and avoid "dead ends" (UNESCO, 2022, p. 12). Thus, one reason for moving beyond programme-oriented education towards more flexible pathways for education, applied learning, and training activities is national government policy. This is the issue in Denmark, where the national government recently launched a master's degree reform to restructure the master's degree towards further and continuing education, cultivating a rich diversity of programmes and a less hierarchical view on educational institutions (Uddannelses- og Forskningsministeriet, 2023). Higher education institutions are steadily working to adapt to the new policy but are challenged by the parameters of flexibility; thus, operationalising flexibility within organisational structures is central. The problem with the current negotiation of goals and technology (ways to get there) is that different understandings of flexibility may be overlooked, simplifying insights, nuances, and concerns from practice. As observed in a study of speculative educational futures in Denmark by Pischetola and peers (2024), 755 Danish faculty members expressed strong concerns about uncontrolled, market-driven changes to higher education, such as the commodification of education and the modularisation of university courses. As this makes clear, means such as flexibility and mediating changes, such as On-Demand Learning, are not just neutral design features (Hrastinski et al., 2025) but are entangled with traditional higher education, policy, and infrastructure. Then, if paradigm shifts in how education is planned, organised, and delivered (Sampson et al., 2002) are to be adequately addressed, understandings of flexibility in education and the question of *why flexibility* needs to play a central role.

In this chapter, we seek to cultivate richer understandings of this aspect by critically examining how understandings of flexibility are represented and negotiated within a higher education context, moving towards On-Demand Learning. The study is guided by the following research questions: *What are the discourses guiding flexibility in practice? What dimensions are adopted in constructing the meaning of flexibility within the discourses?*

We open with a brief review of the literature on flexibility, followed by a qualitative inquiry within Danish higher education. To explore *why flexibility*, we approach language as discourse use that reflects and shapes social order (Clarke et al., 2018). In the discussion, we consider three obstacles to On-Demand Learning, centring on discourses, educational ideals, and individuals as problems. Finally, we highlight the capacity to sustain epistemic mobility as central to On-Demand Learning.

3.2 Constructing Flexibility

Flexibility is a feature often assumed to be unquestionably good. In his seminal work on flexibility, Barnett (2014) identifies the three flexibility orientations of such framing, informing higher education: *Flexibility' as in flexing* (the ability to respond), *flexibility as enterprising* (being innovative and entrepreneurial), and *flexibility as responding to situations in the world emphatically and appropriately* (being able to attune and connect with the world). In more general terms, flexibility is something that is "easily adapted, molded, and managed" (Willems, 2005), resonating with Merriam-Webster's description of flexibility as the quality or state of being flexible, including: (1) capable of being flexed, (2) yielding to influence, and (3) a capability to adapt to new, different, or changing requirements (Merriam-Webster, a). Distinguishing flexibility from what it is not stresses the point. Being inflexible concurs with aspects that are fixed (Collis & Moonen, 2002), resonating with general understandings of inflexible, meaning the firmness of will or purpose (stubbornness), something not easily changed (unalterable), and an imbalance (deficit), such as a weak knee (Merriam-Webster, b). Flexibility is also used in policy and public discourse, where it is tied to the marketisation of higher education, the emergence of students-as-consumers, the potential of new digital technologies, and the apparent potential to widen education at reduced unit costs (Barnett, 2014).

Flexibility is a commonly used concept in the literature on educational technology and distance education (Hrastinski et al., 2025), where it is assumed to be a critical element in empowering learners (Ryan & Tilbury, 2013). In these contexts, flexibility is multifaceted. Collis and Moonen (2002, 2011) suggest that flexible learning relates to time, content, entry requirements, instructional approaches and resources (e.g., forms of communication and types of interaction), delivery, and logistics. A study by Li and Wong (2018) supports these dimensions. Based on a review of literature on flexibility, they suggest a multidimensional system of flexible learning with seven pertinent flexibility dimensions: time (time and date to start or finish the course/module and pace of learning in a course), content (level of difficulty of module content, sequence in which topics are covered, and topic to learn), entry requirement (prerequisites for module/course participation), delivery (channels for course information and place for learning), instructional approach (amount of learning activities, instructional language, modes and structures of presentation, social organisation of learning, time and duration of learning activities, and type

of learning activities), assessment (assessment mode, assessment standard, assignment requirement, weighting of assignments and examination in the course result, and examination dates and assignment deadline), resource and support (amount of learning materials, tools, and support; method of obtaining learning materials, tools, and support; place where learning materials, tools, and support are available; time available for support; and type of learning materials, tools, and support), orientation or goal of the course.

More recently, Beer and peers (2023) have taken an interest in time, place and pace, and the study by El Galad and peers (2024) of flexibility in higher education focuses on deadlines, modality, assessment type, grading and weighting, and course correspondence. Across these accounts, flexibility addresses design features that enable "*learner choice* in different aspects of the learning experience" (Collis & Moonen, 2002, p. 219). Highlighting the human perspective as cardinal to flexibility (Li & Wong, 2018), Khan (2005, p. 140) phrases flexibility as "in your own time, pace, and place".

Despite the multidimensional nature of the construct, empirical research often centres on learners' temporal-spatial flexibility (Hrastinski et al., 2025; Lockee & Clark-Stallkamp, 2022; Roberts, 2002; Veletsianos & Houlden, 2020). Temporal flexibility focuses on the *when* of learning. It provides learners with the opportunity to access and commence courses at their convenience and control the timing of their progression. Spatial flexibility concerns the *where* of learning, emphasising the learner's option to choose from where to participate. Temporal-spatial flexibility is often represented through two dichotomies: online versus face-to-face and synchronous versus asynchronous. Moreover, pedagogical flexibility is positioned as a critical type of flexibility (Barua & Lockee, 2024; Hrastinski et al., 2025), articulating the *how* of flexibility and operationalised as "education that is tailored to the pedagogical needs and preferences of students" (Hrastinski et al., 2025, p. 3), emphasising human freedom in learning. In fairness, the two major types have been widely adopted to operationalise flexibility and describe course qualities (Goodyear, 2001; Nørgård & Hilli, 2022; Vaughan, 2007). Yet, the categorical understanding of flexibility as a distribution with a limited spectrum of possible outcomes often reduces it to a simple, tangible, and relatively easy-to-account-for goal.

Rather, flexibility is a multidimensional construct, and within each dimension of flexibility, there are multiple variations to account for. Barnett's (2014) work also invites us to reflect on the number of levels at which flexibility may be exhibited: sector, institutional, pedagogical, and learner flexibility, and how the different levels might work against or complement each other. Then, in light of the real complexity of flexibility, it seems wise to paraphrase the worried colleague cited by Burge et al., (2011, p. 18): "How far does the rubber stretch?" Certainly, flexibility is important, but is it possible, desirable, or even beneficial across every dimension for student learning? Strongly felt worries towards overhyping flexibility remind us to take care of avoiding flexibility becoming a "shorthand for the value of freedom for all to learn" (Veletsianos & Houlden, 2020, p. 146). The value of flexibility might be constrained. For example, Houlden and Veletsianos (2019) and Willems (2005)

outline how the impact of flexibility is influenced by students' economic circumstances, work-life balance, and access to technology and technological infrastructure. Barua and Lockee (2024) illuminate a tension between choice and choice overload for students and an increased workload for teachers as core concerns. There may also be professional obstacles to staff engaging with flexible education that are imperative to address (Sørensen & Stenalt, 2026). Given these insights, flexibility appears neither unquestionably good nor completely neutral.

The theoretical outset of this chapter is that language constructs and mediates reality or social phenomena. This premise is grounded in discourse theory (Fairclough, 1992; Laclau & Mouffe, 2001) that argues that language is a site of meaning-making and an attempt to dominate the field of focus. It is therefore not only talk, but, in our case, it also changes the ways that we can do flexible education. In this study, we use discourse theory to explore how flexibility and its value are constructed through language use.

3.3 Methodological Approach

To understand flexible learning and education both as social practices and as discursively mediated phenomena, we employ a qualitative research approach that combines constructivist grounded theory (CGT), as outlined by Charmaz (2014), with discourse-analytic (DA) perspectives inspired by Laclau and Mouffe (2001) and Fairclough (1992). While these traditions differ in origin and epistemological grounding, both emphasise meaning-making, relationality, and the identification of differences, similarities, and positions within networks of discourse. Previous studies have demonstrated that the two approaches can be productively integrated (e.g., Jensen, 2015; Johnson, 2014; Mackenzie, 2025), as CGT offers systematic, iterative strategies for inductively engaging with data, while discourse analysis provides tools for examining how meanings are constructed, stabilised, and contested through language.

In this study, CGT serves as an analytical framework for data-proximal coding and constant comparison, enabling a rigorous and grounded engagement with empirical material. Discourse analysis functions as an interpretive lens that extends the analysis by focusing on lexical and modal choices, notions of equivalence and difference, and the construction of subject positions. Rather than aiming to build generalisable or causal theory in a classical grounded-theory sense, the study seeks to generate a nuanced understanding of the discursive configurations that shape how flexibility is enacted and experienced.

Within this framework, analysis was a collaborative and reflexive process. Both authors participated in interview readings, iterative coding, situational mapping, and analytic discussions. Divergent interpretations were openly identified and negotiated via reflexive dialogue and memo-writing, enabling codes, categories, and discourses to be gradually refined and stabilised through continuous comparison.

The analytical process proceeded through the following four interconnected steps:

Step 1: Research Design and Data Construction

The study was undertaken in 2025 following the announcement of the master's reform in Denmark. Data were constructed through semi-structured qualitative interviews, including ten individual interviews and one group interview. To support a multi-voiced understanding of flexibility (Engeström & Sannino, 2010), we employed a mixed purposive sampling strategy that combined intensity and operational sampling (Suri, 2011). The sample comprises twelve academic staff members familiar with flexible education with varying organisational roles in continuing education, including faculty managers, educational leaders, chairs of study boards and lecturers. Recruitment began with central and faculty-level managers, who referred us to relevant stakeholders.

Table 3.1 provides an overview of the 11 interviews—ten individual and one group interview—undertaken and the participants.

The interview guide was designed to elicit participants' situated understandings and enactments of flexibility in educational practice. Importantly, the interviews were not concerned with specific online, blended or hybrid forms of learning. Rather than operationalising flexibility a priori, interviews began with open-ended questions, followed by adaptive follow-up prompts that allowed flexibility to emerge as a participant-defined construct. Examples of guiding questions include: *What do you understand by flexibility in education? How do you work with flexibility in your programme or role? What opportunities and challenges do you experience in relation to flexible courses?* These open-ended questions invited participants to reflect on both the meanings attributed to flexibility and the concrete practices, tensions, and organisational conditions.

Table 3.1 Interview participants

ID	Participant position	Faculty	Interview format
1	Management	University administration	Face-to-face
2	Management	Social Science and Humanities	Face-to-face
3	Management	Engineering	Face-to-face
4	Management	Health	Face-to-face
	Management	Health	
5	Chair of the study board	Social Science and Humanities	Face-to-face
6	Chair of the study board	Social Science and Humanities	Online
7	Chair of the study board	Social Science and Humanities	Face-to-face
8	Lecturer	Technical Faculty	Face-to-face
9	Chair of the study board	Social Science and Humanities	Online
10	Lecturer	Technical Faculty	Face-to-face
11	Lecturer	Technical Faculty	Face-to-face

Interviews lasted between 30 and 60 min, were conducted face-to-face or online, audio-recorded, and transcribed using Transcriber, a customised tool based on OpenAI's Whisper model. The group interview adhered to the same semi-structured interview guide as the individual interviews; likewise, it was transcribed and analysed as part of the same analytical process.

Step 2: Initial Open Coding

Analysis began with CGT-inspired open coding, guided by Charmaz's (2014) invitation to ask: What is happening in the data? We immersed ourselves in the material to develop an intimate familiarity with participants' accounts, breaking the data into analytic units while remaining attentive to variation, tensions, and early signs of emerging categories. Throughout this phase, constant comparison was used to juxtapose codes across interviews, and memo-writing captured reflections, provisional linkages, and questions for further exploration. This stage was intentionally data-proximal, delaying higher-order interpretation while allowing contingent and relational patterns in the material to surface.

Step 3: Situational Mapping

In the third step, we applied situational analysis (Clarke et al., 2018) to extend and structure our initial coding. First, we created messy situational maps to open up the data and identify all relevant human and nonhuman elements mentioned in the interviews, including actors, organisational structures, technologies, and early indications of competing meanings of flexibility. Next, we developed ordered maps to organise these elements into analytical categories. This process clarified key arenas, relationships, and tensions that shape how flexibility is constructed in practice and provided a structured foundation for the subsequent discourse-oriented analysis. Table 3.2 presents an ordered situational map of the 11 interviews. The mapping process involved a broader range of elements than those presented in the Table, which reflects a condensed analytical representation.

Step 4: Focused Coding and Articulation for Discourses

In the final analytical step, we moved from broad, exploratory coding to a more selective engagement with the data through focused coding. We consolidated the most significant categories that emerged across interviews and compared them systematically to identify recurrent patterns. Building on this, we applied a discourse-analytic lens to examine how the meanings of flexibility were constructed and stabilised in the material. This involved analysing key lexical choices, contrasts, and implicit assumptions, as well as tracing how participants positioned themselves and others in relation to flexibility. Through this combined process, we articulated six discourses that capture how flexibility is framed, negotiated, and contested across the interview material. To exemplify each discourse, we include brief excerpts and selected lexical items. These are not linked to individual interviews, as the analytical aim is to trace shared discursive formations rather than personal accounts. After identifying the discourses, we conducted an additional interpretive step in which we

Table 3.2 Ordered situational map

Individual human actors	**Nonhuman elements**
Continuing Education students (professionals/employees, private individuals, learners with family responsibilities, customers) Full-time students Teachers (facilitators, designers, supervisors, researchers) Educational leaders and administrators	Educational structures (modules, semesters, elective systems, ECTS requirements) Teaching modalities (face-to-face, online, hybrid) Digital infrastructures (LMS, Zoom) Timetables, schedules, deadlines Pedagogical artefacts (videos, micro-credentials, assignments)
Collective Human Actors	**Political and Economic Elements**
University as a public institution Professional communities and cohorts Employers and external partner organisations Administrative units	Ministerial reforms and policy agendas (flexibility, lifelong learning) Institutional strategies and business models Participant fees and income generation Market competition between providers
Temporal Elements	**Spatial Elements**
Part-time/full-time Synchronous/asynchronous Predictability and long-term planning 'anytime' Effective time/ sacred hours/ working time/ time-saving activities Speed, sequencing, timing, intensity, pacing, spacing Temporality (e.g. before, during and after)	Campus spaces Home and workplace Online environments Distributed and hybrid learning spaces 'anywhere'
Major issues/Tensions	**Sociocultural/symbolic Elements**
Flexibility and configurability vs coherence and academic rigour Autonomy vs guidance and structure Market responsiveness vs public mandate Individual choice vs collective learning Accessibility vs relational and interactional quality	Values of physical presence and co-presence Professional identity (busy, responsible adults) Trust, autonomy, and self-regulation Theory–practice relations Sense of belonging and learning community

compared and abstracted across the discourses to derive a set of underlying dimensions of flexibility. In examining the relations between these dimensions, we identified five tensions, dynamic dualities that delineate how the dimensions interact, pull in different directions, and shape the enactment of flexibility in practice.

3.4 Findings

In this section, we present six discourses that articulate how flexibility is constructed and negotiated in practice. The discourses were developed through iterative analysis and constant comparison of recurring articulations identified across the interview

material. The discourses should not be understood as internally discrete or mutually exclusive categories. Rather, they represent overlapping and coexisting patterns of meaning that may be articulated simultaneously within the same interview or organisational context. Table 3.3 provides an orienting overview of the recurring articulations informing each discourse and is not intended as an exhaustive coding scheme. Following the presentation of the six discourses, we synthesise how flexibility is constituted across these discourses, identifying key dimensions and tensions that structure its enactment in practice.

D1. Flexibility as Balancing Educational Components

Within this discourse, flexibility is constructed as a matter of balancing, coordinating, and configuring educational components so that they form a coherent, meaningful, and workable whole. Flexibility emerges continuously shaped through ongoing processes of planning, structuring, coordinating, and adjusting learning activities, formats, and temporal arrangements. Rather than being understood as a fixed attribute, flexibility is presented as deliberately produced through pedagogical and organisational choices.

Flexibility as balancing educational components is expressed, among other things, when a participant describes flexibility as "a balance between presence-based teaching and distance learning". This balancing and configuration relate to different educational elements, which are further elaborated in the sub-discourses below. In addition to the choice of modalities, flexibility is articulated in relation to curriculum structures, temporal organisation, and situational adaptation.

a. **Choice of Modalities**

In this sub-discourse, flexibility is articulated through the selection and orchestration of teaching modalities. Different modalities are attributed to distinct functions,

Table 3.3 Overview of the six discourses, articulated through recurring articulations identified in focused coding

Discourses	Recurring articulation
D1 Flexibility as balancing educational components	Balancing modalities; coherence versus configurability; temporal coordination and predictability; planning vs. adaptability
D2 Flexibility on market terms	Demand orientation; customers and competition; flexibility as a selling point
D3 Flexibility for professional	Predictability; time optimisation; fitting education into everyday work and family life
D4 Flexibility as a theory-practice bridge	Applicability; co-creation; professional experience as a learning resource
D5 Flexibility as individualisation	Modularisation; choice and tailoring; personal educational trajectories
D6 Flexibility as autonomy	Self-regulation; responsibility; trust-based learning arrangements

qualities, and risks. Physical presence is associated with authenticity, immediacy, and relational proximity, often described as situations "where you look each other in the eyes" and where a shared, "college-like" learning atmosphere can emerge. Face-to-face settings are thus associated with greater depth of academic interaction, enabling informal dialogue, spontaneous exchange, and the development of a sense of belonging. Online formats, by contrast, are connected to efficiency, accessibility, and temporal-spatial flexibility. They are valued for reducing travel time and enabling participation across geographical distances. Still, they are also associated with risks such as reduced engagement, weaker interaction, and potential losses in relational quality. Hybrid formats are described as both pedagogically and technically demanding, placing high expectations on teachers' competencies and on the establishment of a shared learning space across physical and digital settings. Within this sub-discourse, teachers are positioned as designers who must carefully "balance" the advantages and limitations of different modalities. Students are positioned as participants who both demand flexibility and value meaningful interaction, particularly in physical settings. Flexibility thus becomes a matter of modal orchestration, in which accessibility and interaction quality are continuously weighed against one another.

b. **Curriculum Structures**

In this sub-discourse, flexibility is created through the content and structural construction of education. Modular formats are linked to choice, customisation, and the possibility for students to "pick and choose" and "design their own profile", thereby enabling variation in scope, sequencing, and focus. In contrast, the semester-based structure is associated with progression, coherence, and social integration, as students follow a shared trajectory and develop a "sense of belonging". This creates tension between flexibility as personal tailoring and flexibility as maintaining progression and coherence. Teachers are positioned as curriculum designers who must navigate this tension by enabling choice without undermining the disciplinary progression. Students are positioned both as agents making strategic selections and as participants who benefit from the stability and social integration that shared progression provides.

c. **Temporal Organisation**

Flexibility is further articulated through the organisation of time, including tempo, timing, and intensity. It is associated with the ability to plan well in advance, to 'concentrate' teaching into blocks, and to ensure predictability in schedules and deadlines. Temporal organisation also concerns the balance and rhythm of synchronous and asynchronous activities. While synchronous sessions are institutionally scheduled and coordinated, asynchronous periods are framed as the students' "own time", during which they are granted the autonomy to "access learning materials at various times throughout the day" and "engage in preparatory work, reading, and assignments, whenever they want".

d. **Situational Adaptation**

In this final sub-discourse, flexibility is understood as continuous situational responsiveness rather than as a predefined design. Teachers are described as constantly adjusting and refining teaching through small modifications, experiments, and context-sensitive decisions. Broadly defined curricula are valued for providing manoeuvring space, allowing teachers to adapt content, cases, and activities in response to students' engagement and emerging needs and possibilities.

Students are positioned as active participants whose contributions and interactions shape the specific expression of teaching from session to session. Flexibility thus appears as a pedagogical sensitivity to the situation, grounded in professional judgement rather than in fixed formats or rules.

D2. Flexibility on Market Terms

Within this discourse, flexibility is framed as a means of aligning educational provision with demand, funding structures, and participant expectations, positioning flexible formats as necessary for survival and growth within a competitive continuing education landscape. Flexibility functions as a "selling point", closely linked to economic sustainability, participant fees, and strategic positioning. Students and organisations are consistently positioned as customers, whose expectations and willingness to pay legitimise flexible formats, schedules, and delivery modes.

This construction of flexibility is reflected when participants describe the university, as an actor that must "have something on the shelves", "find out what the customers want", and continually modify its offerings to meet "demands" in a "fiercely competitive market". Hereby, the university is positioned as a commercial enterprise, rather than serving as a public institution with a societal mandate.

Within this logic, teaching and administration are framed as service functions. Flexibility becomes an organisational obligation rather than a pedagogical choice, with staff expected to be "highly service-oriented" and to minimise friction in admission, planning, and delivery.

D3. Flexibility for Professionals

In this discourse, flexibility is presented as a necessity for professionals to participate in continuing education. The students are positioned as individuals with demanding work lives and responsibilities in family and private life, which means that education must "fit into their everyday life" and be organised so it can be incorporated into a "busy schedule". They are depicted as competent time managers, yet also as individuals whose attention to studies can easily 'be stolen' by other responsibilities. Their work is presented as a top priority but also as a potential distraction during study, creating competition for students' attention between work and study.

Flexibility stands out as a means of time optimisation. Time is treated as a precious resource, "hard to find" and something to which education "lays claim". Predictability and clear time schedules become necessities and values, enabling students to "plan around" synchronous educational activities. Various formats are linked to distinct qualities regarding time allocation and adaptation to students' everyday lives. While

asynchronous resources can be utilised at "any time", online sessions are analogous to a Teams meeting scheduled in the work calendar and a format that saves students' travel time. While physical seminars are considered rigid in terms of time and space, they are, conversely, flexible regarding students' personal lives, taking up work time rather than free time. Moreover, physical seminars are described as "a space to be able to put one's work aside", a "bubble of teaching and networking", and a "room for focus and immersion", and thus as a way to reduce possible distractions from work. This creates a tension between fostering academic immersion and accommodating students' busy work schedules.

The teacher is positioned as an organisationally flexible person who should be available when students have time, including outside normal working hours, while the administration's main task is to be "sharp on planning". The key in this context is to create "a short route" and "to make it easy to participate in the education we offer". Rather than merely accommodating busy everyday lives, flexibility here is constructed as an organisational and logistical condition that lowers barriers to participation and minimises friction around access and coordination.

D4. Flexibility as a Theory-Practice Bridge

This discourse presents flexibility as a crucial factor in connecting theory and practice, emphasising it as a mechanism through which academic knowledge is expected to circulate into and be reshaped by professional practice. This understanding of flexibility is reflected when participants emphasise that continuing education should provide "something that can be used in practice", often grounded in "problems from their own organisation". Students are positioned as experienced practitioners who "bring workplace experience into the classroom" and "take the learning they get at university into their company", expecting academic knowledge to be directly applicable in their professional practice. The teacher is positioned as a facilitator and translator responsible for framing theoretical concepts to enable participants to transform their own practices.

A recurring element within this discourse concerns the role of peer interaction and professional networks; "they [the students] learn a lot from each other". Flexibility is constructed as a prerequisite for enabling participants to learn not only from academic content but also from one another. Through dialogue, case sharing, and mutual sparring, participants' diverse professional experiences become a central learning resource. Moreover, this discourse emphasises reciprocal learning relationships between participants and teachers. Flexibility enables teachers to draw on participants' practice-based knowledge, thereby challenging, nuancing, and enriching academic perspectives. Teaching thus emerges as a site of co-creation, characterised by multidirectional knowledge flows between research and practice. Continuing education is positioned as a space in which academic knowledge circulates beyond the university while remaining informed by developments in professional fields.

At an institutional level, flexibility is legitimised as a societal necessity. By facilitating strong connections between theory and practice, continuing education is constructed as a key arena for organisational learning, professional development, and societal change. The discourse introduces tensions concerning the balance between

academic rigour and practical relevance, as well as questions about inclusion and participation. While flexibility enables rich forms of peer learning and practice-based engagement, it also presupposes a certain level of professional experience and reflexive capacity, implicitly shaping who is positioned as a legitimate contributor to knowledge production.

D5. Flexibility as Individualisation

In this discourse, flexibility is constructed as the possibility for participants to compose their own educational trajectory through a wide range of modules, elective courses, formats, and intensities. This understanding of flexibility is reflected when participants describe how students can "pick and choose" between modules and "design their own profile" in order to compose a personalised educational trajectory. Hereby, education becomes a configurable system in which learners select elements that align with their professional interests, career ambitions, or specific knowledge needs.

The students are positioned as purposeful and strategic individuals who navigate an extensive educational landscape and assemble a pathway tailored to their goals. This logic constructs education as something customised rather than collective and positions the institution as a provider of modular offerings. The teacher's role becomes that of a facilitator who supports navigation and offers guidance within a diverse set of possibilities.

Within this discourse, flexibility is linked to choice architecture, the breadth of available options, and the structural openness of the curriculum. The expansion of modules, micro-courses, and elective structures is thus seen as enhancing individual relevance and personal fit. At the same time, this logic produces tensions around coherence and community, as individualised pathways can fragment the shared learning experience and challenge the formation of stable cohorts. Flexibility thus emerges as an attribute of educational design that maximises individual choice.

D6. Flexibility as Autonomy

In this discourse, flexibility is constructed as a pedagogical practice that grants students autonomy in how they structure, prioritise, and orient themselves within their education. Flexibility is framed as an opportunity to manage one's own learning within an open, trust-based framework, positioning participants as competent, responsible adults capable of self-regulation.

This understanding of flexibility is reflected when participants describe flexibility as "freedom with responsibility", emphasising trust in learners' ability to organise and regulate their own engagement. Autonomy in this discourse is closely associated with expectations of self-regulation and individual responsibility. Students are expected to navigate flexible structures, manage their time, and prioritise learning activities in alignment with their own needs and circumstances. Flexibility is thus not framed as unlimited choice, but as conditional autonomy within broadly defined frames. Diversity in pace, effort, and focus is framed as an inherent condition of flexible education rather than as a problem to be eliminated.

Within this discourse, teachers are primarily positioned as facilitators who establish broad, flexible frames while relying on professional judgement to determine when guidance or intervention is necessary. Flexibility thus rests on trust in participants' capabilities and their willingness to assume responsibility for their learning.

This discourse also introduces tensions. While autonomy is presented as an educational ideal, it also functions as a normative expectation. Flexibility becomes something participants must be able to handle, potentially privileging those with experience, strong self-discipline, and favourable life conditions. Excessive flexibility is therefore considered counterproductive, as it requires ongoing negotiation among autonomy, structure, and academic responsibility.

3.5 Dimensions of Constructing Flexibility

Table 3.4 summarises the six discourses and outlines the logic, positionings, tensions, and learning orientations that shape the construction of flexibility in higher education in contexts oriented towards flexible education. Rather than constituting a coherent or unified logic, flexibility emerges as a field of interpretive flexibility and tensions in which competing rationales, educational ideals and institutional priorities coexist. The six discourses should therefore not be read as isolated categories but as pathways that illuminate fundamentally different answers to the question of *why flexibility*.

Viewed together, the discourses reveal flexibility as a multidimensional concept shaped by differing, and sometimes competing, purposes. Across the material, flexibility is justified in ways ranging from pedagogical coordination and professional judgement to market responsiveness, personal tailoring, and expectations of learner autonomy. In this way, each discourse represents not only logic but also a dimension of flexibility, a particular way of constructing what counts as meaningful, desirable, or necessary flexibility in continuing education.

3.6 Discussion: Flexibility as the Solution, Flexibility as *the Problem*

In keeping with and reflecting the prevailing discourse of flexibility, the various discourses mark how culture interacts with flexible education in a range of ways, reflecting different educational values, priorities, and practical constraints. As institutions seek to move from traditional education to On-Demand Learning, stubborn obstacles rooted in these values may be encountered. The first is the tensions within and across discourses, produced by the various cultures, emerging as especially salient to the enactment of flexibility:

Table 3.4 The six identified Flexibility discourses

Discourse	Understanding of flexibility	Focus	Positionalities	Tensions	Assumptions of learning
D1 Flexibility as balancing educational components	Flexibility as pedagogical and organisational design	Modalities, curriculum structures, temporal organisation	Teachers as designers; students as participants	Accessibility vs interaction quality; configurability vs coherence	Learning is structured within pedagogical judgement
D2 Flexibility on market terms	Flexibility as a competitive and economic necessity	Demands, customers, economic sustainability	Students and employers as customers; staff as service providers	Market responsiveness vs public mandate	Learning is a purchasable product, whose value is defined by relevance and convenience
D3 Flexibility for professionals	Flexibility as an accommodation of work and life constraints	Predictability, planning, time optimisation	Participants as busy, responsible professionals	Academic immersion vs everyday feasibility	Learning happens in the margins and fits existing rhythms
D4 Flexibility as a theory-practice bridge	Flexibility as relevance and knowledge circulation	Practice-based learning, co-creation, networks	Participants as experienced practitioners; teachers as facilitators	Practical relevance vs academic rigour	Learning is co-created, practice-based and applicable
D5 Flexibility as individualisation	Flexibility as personal choice and tailored trajectories	Modularisation, freedom of choice, profiling	Learners as strategic choosers	Individual fit vs collective coherence	Learning is an individualised trajectory tailored to needs and ambitions
D6 Flexibility as autonomy	Flexibility as self-direction within trust-based frames	Self-regulation, responsibility	Participants as autonomous adults; teachers as guides	Autonomy vs need for structure	Learning is self-directed, responsibility-based and dependent on self-regulation

- **Designed vs emerging**: In some discourses, flexibility is embedded in predefined structures, modalities, choice architectures, and curriculum configurations (D1, D5). In others, flexibility arises *situationally*, through pedagogical judgement, co-creation, and responsiveness to participants' experiences and professional contexts (D1, D4). This duality points to flexibility as both a matter of pedagogical design and coordination (architectural phenomenon) or as something that emerges responsively in practice (enacted phenomenon).
- **Learner autonomy vs institutional structure**: Flexibility is constructed both as an invitation to self-direction and agency (D6) and as something that depends on strong organisational scaffolding, temporal coordination, and stable expectations (D3). This duality is evident in how teachers and students are positioned: teachers are expected to create coherent, academically grounded learning environments while accommodating individual needs and service expectations, whereas students are constructed as autonomous agents whose engagement nonetheless relies on structured support. This tension reveals how flexibility simultaneously expands learner agency and increases the need for institutional structure, clarity, and predictability.
- **Individualism vs collectivism**: Some discourses emphasise individual tailoring, modular pathways, and strategic content selection (D5, D6), whereas others foreground shared progression, peer relationships, and the value of collective engagement (D1, D4). The tension underscores how expanding individual choice can challenge cohesion and community, while collective structures may limit personal alignment.
- **Learning-as-product vs. learning-as-process.** In some discourses, learning is constructed as an unfolding, relational, and dialogic process grounded in academic depth and professional exchange (D1, D4). In others, learning is framed as targeted, just-in-time competence acquisition aligned with workplace demands or personal efficiency (D2, D3). The tension points to competing assumptions about the purpose of learning within flexible education.
- **Market-driven vs pedagogy-driven.** This tension reflects an overarching dimension that positions flexibility either as an institutional response to external demands, competition, and customer expectations (D2) or as grounded in pedagogical responsibility, academic integrity, and the quality of relational learning (D1, D4).

Practice might make use of the five axes of tensions for analysing and negotiating On-Demand Learning initiatives within higher education. This approach further recognises that flexibility itself is culturally produced—in contrast with the view that it is somehow 'just a tool'. At the same time, however, the axes might prove vulnerable to empirical limitations and theoretical critique.

The second is the problem of the multiple, sometimes competing, justifications for flexibility. The coexistence of these purposes suggests that flexibility operates as a contested, multidirectional construct rather than a singular educational ideal. This makes clear that flexibility is a site where the fundamental question of what constitutes the good of education is implicitly negotiated (Biesta, 2020). This stands in

contrast to widespread approaches to describe and operationalise flexibility through configurable dimensions (Beer et al., 2023; Collis & Moonen, 2002; El Galad et al., 2024). While the variation across discourses is neither unexpected nor inherently problematic, it makes clear important limits to initiatives centred around flexibility. One is the potential inability to counter *what constitutes the good of education* appropriately.

Considering Biesta's (2020) three domains of purpose, qualification, socialisation, and subjectification helps illuminate this issue. With regard to qualification, this concerns developing people's insights and understanding for living. Socialisation involves inviting students to develop a sense of what matters and to navigate traditions, cultures, and practices. Finally, subjectification has to do with "providing each student with a fair chance at being the subject of their own life, rather than the object of what others - whether individuals, groups, or more abstract forces such as capitalist social media - may want them to be and do" (Biesta, 2024, p. 437). The domains clarify that education always serves several purposes simultaneously, and these purposes are weighted differently across the identified discourses. While some discourses foreground qualification, for example, through just-in-time learning and professional upskilling (D5), others emphasise socialisation, including the value of co-presence, dialogue, and community (D4). Flexibility, understood as autonomy and self-regulation (D6), aligns with subjectification, in which learners are positioned as responsible agents capable of shaping their own learning trajectories. In other words, purposes recede into the background when particular meanings and configurations of flexibility are enforced, and flexibility appears to be at the expense of one or more educational purposes. Qualification is challenged when immediate applicability overshadows academic rigour, when efficiency crowds out immersion, or when the expansion of choice fragments coherence and progression. Similarly, while flexibility may enhance accessibility and economic viability, it risks prioritising convenience and scalability over depth and educational quality. Socialisation is challenged when accessibility and comfort are prioritised over interaction, co-presence, or participation in shared learning trajectories. Subjectification becomes vulnerable when autonomy and self-regulation shift from pedagogical aspirations to normative expectations, risking exclusion for those who require guidance, structure, or relational support to act as subjects of their own learning.

The third obstacle is nothing less than the individual as such; that is, the person who navigates multiple understandings of flexibility. Out of the discourses, drawing on a possible recontextualisation of the data (Czarniawska, 2010), emerge visions of key stakeholders and their actions within and beyond flexible education in specific ways, coupled with a temporal orientation that includes before, during and after a flexible teaching-learning event (Fig. 3.1). We highlight the practices of teachers and learners, as articulated through the ordered situational mapping and within the discourses, through two extremes: the highly flexible student and the flexible teacher (Star & Strauss, 1999). None of the representations is identified solely within a single discourse; instead, they are produced across the discourses. Figure 3.1 illustrates a condensed version of the practices and competences expected of the highly flexible teacher and student, respectively, within a formal educational context. Such

individuals may largely escape the relatively optimistic notions of flexibility and On-Demand Learning, respectively.

None of these observations is intended to pose fatal objections to On-Demand Learning. Rather, the framework serves, first and foremost, as a boundary object among stakeholders involved in flexible education, such as management, educational leaders, and teachers (Susan, 2010; Susan & Griesemer, 1989). Inhabiting different social worlds, being weakly structured, and articulating a range of recognisable practices and competences allow for interpretive flexibility and adaptation to local needs and constraints. Moreover, we offer our observations in the conviction that only by recognising both the strengths and limitations of On-Demand Learning will we be able to realise the potential for teaching and learning.

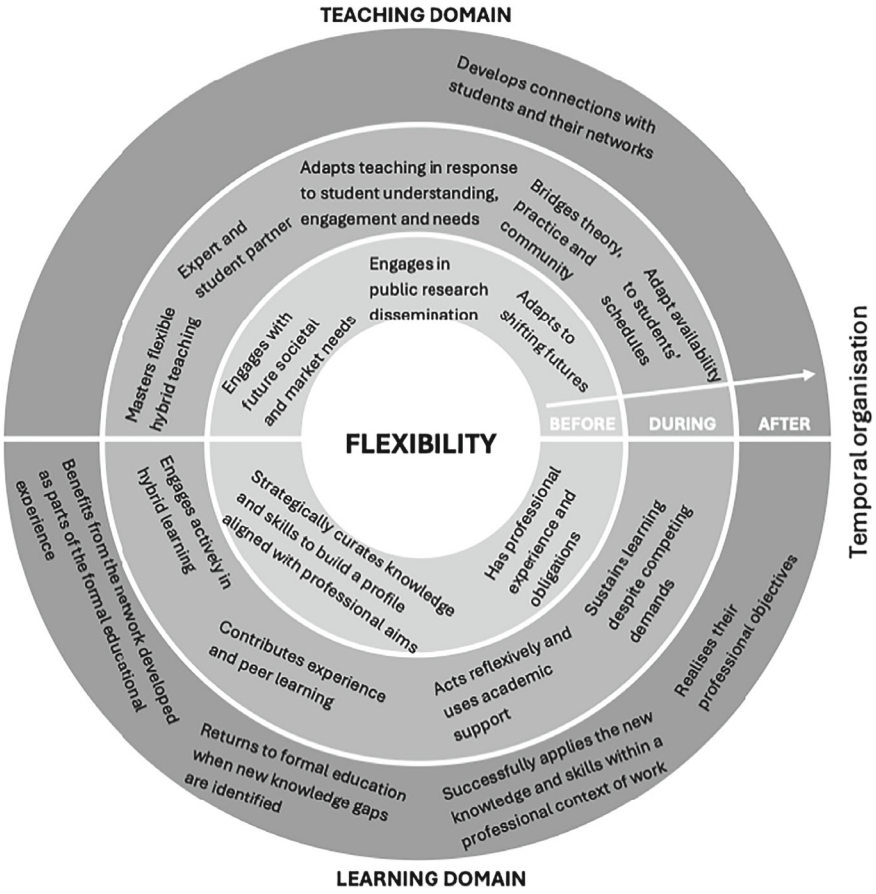


Fig. 3.1 Framework for flexible teaching-learning

The framework makes several central issues visible for practice. Among other things, it highlights the composite nature of flexible education and the connection between teaching and learning. Crucially, flexible education requires not only committed learners pursuing flexible educational options but also flexible teachers. Assumptions about learners' demands reflect expectations of what teachers should do and be able to do.

Second, as evident from the practices captured in the framework, the enactment of the state-of-the-art flexible teacher potentially has multiple implications, ranging from proactively engaging with public communication, societal trends, and market demands to teaching responsibilities and follow-up obligations. Importantly, the range of responsibilities on the part of teachers extends far beyond the expectations of the flexible teacher as imagined by university teachers in regular study programmes (Sørensen & Stenalt, 2026). This insight highlights the need to critically discuss the wage labour for which teachers are selected and the shadow work to which they are subjected in the flexible contexts of formal education (Illich, 1981; Star & Strauss, 1999).

Third, both the teaching and learning domains involve overlapping layers of competences and practices. Given the extremity underpinning the framework, it is reasonable to assume that not every learner or teacher meets the expectations set out, and thus, required practices and competences should be developed, and formal prerequisites should be identified. Finally, the framework suggests an increasing importance of effective public communication by researchers and the organisation to trigger learners' motivation to pursue further education, thereby sustaining the university economy. If public interest becomes a proxy for value, the drive to make an impression in public (Goffman, 2023) is likely to leave less time for scholarly growth and to place less value on foundational research. Ways to balance economic dynamics with academic growth should therefore be considered.

3.7 Closing Remarks

To grasp the complexity of On-Demand Learning, it is essential not to lose sight of the core mechanisms by which it operates. In other words, if we want to get a sense of On-Demand Learning, all expressions of the construct must be appreciated. In this study, we have focused on flexibility, which implicates various dimensions of learning and teaching. Six discourses seem particularly relevant to constructing flexibility in Danish higher education: flexibility as balancing educational components, flexibility on market terms, flexibility for professionals, flexibility as a theory-practice bridge, flexibility as individualisation, and flexibility as autonomy. These discourses allow us to appreciate how understandings of flexibility change the meaning of education from *a passage from novice to knowledgeable* to a more passive *waiting to be of use* to society. Further, they position essential features of flexible teaching and learning. In this way, taking account of flexibility is never just neutral; rather, it privileges certain features of education and the future.

The literature on flexibility provides a cluster of dimensions important to the act of doing flexibility and being flexible. This present study on flexibility used discourse analysis to elicit elements related to flexibility, some of which align with the dimensions identified in prior research. Notably, however, we identified several temporal constructs that inform flexibility, moving far beyond mainstream temporal orientations such as synchronicity/asynchronicity and individual pace/group pace. This suggests that we need to lift established dimensions from the level of taken-for-granted meaning, such as a predictable design feature, to an understanding of the dimensions that link to other sources, to better account for flexibility in educational praxis and better understand how the dimensions are embedded in those activities and contexts. Our analysis also points to how flexibility can expand learning in various ways. In particular, the discourse of *flexibility as a theory-practice bridge* (D4) suggests that flexibility is not only a design feature or an institutional behaviour aimed at responsiveness. Instead, it is an epistemic mechanism through which academic knowledge circulates into professional contexts, and practice-based knowledge flows back into the university (Dismore et al., 2024). In this discourse, flexibility enables multidirectional knowledge exchange, co-creation, and situated application, making the classroom a permeable space where professional challenges, academic concepts, and workplace innovations interact. This potential extends existing understandings of flexibility by highlighting its role in connecting worlds rather than merely configuring learning environments.

On-Demand Learning is often associated with expectations of immediate applicability, responsiveness to workplace needs, and just-in-time knowledge acquisition, with modularity, microlearning, and personalised access as its primary means (Moore et al., 2024). Our findings suggest that the value of flexibility in continuing education also lies in its capacity to sustain epistemic mobility: the movement of knowledge across contexts, professions, and roles (Dismore et al., 2024; Grafström et al., 2025). As such, this study outlines a new dimension of contemporary expectations for On-Demand Learning, in which immediate relevance is viewed not merely as a requirement imposed on education but as a collaborative endeavour between academic inquiry and professional practice. In this framework, immediacy is regarded as a matter of contextual appropriateness rather than solely rapid delivery.

References

Aida, S. (2023). Impact of e-learning orientation, moodle usage, and learning planning on learning outcomes in on-demand lectures. *Education Sciences, 13*(10), 1005.

Barnett, R. (2014). *Conditions of flexibility. Securing a more responsive higher education system* (No. 10). The Higher Education Academy. https://s3.eu-west-2.amazonaws.com/assets.creode.advancehe-document-manager/documents/hea/private/resources/fp_conditions_of_flexibility_0_1568036618.pdf

Barua, L., & Lockee, B. B. (2024). A review of strategies to incorporate flexibility in higher education course designs. *Discover Education, 3*(1), 127. https://doi.org/10.1007/s44217-024-00213-8

Beer, C., Roy, S., & Ames, K. (2023). Is it really flexible? Examining definitions of flexibility against contemporary practice in online education. *Journal of Further and Higher Education, 47*(2), 255–264. https://doi.org/10.1080/0309877X.2022.2106125

Biesta, G. (2020). What constitutes the good of education? Reflections on the possibility of educational critique. *Educational Philosophy and Theory, 52*(10), 1023–1027. https://doi.org/10.1080/00131857.2020.1723468

Biesta, G. (2024). Taking education seriously: The ongoing challenge. *Educational Theory, 74*(3), 434–448. https://doi.org/10.1111/edth.12646

Burge, E. J., Gibson, C. C., & Gibson, T. (2011). *Flexible pedagogy, flexible practice: Notes from the trenches of distance education.* Athabasca University Press.

Charmaz, K. (2014). *Constructing grounded theory* (2nd ed.). SAGE Publications.

Chen, C. (2025, September 28). *Concept Note: On-Demand Learning in a Changing World.* International Association of Smart Learning Environments. Retrieved May 13, 2026, from http://iasle.net/concept-note/

Clarke, A. E., Friese, C., & Washburn, R. S. (2018). *Situational analysis: Grounded theory after the interpretive turn* (2nd ed.). Sage publications.

Collis, B., & Moonen, J. (2002). Flexible learning in a digital world. *Open Learning: The Journal of Open, Distance and E-Learning, 17*(3), 217–230. https://doi.org/10.1080/0268051022000048228

Collis, B., & Moonen, J. (2011). Flexibility in higher education: Revisiting expectations. *Comunicar, 19*(37), 15–25. https://doi.org/10.3916/C37-2011-02-01

Czarniawska, B. (2010). Narratologi og feltstudier. In S. Brinkmann & L. Tanggaard (Eds.), *Kvalitative metoder: En grundbog* (pp. 239–262). Hans Reitzels Forlag.

Dismore, H., Campbell-Barr, V., Manning, R., & Warwick, P. (2024). A relational approach to knowledge exchange in higher education. *Studies in Higher Education, 49*(12), 2534–2545. https://doi.org/10.1080/03075079.2024.2312404

El Galad, A., Betts, D. H., & Campbell, N. (2024). Flexible learning dimensions in higher education: Aligning students' and educators' perspectives for more inclusive practices. *Frontiers in Education, 9*.https://doi.org/10.3389/feduc.2024.1347432

Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review, 5*(1), 1–24. https://doi.org/10.1016/j.edurev.2009.12.002

EUA. (2024). *Flexible learning and teaching. Thematic Peer Group Report* (No. 12). European University Association.

Fairclough, N. (1992). *Discourse and social change.* Polity Press.

Goffman, E. (2023). The presentation of self in everyday life. In W. Longhofer & D. Winchester (Eds.), *Social theory re-wired* (pp. 450–459). Routledge.

Goodyear, P. (2001). *Effective networked learning in higher education: Notes and guidelines* (No. 17). Lancaster UNiversity.

Grafström, M., Jonsson, A., & Klintman, M. (2025). Embracing the academic–practice gap: Knowledge collaboration and the role of institutional knotting. *Management Learning, 56*(2), 160–183. https://doi.org/10.1177/13505076231213056

Houlden, S., & Veletsianos, G. (2019). A posthumanist critique of flexible online learning and its "anytime anyplace" claims. *British Journal of Educational Technology, 50*(3), 1005–1018. https://doi.org/10.1111/bjet.12779

Hrastinski, S., Paul, E., & Åkerfeldt, A. (2025). Temporal-spatial and pedagogical flexibility in distance education. *Distance Education, 46*(3), 435–451. https://doi.org/10.1080/01587919.2024.2380370

Illich, I. (1981). *Shadow Work.* Retrieved May 13, 2026, from https://theanarchistli-brary.org/library/ivan-illich-shadow-work

Jensen, T. W. (2015). *Bjerget og sumpen: En undersøgelse af det danske universitetsspeciales betydninger med afsæt i humaniora* (PhD).

Johnson, L. (2014). Adapting and combining constructivist grounded theory and discourse analysis: A practical guide for research. *International Journal of Multiple Research Approaches, 8*(1), 100–116. https://doi.org/10.5172/mra.2014.8.1.100

Khan, B. (2005). Learning features in an open, flexible and distributed environment. *AACE Review (Formerly AACE Journal), 13*(2), 37–153. https://www.learntechlib.org/primary/p/5987/

Laclau, E., & Mouffe, C. (2001). *Hegemony and socialist strategy* (2nd ed.). Verso books.

Li, K. C., & Wong, B. Y. Y. (2018). Revisiting the definitions and implementation of flexible learning. In K. C. Li, K. S. Yuen, & B. T. M. Wong (Eds.), *Innovations in open and flexible education* (pp. 3–13). Springer Singapore. https://doi.org/10.1007/978-981-10-7995-5_1

Lockee, B. B., & Clark-Stallkamp, R. (2022). Pressure on the system: Increasing flexible learning through distance education. *Distance Education, 43*(2), 342–348. https://doi.org/10.1080/01587919.2022.2064829

Mackenzie, J. (2025). Grounded discourse analysis: A hybrid methodology. *CADAAD Journal, 17*(2), 1–18. https://doi.org/10.21827/cadaad.17.2.42199

Merriam-Webster. (n.d.-a). *Definition of FLEXIBLE.* Retrieved 6 February 2006, from https://www.merriam-webster.com/dictionary/flexibility

Merriam-Webster. (n.d.-b). *Definition of INFLEXIBLE.* Retrieved 6 February 2026, from https://www.merriam-webster.com/dictionary/inflexible

Moore, R. L., Hwang, W., & Moses, J. D. (2024). A systematic review of mobile-based microlearning in adult learner contexts. *Educational Technology & Society, 27*(1), 137–146. https://www.jstor.org/stable/48754847

Nørgård, R. T., & Hilli, C. (2022). Hyper-hybrid learning spaces in higher education. In E. Gil, Y. Mor, Y. Dimitriadis, & C. Köppe (Eds.), *Hybrid learning spaces* (pp. 25–41). Springer International Publishing. https://doi.org/10.1007/978-3-030-88520-5_3

Pischetola, M., Stenalt, M. H., Nøhr, L., Hagood, D. E., & Misfeldt, M. (2024). Desirable and realistic futures of the university: A mixed-methods study with teachers in Denmark. *International Journal of Educational Technology in Higher Education, 21*(1), 29. https://doi.org/10.1186/s41239-024-00459-0

Roberts, T. S. (2002). Flexible learning: How can we get there from here? Paper presented at the *Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)*, 553–560.

Ryan, A., & Tilbury, D. (2013). *Flexible pedagogies: New pedagogical ideas.* Higher Education Academy. https://d1wqtxts1xzle7.cloudfront.net/108524497/New-Pedagogical-Ideas-EC-16092020-libre.pdf?1701976301=&response-content-disposition=inline%3B+filename%3DFlexible_Pedagogies_new_pedagogical_idea.pdf&Expires=1778665420&Signature=bT~sTTJQg4~Z2m~~13w1uLITDDF7hIe80N~jDiAcKJ6HtlFo402J39FXuAaQzOn7unA6ycfB2g8AHXFWe41DJVFYTpRBRvmTG42UITrP3fhx0J~ttuFtlRHV8OTbarreeEbQYdxahzek6Xr8SpT5SJcRFyu7vE6fcoupqzgRDzb5-G8X2lP2m4z2V9bjufrJsr9utyuT5jscNn7tbe332qISiR5GO2-Ml9IAWjuN8NXd74ogX5h~2PgQ6Xhm~kqvnsh~LcKXN2t0ZGp4lhHEuG0kxKHZOKfmEtH7DZadBl4hKYBTxkInt0CuXsQfoarESpAxrADVMHIAnT97QHEqqQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Sampson, D., Karagiannidis, C., Schenone, A., & Cardinali, F. (2002). Knowledge-on-demand in e-learning and e-working settings. *Journal of Educational Technology & Society, 5*(2), 107–112. https://www.jstor.org/stable/jeductechsoci.5.2.107

Star, S. L., & Strauss, A. (1999). Layers of silence, arenas of voice: The ecology of visible and invisible work. *Computer Supported Cooperative Work (CSCW), 8*(1), 9–30. https://doi.org/10.1023/A:1008651105359

Suri, H. (2011). Purposeful sampling in qualitative research synthesis. *Qualitative Research Journal, 11*(2), 63–75. https://doi.org/10.3316/QRJ1102063

Susan, L. S. (2010). This is not a boundary object: Reflections on the origin of a concept. *Science, Technology, & Human Values, 35*(5), 601–617. https://doi.org/10.1177/0162243910377624

Susan, L. S., & Griesemer, J. R. (1989). Institutional ecology, 'translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39. *Social Studies of Science, 19*(3), 387–420. https://doi.org/10.1177/030631289019003001

Sørensen, M. T., & Stenalt, M. H. (2026). *Flexible Pedagogy, Flexible Teachers: Insights from a workshop-based inquiry*. Paper presented at the Proceedings of the International Conference on Networked Learning, 15. https://doi.org/10.54337/nlc.v15.10970

Trondsen, E., & Vickery, K. (1997). Learning on demand. *Journal of Knowledge Management, 1*(3), 169–180.

Uddannelses- og Forskningsministeriet. (2023). *Aftale om rammerne for Reform af universitetsuddannelserne i Danmark*. Uddannelses- og Forskningsministeriet.

UNESCO. (2022). *Beyond limits: New ways to reinvent higher education.* https://unesdoc.unesco.org/ark:/48223/pf0000389912

Vaughan, N. (2007). Perspectives on blended learning in higher education. *International Journal on E-Learning, 6*(1), 81–94. https://www.learntechlib.org/primary/p/6310/

Veletsianos, G., & Houlden, S. (2020). Radical flexibility and relationality as responses to education in times of crisis. *Postdigital Science and Education, 2*(3), 849–862. https://doi.org/10.1007/s42438-020-00196-3

Willems, J. (2005). Flexible learning: Implications of "when-ever", "where-ever" and "what-ever". *Distance Education, 26*(3), 429–435. https://doi.org/10.1080/01587910500291579

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Chapter 4
On-Demand Learning and Epistemic Justice: A Global South Critique of Demand, Platformization, and Skill Formation



Chunhai Gao, Endale Tadesse, and Sabika Khalid

Abstract This chapter critically examines on-demand learning (ODL) as a contemporary educational formation shaped by the convergence of EdTech, platformization, GenAI-supported personalization, labour-market responsiveness, and late-capitalist demands for flexible skill production. Rather than treating ODL as a formally inaugurated model or as a simple technological solution to educational access, the chapter interrogates the deeper ontological and epistemological assumptions through which ODL defines learners, skills, demand, and valuable knowledge. Drawing primarily on Fricker's theory of epistemic injustice, and extending it through decolonial and Global South scholarship, the chapter argues that ODL systems may reproduce testimonial injustice when the expressed needs of marginalized learners are discounted in favour of platform analytics, employer signals, or standardized skill taxonomies. They may also reproduce hermeneutical injustice when indigenous, community-based, informal, ecological, and relational forms of knowledge cannot be recognized within dominant frameworks of competency, credentialing, and employability. The chapter uses the Global South not as a fixed geographical category but as a critical lens for examining how global hierarchies of knowledge are produced, inherited, and contested. It develops an epistemic justice framework for ODL organized around participatory demand formation, hermeneutical plurality, infrastructure pluralism, community-embedded recognition, and non-extractive innovation. The chapter concludes that ODL can support equitable skill development only when

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learners and communities participate in defining what counts as knowledge, demand, evidence, and educational value.

Keywords On-Demand learning (ODL) · Global South · Epistemic justice · Decolonial education · Local innovation · Socio-technical systems · Community-based learning

4.1 Introduction: On-Demand Learning, Epistemic Authority, and the Politics of Knowledge

On-demand learning (ODL) has been increasingly described as a paradigm shift in education, providing flexible, modular, and learner-centred approaches to learning skills in an era of rapid technological, economic, and social change (Means, 2018; Megahed et al., 2021). Today, on-demand learning is linked to just-in-time learning, digital platforms, micro-credentials, learner choice, and the potential for responsiveness to evolving labour-market requirements (Giri, 2025; Hamburg, 2011). On-demand learning is not a model that has a formal start, but rather a relatively new educational formation that is influenced by the intersection of educational technology, platform-based learning, artificial intelligence, market-oriented skill development, and the general requirements of the knowledge economy (Omotoso, 2026). In this formation, learning is envisioned as something that can be accessed when required, is segmented, aligned to occupational needs, and is accumulated through credentials that facilitate employability and lifelong adaptability (Kayyali, 2024).

This is a strong promise, but one that is based on assumptions that need to be examined. On-demand learning is not just a reaction to demand; it is also a part of the definition of demand (Trondsen & Vickery, 1997). It is not just a way to access skills; it is a way to shape what skills are valued. It is not just about personalizing learning; it is also about categorizing learners by platform categories, institutional expectations, data traces, and credentialing systems. Many on-demand learning systems envision an ideal learner who is digitally connected, institutionally supported, can navigate complex credentialing markets, and is able to translate learning into employability (Hang, 2021). Likewise, the best on-demand learning environment is thought to be one that has reliable electricity, stable infrastructure, affordable bandwidth, digital literacy, and user-friendly platforms (Kayyali, 2024). These assumptions do, however, pose questions of access, particularly in settings where there is infrastructural inequality, social stratification, and unequal digital inclusion (Joynes et al., 2019). But the criticism of on-demand learning must not be limited to the resources and technological access.

The deeper question is ontological and epistemological. The design of on-demand learning systems is based on specific assumptions about the nature of the learner, the nature of knowledge, the nature of skill, the nature of evidence of learning, and the nature of human flourishing that education should serve. If on-demand learning

is primarily about employability, measurable competencies, platform analytics and labour-market responsiveness, it can become a production of adaptable workers for a changing economy. This problem is not limited to under-resourced settings. It can also be seen in technology-rich and well-resourced settings where platform logics, market rationalities, and evidence-based governance narrow learning to what can be measured, predicted, credentialed, and monetized. The central question is not just whether learners can access on-demand learning, but who can determine what learning needs are, what valuable knowledge is, what relevant skills are, and what legitimate evidence of competence is (Balanzó-Guzmán & Ramos-Mejía, 2023; Dubazana, 2025; Eyraud et al., 2023).

This chapter suggests that the current theorization and practice of on-demand learning is often a reflection of what postcolonial and decolonial scholars refer to as the epistemic situatedness of dominant knowledge systems, which is the tendency of knowledge produced from powerful institutional locations to seem universal while masking its own historical, cultural and political assumptions (Connell, 2009; Mignolo, 2011). The conceptual language of on-demand learning is not neutral, as it is based on demand, flexibility, modularity, personalization, skills and employability. These terms have values and priorities that may not be shared by learners and communities in different contexts. Externally designed on-demand learning models can be exported via development programs, platform expansion, institutional policy borrowing, and global credentialing systems, which can marginalize local knowledge, undermine indigenous pedagogies, and reinforce global hierarchies of epistemic authority. Giri (2025) discusses participant-centred instructional design, but not as a full description of on-demand learning, but as a reminder that learner responsiveness is not just about content availability or platform access.

A word of explanation is required. The terms “Global North” and “Global South” are used with caution and critically in this chapter. These terms are not used for fixed, homogeneous or purely geographical blocs. They can mask differences within countries and regions, level complex histories, and potentially reinforce the binaries that critical scholarship aims to critique. The Global North is not a single, uniform intellectual, political, or technological formation, and the Global South is not a uniform space of lack, resistance, or alternative knowledge. The term Global South is not merely a geographical location, but a lens through which to explore historically created inequalities in knowledge production, institutional authority, technological power, and educational governance. This lens enables the chapter to reflect on the question of how on-demand learning inherits global hierarchies of knowledge and how these hierarchies can be challenged through epistemic justice, local agency, and community-based innovation.

4.2 Conceptual Framework: Epistemic Injustice, Cognitive Justice, and Decoloniality

The chapter is based on the premise that the critique of on-demand learning (ODL) should start with questions of knowledge, power, and human purpose. On-demand learning is frequently cited as a viable solution to evolving skill requirements: learners need flexibility, employers need adaptable employees, and digital platforms offer the promise of meeting these needs with modular, just-in-time, and increasingly AI-driven learning experiences. This approach can, however, mask more fundamental conceptual issues. Who is the learner that on-demand learning imagines? Which types of knowledge are valued? Who determines the demand? What is evidence of learning? These are not just technical or policy questions. They are epistemological and ontological questions because they are about what it means to know, to learn, to become skilled, and to flourish as a human being.

This chapter's conceptual framework combines Fricker's (2007) theory of epistemic injustice, the concept of cognitive justice of Santos (2015) and Visvanathan (2009), Connell's (2009) Southern theory, and Mignolo's (2011) critique of coloniality and call for epistemic disobedience. These views collectively contribute to understanding why on-demand learning cannot be judged solely on access, efficiency, flexibility or labour-market responsiveness. They enable us to ask questions about the recognition of learners as credible knowers, about the provision of interpretive space for multiple knowledge traditions, and about the reproduction or challenge of global hierarchies of epistemic authority.

4.2.1 Fricker's Epistemic Injustice: Testimonial and Hermeneutical Dimensions

The concept of epistemic injustice, developed by Fricker (2007), is central to the argument of this chapter because it highlights types of injustice that impact individuals in their role as knowers. This is particularly important for on-demand learning as these systems are not just about distributing educational content. They also categorize learners, identify learning needs, structure knowledge into categories, establish assessment criteria, and certify some types of competence and exclude others. In this way, on-demand learning is an epistemic system, not only a technological or pedagogical system.

Fricker distinguishes between two types of epistemic injustice: testimonial injustice and hermeneutical injustice. Testimonial injustice is when a speaker is not believed due to prejudice based on their identity, social status, or perceived ability. In educational systems, this can occur when the knowledge claims of marginalized learners are deemed less credible than those of institutionally recognized experts, employers, platform designers, or data systems. In on-demand learning, testimonial injustice can happen when learners' own narratives of their learning needs are

secondary to platform analytics, employer surveys, algorithmic predictions, or standardized skill frameworks. A learner might see community leadership, ecological knowledge, care work, informal entrepreneurship, or cultural preservation as central to their learning needs, but these could be considered secondary or irrelevant if they do not align with the platform's categories of demand.

Hermeneutical injustice is more profound. It is when individuals are unable to access common interpretive tools that enable their experiences to be understood and acknowledged in dominant knowledge systems. In on-demand learning, hermeneutical injustice can happen when indigenous knowledge, informal learning, embodied practice, oral transmission, spiritual responsibility, or community-based skill formation are not captured in the language of competencies, micro-credentials, employability, or measurable outcomes. The issue is not that learners do not know. The issue is that the dominant system might not have the conceptual tools to acknowledge what they know.

Fricker's framework thus moves the discussion of on-demand learning from the question of whether learners can simply access learning platforms. It focuses on the question of whether learners and communities are seen as legitimate actors in the definition of learning. In an epistemically unjust on-demand learning system, demand is not just not met, it is misrecognized. Some needs are visible because they fit the platform, others are not visible because the system doesn't have a category for them. This is why the politics of on-demand learning needs to be analysed at the level of curriculum design, assessment, credentialing, platform architecture, data collection and categorization of learners.

4.2.2 Cognitive Justice and the Plurality of Knowledge

While Fricker's work helps identify how individuals and groups may be wronged as knowers, the concept of cognitive justice expands the critique to the level of knowledge traditions. Santos (2015) states that modern knowledge systems frequently function through epistemicide, which is the destruction, silencing or marginalization of alternative ways of knowing. Visvanathan (2009) also states that justice demands recognition of the plurality of knowledge systems, rather than the marginalization of learners in already dominant knowledge systems.

Cognitive justice is relevant to this chapter because on-demand learning can be seen as inclusive when it opens up access to digital content, but access does not necessarily mean epistemic equality. A platform can have learners from various regions, languages, and social groups, but still needs to translate their knowledge into externally defined categories. It can provide flexible learning, but still value formal, technical, market-oriented and credentialable knowledge. It can enable learner choice, but restrict it to choices that have been pre-arranged by platform providers, employers, and institutional priorities.

The question from the cognitive justice point of view is not just about the quantity of content that on-demand learning can deliver to more learners. The question

is whether on-demand learning can accommodate multiple knowledge traditions, engage with them, and be acknowledged without being homogenized into a single model of skill or employability. This is especially relevant in the Global South where agricultural knowledge, artisanal skills, community-based health practices, local environmental knowledge, oral pedagogies, and intergenerational learning are important to human flourishing but hard to articulate in terms of learning outcomes.

Cognitive justice does not demand the rejection of scientific, technical, or professional knowledge. Instead, it questions the hierarchy that sees some knowledge as universal and others as local, cultural, informal, or supplementary. In the context of on-demand learning, this implies that platforms, curricula and credentialing systems should not just be a mere overlay of local content on existing platforms, curricula and credentialing systems. They need to be reimagined to enable communities to determine what is considered knowledge, how learning is measured, and what is considered a meaningful form of recognition.

4.2.3 Southern Theory and the Critique of Universal Knowledge

This critique is further reinforced by Connell's (2009) theory of the South, which demonstrates how social theory and educational knowledge have been created from dominant institutional positions and then claimed as universal. This is not to say that all knowledge created in the Global North is wrong or that all knowledge created in the Global South is emancipatory. Instead, Connell's (2009) argument highlights the unequal global circumstances in which knowledge is created, disseminated, referenced, institutionalized, and considered authoritative.

This is directly applicable to on-demand learning. Many on-demand learning systems are based on assumptions that circulate globally around skill, productivity, employability, flexibility and lifelong learning. These assumptions are frequently presented as neutral, as they are stated in the language of efficiency, innovation, and learner empowerment. However, they can have particular experiences of market-oriented education, human-capital theory, managerial governance, and platform capitalism. If these assumptions are transferred from one context to another without critical analysis, they can seem counterproductive, ineffective, or unhelpful in the local context.

A Southern theory perspective thus asks who has been the subject of the dominant language of on-demand learning. It questions whether on-demand learning's categories of demand, skill, flexibility, and success are derived from lived experiences of a variety of learners or from institutional systems already with global authority. It also asks what theories of learning would look like if they started from informal economies, community-based learning, multilingual settings, interrupted infrastructures, indigenous pedagogies, and collective rather than purely individual forms of agency.

The use of a Global South lens in this chapter is not intended to be a replacement for another universal framework. It is to provincialize dominant understandings of on-demand learning and to reveal the historical and institutional conditions that enable some kinds of educational knowledge to circulate as universal, while others circulate as local or marginal.

4.2.4 Coloniality, Epistemic Disobedience, and On-Demand Learning

Another important layer to the framework is provided by Mignolo's (2011) work on coloniality and epistemic disobedience. Coloniality is the persistent structures of power that persist beyond the formal colonial period, particularly in the structuring of knowledge, culture, economy and subjectivity. Coloniality in education is manifested when some modes of knowing, speaking, measuring and certifying are considered superior, and other epistemologies are deemed deficient, traditional or non-modern.

When on-demand learning sees platform-based, data-driven, market-responsive learning as the natural future of education, it can reproduce coloniality. This is especially important in the context of GenAI-supported learning, where personalization can seem neutral but is actually influenced by training data, platform design, dominant languages, and assumptions about what is useful knowledge that are inherited. AI-driven on-demand learning systems can generate learning pathways using current labour-market information, skills taxonomies, or prevailing educational content, potentially perpetuating existing inequalities and presenting them as individualized guidance.

The concept of epistemic disobedience, which Mignolo (2011) proposes, is helpful here because it requires a rejection of the dominant categories as the only means of knowledge and education. Epistemic disobedience in on-demand learning would involve challenging the notion that learning must always be structured around employability, productivity, measurable competencies, and platform efficiency. It would also involve providing room for learners and communities to establish educational value in terms of dignity, cultural continuity, ecological responsibility, social participation, livelihood and collective flourishing.

This is not a rejection of technology or on-demand learning per se. Instead, it is about rejecting a model in which technology is the definition of learning. An epistemically just on-demand learning system would employ technology in ways that would facilitate plural knowledge systems, community-defined learning goals, and locally meaningful forms of recognition. It would view platforms and AI as tools that need to be regulated by educational, ethical, and epistemic values, rather than as neutral systems that can enhance learning automatically.

4.2.5 *Implications of the Framework for the Chapter*

Epistemic injustice, cognitive justice, Southern theory, and decoloniality are the conceptual pillars of the remainder of this chapter. Fricker's framework is useful for understanding how on-demand learning can mislead learners as knowers in two ways: through testimonial injustice and hermeneutical injustice. Cognitive justice extends the analysis by asking if there are multiple knowledge traditions that are recognized as equally valid. Southern theory questions the universalization of educational assumptions from dominant institutional sites. Mignolo's (2011) work on coloniality and epistemic disobedience calls for the questioning of inherited categories of knowledge, skill, progress, and educational value.

This framework also helps to clarify what is meant by critique in this chapter. The issue with on-demand learning is not just that some learners don't have devices, connectivity, or digital literacy, but that these are still significant concerns. The real issue is that on-demand learning can perpetuate limited conceptions of learning, of knowing, of being skilled, and of being employable. In environments where technology is ubiquitous, these assumptions can exclude learners. This critique is not just for resource-poor settings, but also for well-resourced systems that are influenced by platform capitalism, evidence-based governance, and AI-driven prediction.

The next section uses this framework to examine the politics of demand in on-demand learning. It questions how demand is built, who is heard as credible, what kinds of knowledge are made visible, and how on-demand learning could be reconfigured to involve learners and communities in the purposes, categories, and recognition systems of learning.

4.3 Re-theorizing Demand and Learning: Politics of Epistemic Authority in On-Demand Learning Systems

On-demand learning is based on the concept of demand, but the concept of demand is not explored in enough depth. In the mainstream on-demand learning discourse, demand is assumed to be a natural and self-evident category: learners are assumed to know what they need, labour markets are assumed to signal which skills are valuable, and responsive learning systems are expected to connect the two efficiently (de Sousa Santos, 2015; Neiman, 1986). But on-demand learning systems are not the only ones that discover demand. It is created by institutional priorities, platform infrastructures, labour-market categories, credentialing systems, and general beliefs about what is useful knowledge.

The politics of demand in on-demand learning is essentially an issue of epistemic authority, it is argued in this section. Who can determine learning needs? Who is considered to have valuable knowledge? What skills are exposed to platforms, employers, and credentialing systems? These questions can only be answered

if access to technology or resource differences are not considered. They need to be addressed with regard to the ontological and epistemological assumptions that underlie on-demand learning's conception of the learner, the labour market, the skill, and the future of work. When learners' own accounts of their needs are not believed as much as the data from the platform or the signals from the employer, on-demand learning can produce testimonial injustice as described by Fricker (2007). It can also create hermeneutical injustice if the categories that exist in on-demand learning systems are not sufficient to enable learners and communities to name, describe and validate the forms of knowledge that are relevant to their lives.

4.3.1 Demand Under Platform Logic: Constructing Learner Need and Labour-Market Value

Theorization of demand in mainstream on-demand learning tends to be in two broad categories: learner demand and labour-market demand. Learner demand is the learner's expressed preference for specific learning content, which can be captured by platform analytics, search behaviour, enrolment patterns, completion data, or user feedback (Cui, 2010). Labour-market demand is the skills that employers are expected to require, typically determined by job postings, industry surveys, occupational projections, or predictions generated by platforms (Means, 2018). In both, demand is frequently expressed as an objective indicator to which on-demand learning systems react.

This seeming objectivity conceals the process of constructing demand. The design of the platform, the algorithms for recommending content, the catalogues of content, and the pathways for credentials determine what learners can request first. What platforms do not provide, interfaces do not make visible, and credentialling systems do not recognize, learners cannot demand. Their decisions are thus constrained by the epistemic boundaries of the platform itself (Means, 2018; Pinto et al., 2025). Platform analytics also favour some types of expression, including click-through rates, completion rates, time on task, enrolment rates, and assessment performance. While these indicators can be helpful, they do not necessarily reflect deeper aspirations, community responsibilities, cultural commitments, or informal learning needs of learners. Platform-based on-demand learning can transform learners into data points, and behavioural traces can be used as a proxy for more nuanced descriptions of educational need, as Wark and Ally (2019) propose.

To understand what is at stake here, one needs to grasp Fricker's notion of testimonial injustice. Testimonial injustice is when a speaker's credibility is diminished due to prejudice or unequal power relations (Fricker, 2007). This can happen in on-demand learning systems when the learner's own description of what they need is not as reliable as data from employer surveys, platform data, standardized skill forecasts, or institutional assumptions. For instance, a learner might consider community

leadership, ecological knowledge, informal entrepreneurship or care-related competencies as important to their life and work, but these might not be considered as key skills if they are not recognized by the platform. In this way, demand is not only measured, but also filtered through hierarchies of credibility.

Labour-market demand is also created by classification systems, skill taxonomies, occupational categories and policy frameworks that embody specific assumptions about work, productivity and human development. While occupational frameworks like the International Standard Classification of Occupations (ISCO), national qualification systems, and platform-specific skills taxonomies can be helpful for structuring employment data, they are not neutral descriptions of all possible forms of work (Choi et al., 2020). They tend to value formal jobs, standardized jobs, and quantifiable skills. In the Global South, these systems can misrecognize or underrecognize the skills that enable informal economies, artisanal production, subsistence farming, community-based livelihoods, and other socially valuable forms of work (Asif & Panakaje, 2022).

In this context, hermeneutical injustice takes centre stage. Hermeneutical injustice is the situation in which individuals are deprived of shared interpretive resources that enable them to make sense of their experiences in dominant systems of meaning (Fricker, 2007). In on-demand learning, this can occur when the categories of demand available do not enable certain types of knowledge to be expressed as knowledge. Learning that takes place in the context of apprenticeship, observation, oral transmission, collective practice, religious or cultural life, ecological stewardship, and intergenerational learning may not be easily categorized in platform-based taxonomies or micro-credentialing formats. The issue is not that these learners are lacking in skills. The issue is that dominant on-demand learning systems might not have the interpretive capacity to see those skills as legitimate demand.

It is more accurate to consider it as a logic of the platform and the market, rather than a "Northern" on-demand learning framework, which circulates globally. This logic can be historically linked to strong institutions and knowledge systems but is not limited to a particular geographical area. It functions wherever learning is limited to being responsive to the market, where learner need is determined largely from behavioural data, and where educational value is determined by employability, prediction, and credential accumulation. The critique is relevant to on-demand learning systems anywhere that they exclude certain aspects of learning, and a Global South lens is important to make these exclusions more visible.

4.3.2 Epistemic Injustice and the Recognition of Knowledge

The concept of epistemic injustice (Fricker, 2007) provides a useful analytical tool to examine how on-demand learning systems can marginalize specific knowers and knowledge traditions (Eyraud et al., 2023). Epistemic injustice is a kind of injustice that occurs to people in their role as knowers. This is particularly relevant for on-demand learning, as these are not just delivery mechanisms. It's also a system of

recognition. It acknowledges some needs as legitimate, some skills as valuable, some evidence as credible and some learning pathways as worthy of certification.

Testimonial injustice occurs when some learners are not seen as reliable interpreters of their own learning needs. In on-demand learning settings, marginalized learners, such as rural women, indigenous communities, informal workers, and socially excluded groups, might not have their learning needs recognized as seriously as those of formally educated, urban, digitally connected, and institutionally recognized learners (Abu-Salih & Alotaibi, 2024; Imran & Almusharraf, 2024). This can occur even in platforms that seem open and learner-centred. If the "average user" of the platform is already digitally literate, linguistically privileged, individually autonomous, and familiar with formal credentialing systems, then those who are not may be viewed as "deficient users" rather than "knowers" whose experiences should inform the system.

In the context of on-demand learning, hermeneutical injustice is even more basic. It occurs when there are no sufficient categories to interpret some experiences or types of knowledge (Fricker, 2007). Hermeneutical injustice in on-demand learning systems is when the knowledge traditions of indigenous peoples, community-based learning, spiritual and ecological duties, informal work skills, and intergenerational knowledge and expertise are not captured in the dominant competency frameworks, micro-credentialling systems, or productivity-based assessments. The terms "Western occupational psychology" are too general and should be replaced by the more specific terms of dominant competency-based education models, human-capital assumptions, occupational classification systems, employer-led skill frameworks, and globally circulated credentialling models. These are not necessarily wrong, but they are unfair if they are used as the sole means of defining learning and skill.

The question is not just about the number of content or the number of learners reached by on-demand learning platforms. The question is whether their epistemic architecture can be named, interpreted, assessed, and valued different knowledge systems. On-demand learning systems perpetuate hermeneutical injustice when community-based learning is not valued as a credential, when care work is not valued as a skill, when ecological knowledge is valued as productivity, and when informal entrepreneurship is valued as a lack of formal training. They make some forms of knowledge difficult to express within the language of educational value.

Giri's (2025) discussion of participant-centred instructional design should be read with caution in this context. It should not be interpreted as a complete description of on-demand learning as it is understood in the context of platformized learning, just-in-time learning or GenAI learning. Instead, it serves as a partial reminder that online content does not necessarily result in learner responsiveness. If "on-demand" is interpreted as the ability to access course materials at any time and place, it is still very similar to the concept of distance and open learning. The more significant question for this chapter is whether learners can be involved in the processes of setting the goals, classification, and recognition systems of on-demand learning. The learning ecology perspective of Jackson (2012) is useful here, as it moves beyond the context of course access to the wider contexts in which learning is meaningful, connected, and socially recognized.

4.3.3 *Towards Learner-Defined Demand: Reclaiming Epistemic Agency*

On-demand learning needs to break away from the notion that demand can be sufficiently captured by platforms, employers, or institutional planners to restore epistemic agency to learners and communities. An equity-oriented approach sees demand as a process of dialogue, deliberation, critical reflection, and community-engagement (Forkosh-Baruch et al., 2024). Learners should not just choose from the list of available options. They should also be involved in deciding on options available, the types of knowledge that are covered, the types of skills that are recognized, and the types of evidence that are accepted as evidence of learning.

This reorientation is a direct reaction to testimonial injustice. Participative needs assessment cannot be an optional extra to the design of on-demand learning if learners' own accounts of their needs are credible sources of knowledge. It becomes pivotal to epistemic justice. Communities should have the opportunity to establish learning priorities in their own languages, categories and social contexts, not just to select from catalogues created elsewhere. This is not a rejection of labour-market data or platform analytics altogether. It means not taking them more seriously than the lived knowledge of learners and communities.

It also addresses hermeneutical injustice. On-demand learning systems require flexible content authoring tools, locally adaptable curricula, plural assessment methods, and recognition systems that can validate informal learning, community practice, intergenerational knowledge, and practical competence. Participatory needs assessment should not be a process that just determines what courses learners desire. It should make possible to uncover forms of knowledge that are not yet named by existing platforms (Means, 2018). In this way, learner-defined demand is not just a design method. It is a means of extending the interpretive tools by which learning is made visible.

The notion of cognitive justice reinforces this argument. Santos (2015) and Visvanathan (2009) call for the recognition of multiple knowledge traditions and the critique of the hierarchy that privileges western scientific, technical, or market-oriented knowledge over indigenous, traditional, local and experiential knowledge. In on-demand learning, cognitive justice means more than adding diverse content to existing platforms. It demands a reorganization of the epistemic structure of on-demand learning to enable different knowledge traditions to coexist, interact and be recognized without being required to fit into one model of skill, evidence, or employability.

This has implications for the design of on-demand learning. Platforms should include community-defined learning priorities, rather than algorithmic recommendation. They require assessment systems that acknowledge demonstrated practice, peer validation, local expertise and community contribution, rather than standardized tests or completion badges. They require credentialing systems that are able to link local legitimacy to wider mobility, not to replace local knowledge with external standards. Most importantly, they require governance systems that involve learners

and communities as co-creators of the demand, not the extraction of the demand from them.

Restoring epistemic agency thus alters the definition of "on-demand" learning. In an epistemically just on-demand learning system, demand is not just what the market foresees, what the platform documents, or what employers demand. Demand is also the voice of learners and communities that express what they need for dignity, livelihood, cultural continuity, ecological responsibility, social participation, and human flourishing. This more comprehensive understanding enables on-demand learning to shift from a responsive delivery to an epistemic justice.

4.4 Infrastructural and Socio-Technical Conditions: On-Demand Learning as Epistemic Infrastructure

The second aspect of the chapter is related to the material, social, and epistemic conditions that influence the possibilities of on-demand learning (ODL). Infrastructure is often discussed primarily as a technical problem—whether learners have devices, connectivity, electricity and access to digital platforms. These questions are significant, particularly in environments where digital technologies are not equally distributed. But infrastructure should not be seen as a resource issue. It is also an epistemic arrangement, as it defines who can learn, whose learning is visible, what can be measured as knowledge, and who can be considered as legitimate users of on-demand learning systems.

In the context of learning in hybrid, resource-constrained, and collectively organized settings, on-demand learning models which rely on stable digital infrastructure, individual access, private study time, and continuous connectivity should be rethought (Tabo, 2020). The problem is not only that some contexts do not have the infrastructure that is needed by dominant on-demand learning models. What is more fundamental is that these models tend to conceptualize participation based on notions of autonomy, digital literacy, platform availability and quantifiable engagement. If these assumptions are taken as universal, then learners who rely on shared devices, intermittent connection, oral explanation, peer support, or community-based learning may be considered as deficient users instead of as knowers whose practices should inform the design of on-demand learning.

4.4.1 Beyond the Digital Divide: Theorizing Socio-Technical Assemblages

The concept of on-demand learning in development contexts is often expressed in terms of the digital divide, which is typically defined as the disparity between people who have access to digital technologies and those who do not. This framing

is helpful because inequalities in access are actual and real-world. The digital divide framework, however, can also reduce the socio-technical realities to a binary choice of connected versus disconnected. This distinction is not sufficient to reflect the actual use of digital technologies in the lives of learners and communities. In many contexts, access is shared, connectivity is intermittent, devices are reused, and learning is done in an improvised way, combining digital and non-digital resources (Balanzó-Guzmán & Ramos-Mejía, 2023).

Asif and Panakaje (2022) have analysed the educational technology in India and found that it is not enough to measure access. Whereas Internet access is growing, meaningful participation is still constrained by language, gender, caste, class, rural–urban location, device quality and social norms. The use of digital learning resources and the conditions of use are influenced by English-dominant content, gendered control over devices, differential rural connectivity, and the marginalization of Dalit and Adivasi communities. Individual, private, and uninterrupted use may not therefore be captured by on-demand learning platforms. Individual, private, and uninterrupted use may not therefore be captured by on-demand learning platforms.

This is where Fricker's notion of epistemic injustice is applicable to infrastructure. If platforms only value certain types of participation as normal, they can create testimonial injustice by assuming that the experiences of digitally privileged users are more valid representations of learners' demands. They can also be hermeneutical injustice when the system does not have categories to comprehend the shared, intermittent, oral, collective, or community-mediated modes of learning. When this happens, it is not just a matter of access. The issue is that some learning practices are considered legitimate and others are considered marginal in the infrastructure.

The idea of socio-technical assemblages provides a more suitable approach to these dynamics (Bijker, 1997; Latour, 2005). In this view, on-demand learning is not just a platform or a delivery system. It is a diverse mix of people, devices, infrastructures, institutions, languages, economics, culture, and social relations. In the global south, these assemblages frequently are hybrid in ways that are not predicted by standard on-demand learning models. Learning can be through downloading of content during short periods of connectivity, study without connectivity, use of shared devices in community centres, use of oral discussion to supplement content on platforms, translation of content into local languages, or the use of digital resources in apprenticeship and peer-learning.

The shift from "Do learners have access?" to "What kinds of arrangements make learning meaningful, recognizable and sustainable?" is a shift in the question that can be made as a result of understanding on-demand learning as a socio-technical assemblage. This change is significant as access does not necessarily mean epistemic justice. While a learner may be able to log into a platform, the language, examples, categories, assessment practices, or credentialing systems may not acknowledge his or her knowledge or social reality. Infrastructure should not only be considered in terms of availability but also as a support for epistemic participation.

4.4.2 *Hybrid Learning Ecologies: Digital and Non-Digital Modalities*

The hybridity of learning spaces calls for on-demand learning models that do not rely on constant connectivity, individual device ownership, or digital-only modes of participation (Gairola, 2021). Equity-oriented on-demand learning should be developed for learning ecologies that are not mutually exclusive, but rather digital and non-digital modalities complement each other in terms of legitimacy (Díaz-Gibson et al., 2023). Learning already happens in many communities in homes, workplaces, religious institutions, community centres, informal training spaces, peer groups, and digital platforms. On-demand learning is meaningful when it enhances these learning ecologies instead of displacing them with platform-centred learning ecologies.

Within such ecologies, no-tech and low-tech modalities are still vital. Lightweight text-based materials, downloadable resources, offline access, and radio, TV, print, or community facilitation can increase participation when bandwidth is limited or unreliable. Platforms should enable multi-user access, offline sync, short learning sessions, and flexible progress tracking when devices are shared. Digital literacy is not uniform, and interfaces must be simple, language localized, and mediated by human beings, such as peer mentors, community volunteers, teachers, or trained facilitators (Kayyali, 2024).

The role of human mediation is particularly significant when on-demand learning is envisioned as self-directed, automated, or algorithmically personalized. These assumptions can underestimate the importance of trusted intermediaries in supporting learners to make sense of content, navigate platforms, link digital resources to local contexts, and maintain motivation. Learning is not necessarily a one-to-one relationship with a screen in many Global South settings. It is relational, dialogic and part of community life. Platform content and lived experience are frequently connected by teachers, community workers, peer networks, and local experts.

In this context, Giri's (2025) work can be used with caution. It should not be seen as a comprehensive overview of current on-demand learning as platformized, just in time or GenAI-supported learning. It is helpful, however, as a reminder in a limited way that access to online content does not ensure meaningful learning. When digital content is used in conjunction with facilitation, group discussion, and learner-centred instructional design, learners with limited prior educational experience may be better supported than in models that involve only self-directed use of the platform. The big idea is that on-demand learning should not diminish the responsiveness to content availability anytime, anywhere. Human support, contextual interpretation and recognition of the social conditions in which learning occurs are also necessary for responsiveness.

Hybrid learning ecologies are not just practical responses to scarcity from a cognitive justice perspective. They are also means of maintaining and validating multiple knowledge systems. Oral explanation, peer teaching, apprenticeship, embodied demonstration, community validation, and local language interpretation are not second-best alternatives to "real" digital learning. They are practices of the mind.

An on-demand learning system that is dedicated to cognitive justice should therefore plan for the coexistence of multiple modalities of learning, and not assume that access to digital platforms is the most recent or most important way of participating.

4.4.3 Gender, Infrastructure, and Intersectional Access

Gender and intersectionality are also important aspects of infrastructure that must be considered in an adequate analysis of on-demand learning. Feminist technology researchers have demonstrated that access to digital technologies is often gendered, with women less likely to own devices, to have access to shared devices, to have control over connectivity costs, to have time poverty due to unpaid care work, and to be vulnerable to online harassment (Gurumurthy et al., 2019; Hafkin, 2006). These inequalities have a direct impact on the way learners access on-demand learning systems and their ability to access them safely, regularly and effectively.

Gendered barriers also overlap with caste, class, ethnicity, age, disability, language, place, and education. A platform that assumes personal device ownership, private study space, constant access, and individual autonomy can inadvertently benefit learners who already have these conditions. Even if they are not able to participate due to social and infrastructural factors, those who do not may be viewed as irregular, disengaged, or low-performing. Another type of epistemic misrecognition is when the learner is evaluated based on platform metrics that fail to capture the conditions of learning.

Intersectional analysis is thus required for an epistemically just approach to on-demand learning. It should explore the impact of various social roles on access, participation, credibility and recognition. For example, women learners may require flexible scheduling, safe modes of participation, local support groups, shared learning spaces, or offline materials. Learners with disabilities may need accessible interfaces, alternative formats and assistive technologies. Low bandwidth design and community-based facilitation may be needed for rural learners. Content in local languages and opportunities for oral or peer-mediated interpretation may be needed for linguistically marginalized learners.

The implications for practice are important. Design on-demand learning systems for shared access as well as individual access. They should feature easy-to-use content and interfaces for people with varying literacy and digital confidence. They should offer choices of privacy, anonymity, or protected participation when safety is an issue. They should collaborate with women's groups, community groups, local associations and social networks that are already supporting marginalized learners. Megahed et al. (2021) demonstrate in their study of hybrid learning in Egypt that gender-inclusive programmes with specific gender support measures are more likely to achieve gender-equitable results than gender-blind programmes.

In this section, it has been argued that infrastructure is not only a technical condition for on-demand learning but also an epistemic condition. It defines who can be a learner, how they can participate, what kinds of participation are documented, what

kinds of participation are considered legitimate, and whose knowledge is recognized. Therefore, the design of on-demand learning should go beyond the concept of simple access models and shift towards infrastructure pluralism, which is the intentional development of learning systems that enable digital, low-tech, no-tech, human-mediated, community-based, and culturally situated learning. This pluralism is not a compromise imposed by lack of resources. It is a prerequisite for epistemic and cognitive justice in on-demand learning.

4.5 Towards Contextual Models of Equity and Innovation: Localized On-Demand Learning Ecosystems as Epistemic Repair

The third dimension of this chapter builds on a positive vision of on-demand learning (ODL) based on localized learning ecosystems. Whereas the previous sections have suggested that on-demand learning can create epistemic injustice by limiting the definition of demand, skill, infrastructure and evidence, this section asks how on-demand learning can be rethought as a means of epistemic repair. This repair is not just about increasing platform access or adding local content to existing systems. It demands an understanding that communities, informal networks, micro-enterprises and local knowledge holders are not an afterthought in skill formation. They play a key role in shaping the purpose of learning, the nature of knowledge, and the criteria for the recognition of competence.

A local on-demand learning ecosystem is not just a digital content delivery network. It is a social, institutional and epistemic structure that links various learning sites together without being integrated into a single platform logic. This is especially relevant in the Global South, where learning may occur in community-based organizations, informal workplaces, agricultural environments, religious institutions, women's groups, youth associations, and family-based or intergenerational networks. While not necessarily identified by formal education systems, these spaces are where practical knowledge, livelihood skills, social responsibility, and cultural continuity are created and maintained (Munda, 2024).

4.5.1 Beyond Formal Institutions: Recognizing Multiple Learning Spaces

In dominant on-demand learning models, formal institutions like schools, universities, training centres and credentialing bodies are still seen as the main actors in organizing learning, even when learning is provided via digital platforms. This

assumption can mask the myriad places where learning takes place. Formal institutions are just one component of a wider learning ecology for many learners, particularly those in the informal sector or community-based livelihoods. Skills are acquired in artisanal workshops, market stalls, agricultural cooperatives, religious institutions, women's self-help groups, youth associations, community centres and work-based environments (Munda, 2024; Shaheen et al., 2020).

It is important to acknowledge these multiple learning spaces to prevent hermeneutical injustice. If on-demand learning systems can only identify learning that is embedded in formal course structures, standardized assessments, or platform-tracked activities, then many forms of community-based and informal learning are hard to call learning, let alone education. This is not to say that such learning is not valuable, but that dominant systems may not have the interpretive categories to understand it. The issue from Fricker's point of view is hermeneutical: learners and communities might have knowledge that is not readily transferable to the language of competencies, modules, credentials, or employability.

An equity-orientated on-demand learning model should therefore reinforce and link with the existing structures of learning in the community, rather than circumvent them to reach learners as individual learners. This means tools that can be adapted to the needs of community organizations, recognition systems that recognize learning that takes place outside of formal programs, and pathways that enable learners to move between informal and formal learning without losing their communities, languages, or epistemologies (Dubazana, 2025; Munda, 2024).

The idea of learning ecosystems is relevant here as it acknowledges that learning takes place in a variety of settings, such as the home, community, workplace, formal institutions and digital environments (Barron, 2006; Jackson, 2012). In terms of learning ecosystem, on-demand learning should not be a substitute for the current learning structures. Rather, it should facilitate their linkage in a manner that maintains their integrity and autonomy. This implies that local learning spaces are not to be fixed, but rather are to be understood as epistemic resources that can transform the way on-demand learning conceptualizes demand, content, competence assessment, and achievement.

4.5.2 Community-Based Organizations as On-Demand Learning Agents

Community-based organizations (CBOs) are well placed in the localized on-demand learning ecosystems as they are situated in a particular social context and answerable to local stakeholders. CBOs typically have a deeper understanding of the language, culture, gender, economic, and infrastructure factors that influence participation in learning, as compared to external platforms. They can thus act as a link between the global on-demand learning resources and the local learning priorities in a more responsive manner to the local realities (Yang et al., 2007).

CBOs can play several roles in epistemically just on-demand learning systems. First, they can facilitate participatory needs assessment, ensuring that on-demand learning offerings are not just based on employer demand, platform analytics, or external development agendas, but are also based on community-defined priorities. This directly challenges testimonial injustice by valuing learners and communities as reliable sources of knowledge about their own educational needs. Second, CBOs can offer physical and social infrastructure, such as learning spaces, shared devices, connectivity support, and safe spaces for learners who may not have private or individual access to digital platforms.

Third, CBOs can provide human facilitation. They can assist learners in navigating digital materials, understanding content in relation to local realities, maintaining motivation, and linking online learning with offline practice (Choe et al., 2024). This is particularly relevant in the context of on-demand learning as self-directed or algorithmically personalized. Human facilitation reminds us that learning is often relational, dialogic and socially embedded. Fourth, CBOs can adapt content by translating materials into local languages, adapting examples to local livelihoods, and incorporating local knowledge with materials from outside sources. Fifth, they can promote recognition by collaborating with credentialing organizations, employers, policymakers, and local institutions to ensure that skills learned in on-demand learning and community-based learning are recognized and accredited.

This function of CBOs also redefines the concept of innovation. Innovation is not just about new platforms, applications, or AI-powered tools. It may also include new models of community governance, local facilitation, contextual adaptation, and recognition of existing knowledge practices. The value of stakeholder co-creation, sectoral responsiveness and collaboration across institutions is demonstrated in projects like Auto Credify and METASKILFS4TCLF. Their principles, however, should not be blindly imported into community settings. The challenge is to transfer these concepts from formal, institutionally dense, and industry-oriented contexts to informal and community-embedded contexts where accountability, trust, and knowledge recognition are different (Capecchi et al., 2025; Dubazana, 2025).

4.5.3 Micro-Enterprises and Informal Training Networks

Another key component of local on-demand learning ecosystems is micro-enterprises and informal training networks. Skills training is not the main way in many Global South settings. It is often done via apprenticeship, observation, learning by doing, peer instruction, family-based work, and informal economic activity (Farisani, 2022). A young person learning how to repair vehicles in a local workshop, a woman learning tailoring in a neighbourhood enterprise, or a farmer learning new agricultural methods through peer exchange is already involved in skill development. However, this learning can be invisible to platforms that focus on formal learning, individual course enrolment, and standardized assessment.

This invisibility is a form of epistemic misrecognition. In terms of testimonial injustice, informal learners might not be considered as credible knowers due to their lack of formal institutional status. Their skills might not be acknowledged from a hermeneutical injustice standpoint, due to the lack of categories in dominant on-demand learning systems for embodied practice, apprenticeship, tacit knowledge, and community validation. The problem, then, is not just that informal learners must have access to formal learning. It is also that on-demand learning systems must acknowledge informal learning as a valid method of knowledge creation.

Informal training networks can be supported by on-demand learning if they are designed to work within the rhythms of work and community life. This can include mobile tools that can be used in short learning intervals, audio-visual content that does not require high levels of formal schooling, multilingual resources, low bandwidth design, peer-supported learning and assessment models based on demonstrated practice, not just formal testing. It can also mean establishing connections between informal and formal learning, without the learner having to move from their current workplaces, communities or epistemic environments.

In this regard, Recognition of Prior Learning (RPL) is particularly relevant. RPL is a process that enables individuals to be formally recognized for skills and knowledge gained from informal, non-formal and experiential learning (Srivastava & Jena, 2015). Digital portfolios, peer assessment, practical demonstrations, mentor assessment, workplace evidence, and community-based validation are all potential ways to support RPL in on-demand learning systems. These mechanisms are more flexible to the realities of informal learning than assessment systems based solely on written exams, standardized tests, or course completion badges.

RPL should not be an automatic process of converting informal learning into formal categories without challenging the categories. If RPL is only able to recognize what can be formally recognized, then it can perpetuate the same epistemic exclusions it aims to overcome. An epistemically just approach to RPL should involve communities, practitioners and local experts in the definition of the standards of competence. In this way, on-demand learning can be a connector between learning systems, not a conduit for the informal learning to be integrated into the dominant credentialing systems.

4.5.4 Indigenous Innovation and Cognitive Justice

A Global South perspective also disrupts the notion that innovation in education flows mainly from the "core" to the "periphery." Communities in the Global South are already finding creative solutions to learning needs through the adaptation of existing technologies, the mobilization of local knowledge, the creation of informal pedagogies and the response to social priorities in ways that external actors may not expect (Mays, 2022). On-demand learning should thus be built to complement, build on and learn from these innovations, not supplant them with externally imposed models.

This orientation is significant for the design of on-demand learning. Platforms should enable local adaptation of interfaces, content, language, assessment and learning pathways. Local experts, practitioners, elders, community organizations and learners themselves should be involved in content development. Competencies that are not immediately apparent in global skill taxonomies but are important for livelihood, cultural continuity, ecological responsibility, care and community well-being, should be recognized in credentialing systems.

This argument is ethically based on the concept of cognitive justice. Visvanathan (2009) maintains that justice demands that the plurality of knowledge systems be recognized and that epistemic hierarchies be rejected that privilege scientific, technical, or market-oriented knowledge over indigenous, traditional, local, and experiential knowledge. In on-demand learning settings, cognitive justice is defined as not only allowing for diversity in existing systems, but also as a platform that allows for the creation of new systems. They need to be restructured to allow for the coexistence and interaction of multiple epistemologies on more equal terms (Dubazana, 2025).

Caution is also needed against romanticizing local knowledge in the context of cognitive justice. Emancipatory, inclusive, and equitable practices are not necessarily local practices. Some may perpetuate gender, caste, class, ethnic, or generational inequalities. The point is not to idealize the local but to establish dialogic systems in which knowledge traditions can meet each other critically and respectfully. On-demand learning should facilitate this conversation by allowing communities to identify their own priorities and by providing opportunities for wider recognition, mobility and participation.

4.5.5 Localized On-Demand Learning Ecosystems as Epistemic Repair

Localized on-demand learning ecosystems can be considered as an epistemic repair since they directly address the injustices identified earlier in the chapter. They respond to testimonial injustice by engaging learners, community groups, informal workers, and local knowledge holders as legitimate actors in the process of articulating learning demand. They contribute to hermeneutical injustice by broadening the range of ways in which learning, skill, evidence and competence can be understood. They promote cognitive justice by acknowledging that several knowledge traditions should inform the design, evaluation, and management of on-demand learning.

It is not a rejection of platforms, digital tools, AI-driven personalization, or formal credentials. Instead, it involves embedding them in the larger social and epistemic structures. In an equity-oriented on-demand learning ecosystem, technology is used for learning purposes that are defined by the community. Platforms are no longer instruments of extraction, but tools of connection. Credentials are no longer filters

that exclude informal knowledge, but rather bridges between learning systems. Innovation is a two-way street of local adaptation, community engagement, and mutual recognition.

The main message of this section is thus that on-demand learning needs to be integrated into local learning ecosystems if it is to be truly responsive. Responsiveness is not limited to providing content when it is requested. It also implies reacting to the knowledge systems, social relations, infrastructures, and aspirations by which learners understand their own needs. This is possible through localized on-demand learning ecosystems, which move beyond individual platform access to collective epistemic agency.

4.6 An Equity-Oriented Framework for On-Demand Learning in the Global South

Building on the preceding discussion, this section presents an equity-oriented framework for on-demand learning. The purpose of the framework is not simply to make on-demand learning more accessible in resource-constrained contexts, although access remains important. Rather, the framework seeks to make on-demand learning more epistemically just. It asks how on-demand learning systems can recognize learners and communities as credible knowers, how they can make space for multiple knowledge traditions, and how they can avoid reducing learning to platform analytics, employer demand, or standardized credentialing systems.

The framework is organized around five interrelated principles: epistemic justice, infrastructure pluralism, community embeddedness, intersectional equity, and sustainable innovation. These principles should not be read as a general wish list for inclusive education. Each principle emerges from the theoretical argument developed in this chapter. Fricker's (2007) concepts of testimonial and hermeneutical injustice show why learners must participate in defining demand and why on-demand learning systems must expand the categories through which knowledge is recognized. The notion of cognitive justice advanced by de Sousa Santos (2015) and Visvanathan (2009) shows why different knowledge traditions must be treated as valid rather than merely added as local supplements to dominant frameworks. Connell's (2009) Southern theory and Mignolo's (2011) critique of coloniality further remind us that educational models often travel as universal while carrying specific historical and institutional assumptions. An equity-oriented framework for on-demand learning must therefore challenge the epistemic architecture of on-demand learning, not only improve its delivery mechanisms.

To present this framework in figure form and make it look more understandable, the author has taken help from AI tools to draw a graphical image of the framework, Fig. 4.1 presents a framework for equity-oriented on-demand learning. It explains that on-demand learning should not only be flexible and accessible, but also fair,

inclusive, and rooted in diverse knowledge systems, because apparently "access" alone is too easy for institutions to misunderstand.

The framework (Fig. 4.1) begins with conceptual foundations, including epistemic justice, cognitive justice, Southern theory, coloniality, and epistemic disobedience. These ideas challenge dominant ways of defining knowledge and argue that local, community-based, and marginalized forms of knowledge should also be valued.

The second part introduces the Equity-Oriented On-demand learning Framework, which argues that on-demand learning should be judged by how it distributes authority over knowledge, infrastructure, recognition, demand, and innovation. It highlights five key principles: epistemic justice, infrastructure pluralism, community embeddedness, intersectional equity, and sustainable non-extractive innovation.

The final section shows the design and policy implications. These include participatory demand formation, locally adaptable content, recognition of informal and community-based learning, hybrid learning ecologies, and community-governed innovation.

Overall, the framework (Fig. 4.1) argues that an equitable on-demand learning system should be responsive, community-centred, inclusive, and accountable to multiple knowledge traditions, rather than simply delivering digital learning from the top down.

4.6.1 Conceptual Foundations

4.7 Conceptual Foundations of the Framework

It is important to first describe the conceptual underpinnings of the five core principles of an equity-oriented on-demand learning framework. These foundations are not philosophical statements, but rather the result of a critical analysis of the inequalities that already exist in digital learning systems, especially in Global South settings. The framework is based on five interrelated theoretical traditions: epistemic injustice, cognitive justice, Southern theory, coloniality, and epistemic disobedience.

1. *Epistemic Injustice* (Fricker, 2007)

   Epistemic injustice is a wrong that happens to individuals or groups in their role as knowers. Fricker distinguishes between testimonial injustice (when a speaker's credibility is unfairly discounted) and hermeneutical injustice (when a gap in shared interpretive resources puts marginalized groups at a disadvantage in making sense of their own experiences). Testimonial injustice occurs in on-demand learning when learners' own voices about their needs are not heard, but instead are replaced by platform analytics or skill taxonomies based on the employer. Hermeneutical injustice is the situation in which the categories used to describe learning (such as formal credit hours, standardized competencies) are inadequate to capture community-based knowledge, care work, or informal skill transmission.

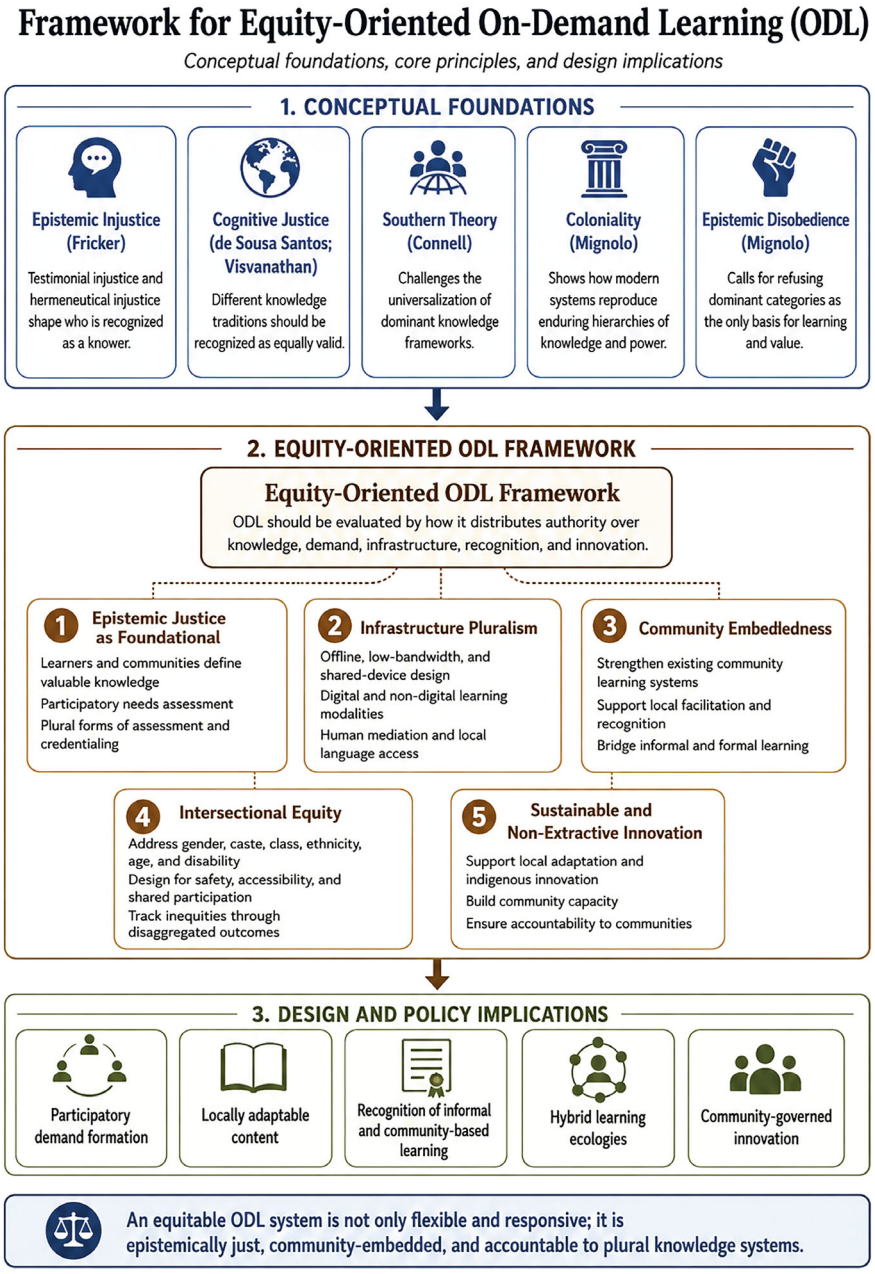


Fig. 4.1 Graphical image of the equity-oriented framework. *Source* The figure was created using an advanced AI-based graphical tool available through ChatGPT

2. *Cognitive Justice* (De Sousa Santos, 2015; Visvanathan, 2009)
   Cognitive justice is the idea that knowledge is not one and the same. Rather, there is a need to respect and recognize different knowledge traditions: scientific, indigenous, rural, urban, formal, informal. For on-demand learning, cognitive justice must go beyond the notion of "adding" local content to a dominant Western curriculum. It requires the coexistence of several knowledge systems, not just as supplements or examples.
3. *Southern Theory* (Connell, 2009)
   Southern theory challenges the notion of knowledge being transferred from the Global North to the Global South. Connell shows that much of what is called universal social theory is actually based on Euro-American experiences. An equity-focused on-demand learning framework, then, needs to consider the implicit assumptions about learners, time, space, and success that are embedded in platforms, pedagogies, and credentialing systems that may not be relevant to Southern contexts.
4. *Coloniality* (Mignolo, 2011)
   Coloniality is the continuation of colonial structures and thinking beyond the end of formal colonization. Coloniality in education is manifested in the emphasis on Western knowledge in curricula, the devaluation of oral and practical skills in assessment systems, and the assumption of individual over collective learning in platforms. Mignolo's work reminds us that decolonizing on-demand learning is not just about representation; it is about the reconfiguration of who has the authority to define demand, knowledge and value.
5. *Epistemic Disobedience* (Mignolo, 2011)
   Epistemic disobedience is the active practice of resisting dominant definitions of knowledge, credibility, and progress. In the real world, this translates to creating on-demand learning systems that do not default to employer skill frameworks, platform metrics, or international rankings. Rather, epistemic disobedience calls for communities to create their own learning needs, regardless of whether they are in opposition to external expectations.

These five conceptual foundations are not independent issues. They complement and support one another. They are all good reasons for an equity-based approach to on-demand learning to be more than just about access; it's about authority, recognition, and the distribution of epistemic power.

4.7.1 Equity-Oriented On-Demand Learning Framework (Principles)

1. *Principle 1: Epistemic Justice as Foundational*
   The first principle is that epistemic justice should be at the core of the design, implementation, and governance of on-demand learning. In an epistemically just on-demand learning system, learners are not treated as users, consumers, data

points, or future workers. They are regarded as knowers who have the right to be involved in the definition of what is valuable knowledge, relevant skill, meaningful demand, and legitimate evidence of learning. This principle directly responds to testimonial injustice. When learners' own needs are not valued as much as the data from the platform or employer predictions or external skill taxonomies, on-demand learning creates epistemic inequality even if it seems flexible or learner-centred.

Epistemic justice in practice involves participatory needs assessment processes that enable communities to identify learning priorities in their own language, categories, and social contexts. These procedures should not just require learners to select from a list of available course catalogues. They should provide opportunities for learners, community groups, informal workers, local experts and marginalized groups to identify learning needs that are not yet apparent in platform systems. For instance, the learning priorities of community leadership, ecological knowledge, care work, cultural preservation, informal entrepreneurship, and intergenerational skill transmission can be significant even if they are not reflected in traditional labour-market statistics.

There is also a need for flexible content authoring systems that enable local knowledge and indigenous expertise to influence the curriculum, as part of epistemic justice. On-demand learning platforms should not be used to create knowledge from outside the community and present it to the passive learner, but should be used to adapt, translate, revise, and produce knowledge that is relevant to the community. Assessment systems also need to be expanded to accommodate a variety of competencies, such as those that are acquired through informal learning, community-based practice, apprenticeship, oral transmission, and practical demonstration. Credentialing systems should be designed to accommodate both locally defined competencies and externally recognized standards, allowing learners to not have to choose between local legitimacy and mobility.

2. *Principle 2: Infrastructure Pluralism*

The second principle is infrastructure pluralism. Infrastructure pluralism is not just about the number of devices or the quality of internet connectivity. It involves acknowledging learning infrastructures as social, material, cultural and epistemic arrangements. They define who can learn, who can be seen learning, and what kinds of knowledge can be documented, evaluated, and validated. The design of on-demand learning systems that rely on constant connectivity, personal ownership of devices, private study time and high levels of digital literacy can inadvertently exclude learners who rely on shared devices, intermittent connectivity, human mediation, and community-based learning spaces.

Thus, on-demand learning systems must be designed to cater for different technological and social contexts, which is what infrastructure pluralism demands. Offline access, intermittent connectivity, shared device use, downloadable content, low-bandwidth design and flexible session structures should be considered as essential design features, not as afterthoughts. Additionally, on-demand learning should incorporate low-tech and no-tech approaches like print resources, broadcast media, in-person facilitation, local study circles, and community

learning centres. These modalities are not to be considered as inferior alternatives to digital learning. They are key components of the meaning, relationality, and sustainability of learning in many contexts.

This principle also calls for language-localized and culturally accessible interfaces that are accessible to learners with varying levels of literacy and digital confidence. Facilitators, peer mentors, teachers, community volunteers, and local learning coordinators should be part of the human mediation in on-demand learning systems. This mediation is particularly crucial when the social reality of learners is not sufficiently captured by platform automation and algorithmic personalization. Infrastructure pluralism thus broadens the concept of access. It moves the focus from whether learners can access a platform to whether the wider learning environment enables them to access it with dignity, safety, understanding and recognition.

3. *Principle 3: Community Embeddedness*

The third principle is community embeddedness. An equity-oriented on-demand learning system should build on the existing community-based learning systems, not circumvent them to access learners as individuals. This is based on the preceding argument that learning is frequently distributed across a variety of settings, such as households, workplaces, community groups, informal businesses, agricultural environments, religious institutions, women's groups, youth clubs and peer groups. These are not places of education outside. They are the places where practical knowledge, livelihood skills, cultural identity and social responsibility are developed.

Hermeneutical injustice is addressed by community embeddedness, which increases the contexts and forms in which learning is acknowledged. However, if on-demand learning only validates learning that takes place in formal courses, standardized modules, or activities tracked on a platform, it could render community-based knowledge invisible. An equity-oriented on-demand learning model should thus offer tools and resources that can be adapted to the needs of community organizations. It should enable community-based production, facilitation, contextual interpretation and participatory governance.

This principle also needs to be supported by the recognition of skills gained in the community. On-demand learning should provide opportunities for learners to connect informal and formal learning without having to move from their communities, give up their languages, or convert all knowledge into externally imposed categories. Community organizations have the potential to be important facilitators, contextualizers, mentors, assessors, and advocates. They can support the linkage of on-demand learning offerings to local priorities and the recognition of skills acquired in community practice by educational institutions, employers and policymakers. Community embeddedness is not just a delivery strategy in this sense. It is a form of epistemic redistribution.

4. *Principle 4: Intersectional Equity*

The fourth principle is intersectional equity. Designing on-demand learning systems with explicit consideration of the impact of gender, caste, class, ethnicity, language, age, disability, rural–urban location, and other social positions on

access, participation, credibility and recognition. While a platform might seem open to everyone, its actual use is determined by unequal social conditions. Learners can vary in terms of access to devices, control over time, safety in online environments, freedom to participate, language proficiency, prior schooling, and confidence in formal learning environments. When these differences are overlooked, on-demand learning can perpetuate inequality and appear to be flexible and inclusive.

To achieve intersectional equity, it is important to examine the multiple disadvantages faced by marginalized groups. For instance, women learners might have limited access to devices, limited mobility, unpaid care responsibilities, or privacy and online harassment concerns. Rural learners might have less reliable access to internet connectivity, fewer opportunities to attend learning centres, or fewer opportunities to translate credentials into jobs. Students with disabilities might need alternative formats, assistive technologies, flexible assessment options, and accessible interfaces. Linguistically marginalized learners may require content in local language, oral explanation, and peer-supported interpretation. These needs should be taken into account when designing on-demand learning, rather than as a remedial support.

An intersectional approach also involves designing for shared use, not individual use. Collective learning spaces and shared devices can be more feasible and fair than private access models in many settings. Where privacy or safety is an issue, on-demand learning systems should also offer opportunities for anonymous, protected or community-mediated participation. Collaborations with women's groups, disability groups, community groups, local associations, and other support systems can help to ensure that the marginalized learners are not left to deal with on-demand learning on their own. Lastly, equity needs to be tracked by disaggregated outcomes. The participation, completion, recognition, and benefit should be considered across relevant social categories to uncover hidden inequalities and address them.

5. *Principle 5: Sustainable and Non-extractive Innovation*

The fifth principle is sustainable and non-extractive innovation. On-demand learning should not be merely the importation of externally designed platforms, curricula, and credentialing systems, but rather the facilitation of local adaptation and indigenous innovation. This principle is based on cognitive justice. It acknowledges that innovation is not limited to technology companies, international organizations, or formal education institutions. Communities also innovate through adapting available tools, informal pedagogies, local knowledge practices, and creatively addressing social and economic needs.

Open and flexible platforms are essential for sustainable innovation, allowing them to be customized to community needs. Local content creation should be encouraged to enable learners and communities to contribute knowledge, not just absorb content created elsewhere. Capacity building for communities to adapt, maintain, and govern learning systems beyond the life of short-term projects should be a goal of on-demand learning initiatives. This involves investing in

local facilitators, community-based organizations, local technical capacity and participatory governance structures.

There is also a need for accountability in non-extractive innovation. On-demand learning systems should not take knowledge, data, labour, or cultural resources from communities without benefit, consent and reciprocity. Platforms and providers should be held accountable to funders, markets or institutional performance measures, but also to the communities that provide the knowledge and participation that keep the system alive. Long-term sustainability should be given priority over short-term pilot projects. On-demand learning should not be a one-off technological solution, but a component of sustainable local learning ecosystems.

Combined, these five principles redefine on-demand learning as more than flexible access to modular content. They see on-demand learning as an epistemic, social and political system that is to be evaluated based on the distribution of authority over knowledge, demand, infrastructure, recognition and innovation. An equity-based approach to on-demand learning should not only question the availability of learning on demand. It should question whose needs are met, whose knowledge is valued, whose participation is accepted, and whose futures are enabled by learning.

4.7.2 Design and Policy Implications

The five principles above directly translate to implications for the design of on-demand learning platforms, policies that regulate them, and institutional arrangements that facilitate them. The implications are grouped into five interrelated domains, one for each principle. They combine theory with practice to provide guidance for educators, platform developers, policymakers, and community-based organizations who want to create more equitable on-demand learning systems in the Global South and beyond.

1. *Participatory Demand Formation (from Principle 1: Epistemic Justice)*

   Design implications include the need to move away from static course catalogues and towards tools that are flexible and can be edited by the community, enabling local stakeholders to express their own learning priorities. This includes creating feedback loops where students can suggest new topics, skills, or knowledge that are not covered on the platform. In addition, assessment methods need to be restructured to allow for a variety of evidence such as video recordings, audio submissions, practical demonstrations, and peer testimony, instead of just multiple-choice quizzes or written exams. In terms of policy implications, governments and funding bodies should mandate on-demand learning providers to make it clear how learners and communities are involved in the definition of what is taught. Credentialing systems should be required to accept both locally defined competencies and externally validated standards, and learners should be able to select from a variety of credentialing without penalty. Last but not least,

participatory needs assessment processes must be funded as a precondition for the deployment of any on-demand learning system in new communities.

2. *Locally Adaptable Content and Infrastructure*

   Locally adaptable content and infrastructure require offline mode, low bandwidth options, and downloadable content to be considered standard features, not premium extras, from a design point of view. Platforms need to be able to accommodate multiple access points at the same time, such as mobile phones, desktop computers, shared kiosks, print-on-demand materials, SMS messaging, radio broadcasts, and in-person facilitation. Interfaces must be simple and easy to use for low-literacy learners, and must include voice navigation and multiple language options as standard. Policy: Procurement decisions should not include the purchase or deployment of on-demand learning platforms that require continuous high-speed connectivity, because this would systematically exclude learners in underserved areas. Governments should provide funding for community learning hubs with shared devices, printed materials and trained local facilitators to support learners in various modalities. Infrastructure standards should be developed that recognize the value and legitimacy of low-tech and no-tech modalities as equal to full digital delivery, and that do not penalize resource-constrained contexts.

3. *Recognition of Informal and Community-Based Learning (from Principle 3: Community Embeddedness)*

   Design implications for recognition of informal and community-based learning are that clear and accessible pathways should be provided for learners to upload evidence of skills acquired in paid work, unpaid caregiving, traditional apprenticeships, or community leadership. Platforms should enable community organizations to validate informal learning, not just formal education institutions. Peer and mentor verification tools need to be developed with sensitivity to local hierarchies and social structures, and to ensure that recognition processes are culturally appropriate and equitable. On the policy side, national or regional policies should be developed specifically for the recognition of informally acquired skills, which are related to on-demand learning pathways. Funding should go to community-based organizations to support their role in co-designing, co-delivering, and co-certifying learning experiences with formal providers. Importantly, recognition policies need to be developed in a way that does not require informal knowledge to be translated into dominant academic or corporate categories unless the learner chooses to do so for mobility or formal employment.

4. *Hybrid Learning Ecologies (from Principle 4: Intersectional Equity)*

   Creating a hybrid learning ecology requires a design that allows for the use of shared devices and group learning models, not just individual account-based models. To ensure the privacy of vulnerable learners who may be subject to surveillance, harassment, or domestic barriers to safe participation, anonymous participation and protected user profiles are required. Platforms should provide flexible session durations, pause and resume options, and offline sync features to

support learners who may have to pause their learning due to work, care responsibilities, or unreliable infrastructure. Policy-wise, equity audits should be required, which break down participation, completion rates and learning outcomes by gender, caste, class, disability, geographic location, language group and age. Equity strategies should not focus on one social category at a time, but should take into account several overlapping disadvantages. The funding should be channelled towards partnerships with women's groups, disability rights organizations, caste-based collectives, and other community associations specifically to reach the most marginalize learners who are typically excluded from mainstream digital education initiatives.

5. *Community-Governed Innovation (from Principle 5: Sustainable and Non-Extractive Innovation)*

   From a design perspective, community-driven innovation should be designed so that source code and educational materials are made available under open licenses that clearly allow local adaptation, translation, and redistribution without legal or technical restrictions. Simple authoring tools need to be embedded in platforms to enable communities to author, update and share their own content without requiring advanced technical skills. Learners should always have control over their personal data, and platforms should always ask for explicit, informed and revocable consent for any data use that goes beyond the learning transaction itself. As far as policy implications are concerned, contracts with on-demand learning providers should contain clauses on data sovereignty and benefit-sharing that safeguard the participating communities from exploitation. Long-term funding should be prioritized for community-owned and community-governed learning systems rather than short-term pilot projects that tend to be short-lived after the initial funding. Lastly, accountability mechanisms should be put in place that are directly accountable to communities, not to funders, regulators or institutional performance measures, and that give communities real control over the operation and development of on-demand learning systems over time.

4.8 Implications for Policy and Practice

The above equity-oriented framework has implications for all actors involved in the design, implementation, governance, and evaluation of on-demand learning. When on-demand learning is perceived as flexible access to modular content, policy and practice will be largely about expanding platforms, enhancing connectivity and boosting course completion. These are still significant objectives, but not enough. An epistemically just approach is asking a different set of questions: Who decides what is demanded? Whose knowledge is acknowledged? Whose learning is valued? Who is served by the systems being built? The implications below are thus not only about access and delivery, but also about epistemic authority, community participation, recognition and accountability.

4.8.1 For Policymakers

Policymakers play a key role in making sure that on-demand learning is not yet another way in which market priorities, platform metrics, or externally defined skill frameworks take precedence in educational planning. National and regional on-demand learning strategies need to therefore take into account infrastructure inequalities, digital divides, language barriers, gendered access, and social inequalities, but more. They should expect on-demand learning systems to show how learners and communities are involved in setting learning priorities and how diverse knowledge traditions are valued in curricula, assessment and credentialing.

Policy should enable hybrid infrastructure that integrates digital connectivity with physical learning spaces, community facilitators, and low-tech ways of participation. This is particularly relevant in situations where learners rely on shared devices, intermittent connectivity, or collective learning arrangements. Policy frameworks should not view these as short-term deficiencies, but as a component of the actual learning environment in which on-demand learning functions.

Regulatory frameworks should also mandate on-demand learning providers to show equity outcomes. This encompasses accessible design, local-language provision, gender-sensitive participation mechanisms, disability inclusion, protection of privacy, and specific support for marginalized groups. Furthermore, policies should enhance the recognition of prior learning systems to ensure that skills gained from informal work, community practice, apprenticeship and local knowledge systems can be recognized. This would go some way towards solving hermeneutical injustice by broadening the scope of what formal systems can count as learning.

Last but not least, policymakers need to fund participatory research and community-based experimentation. Policy should not only be based on imported models of on-demand learning or standardized global indicators but should also be based on contextual evidence of what works in specific communities, languages, sectors, and social conditions. This research should not be seen as a research project on communities, but as a project in which communities are co-producers of educational knowledge.

4.8.2 For On-Demand Learning Platform Developers and Providers

Platform developers and on-demand learning providers need to consider infrastructural diversity and epistemic plurality from the outset. This involves creating platforms that operate in low bandwidth, intermittent connection, offline and shared device environments. It also involves creating interfaces that are accessible in various languages, literacy levels, cultural contexts, and digital confidence.

But technical accessibility is not sufficient. Platforms should also be localized and adapted to the community. Content authoring tools should allow teachers, local

experts, community groups, and learners to modify examples, translate content, integrate indigenous knowledge and develop locally relevant learning pathways. This way, platforms can shift from providing uniform content to plural knowledge production.

There is also a need to revise assessment and credentialing systems. Evaluation mechanisms should be established by on-demand learning providers that acknowledge various types of competence, such as practical demonstration, peer validation, workplace evidence, community-based assessment, oral explanation, and digital portfolios. These mechanisms are especially crucial for learners who acquire their skills outside of formal education, through experience, or through community-based learning.

Another key role is data governance. Extractive data practices should be avoided by platform developers where learners' interactions, knowledge, or community information is gathered for institutional, commercial, or predictive purposes. Data systems must safeguard learner privacy, be transparent about how data are used, and establish mechanisms of accountability to communities, not just to platform owners, funders, or employers. An epistemically just platform should not only be a data source for learners but also a platform where learners' knowledge and agency are also part of the system.

4.8.3 For Educators and Facilitators

Educators and facilitators play an important role as they are the link between digital systems and lived learning realities. In an equity-based on-demand learning model, their job is not just to assist learners in using platforms. They support learners to understand content, relate it to local contexts, express their own learning needs, and shift between digital and non-digital learning.

Designing learning strategies, therefore, that link platform-based resources with community knowledge, practical experience, local languages and everyday problem-solving is essential for facilitators. This can include group discussion, peer learning, oral explanation, demonstration at work, local case examples and community-based projects. These practices can help to avoid on-demand learning from being a one-to-one relationship between the learner and the digital interface.

Participatory needs assessment should also be supported by educators. Learners should be encouraged to set their own learning priorities, not just be users of content prepared by others. This directly addresses testimonial injustice by taking learners' own accounts of their needs seriously and as credible. Facilitators can also be used to capture knowledge that is not captured in formal ways, such as informal skills, community practices, indigenous knowledge, and intergenerational learning.

Moreover, teachers need to promote the recognition of learning acquired through on-demand learning and community-based practice. This will involve working with credentialing organizations, employers, community groups, and policymakers. Teachers can support the creation of assessment strategies that value practical skills

and local context, in addition to standardized exams or completion badges. They can also document and share local innovations in on-demand learning adaptation, which can help to build a wider picture of what epistemically just on-demand learning can look like in different contexts.

4.8.4 For Development Partners and Funders

Development partners and funders should not consider on-demand learning as a technology intervention. Many on-demand learning projects do not lead to sustainable change because they are based on pilots, platforms, devices, or rapid scaling without taking the time to invest in social and epistemic conditions that make learning meaningful. An equity-oriented approach demands long-term investments in community-based learning ecosystems, local facilitation, contextual content development, and sustainable governance.

Funders should encourage participatory design processes that engage communities from the outset in the problem definition, learning priority setting, design of interventions, and evaluation of outcomes. This helps to avoid imposed solutions that replicate epistemic hierarchies. It also guarantees that on-demand learning programmes are not driven by donor priorities, labour-market forecasts or platform expansion plans, but by local aspirations.

Research and evaluation should also be rethought. Funders should encourage research that provides contextual information on on-demand learning in a variety of Global South contexts such as informal economies, multilingual communities, rural areas, women's learning networks, indigenous contexts, and low infrastructure contexts. Evaluation should not be limited to enrolment, completion or employment. It should also explore how on-demand learning increases learner agency, acknowledges local knowledge, enhances community capacity and decreases exclusion.

Last but not least, there should be a focus on community voice in accountability mechanisms. Reporting to donors is required, but not a substitute for accountability to learners and communities. The design of on-demand learning projects should incorporate ways for communities to evaluate the usefulness, respect, inclusion and sustainability of the project. Therefore, the projects that build local capacity and local innovation should be prioritized by the funders, instead of the projects that import the external model under the name of educational modernization.

4.9 Conclusion: Towards Epistemic and Cognitive Justice in On-Demand Learning

This chapter has suggested that on-demand learning is not just a flexible or technology-based approach to educational delivery, but an epistemic system that outlines what is demanded, what skills are required, what evidence is needed, what agency is expected, and what educational value is to be gained. Platformization, labour-market responsiveness, modular credentials, data-driven personalization, and new learning environments enabled by GenAI are increasingly defining contemporary on-demand learning. These changes offer possibilities for flexible and responsive learning but also pose serious questions about knowledge, power, and recognition.

The chapter has thus transcended the criticism that is limited to access to technology or infrastructure. These inequalities are significant but the ontological and epistemological are more significant. Assumptions about what learners are, what learning is for, what is useful knowledge, and how competence should be measured are often embedded in on-demand learning systems. If these assumptions are made universal, they can exclude learners and communities whose knowledge practices are not aligned with dominant notions of employability, micro-credentialing, productivity, or measurable skill acquisition.

This argument has been supported by the concept of epistemic injustice introduced by Fricker (2007). On-demand learning can perpetuate testimonial injustice when learners' own reports of their needs are not as trustworthy as platform data, employer indicators, algorithmic forecasts, or standardized skill profiles. It may be hermeneutical injustice if indigenous knowledge, informal learning, care work, ecological knowledge, community-based practice, and intergenerational skill transmission cannot be captured in the existing categories of on-demand learning. When this happens, the issue isn't just about learners being barred from platforms. The issue is that the system may not be able to fully identify them as knowers.

The chapter has also been informed by the concepts of cognitive justice, Southern theory, and decoloniality, which demonstrate that the issue is not just recognition of the individual, but also recognition of plural knowledge systems. De Sousa Santos and Visvanathan explain why the various knowledge traditions need to be considered as legitimate, not as local alternatives to dominant knowledge traditions. As Connell (2009) reminds us in his theory from the South, educational models can be universal, and can bring with them the assumptions of powerful institutional locations. Mignolo's (2011) ideas of coloniality and epistemic disobedience challenge the categories of progress, skill, modernization, and educational value that have been passed down. These views together imply that the effectiveness of on-demand learning in providing learning is not the only criterion to be used to evaluate it, but also the equity of the distribution of authority over knowledge.

The positive contribution of this chapter is an equity-oriented framework for on-demand learning that draws on the concepts of epistemic justice, infrastructure pluralism, community embeddedness, intersectional equity, and sustainable, non-extractive innovation. This framework redefines on-demand learning as a system

that is accountable to learners and communities, and not to platforms, employers, funders or formal institutions. It also reveals that local and community-based learning systems do not stand in the way of modernization. They are valuable sources of information, invention, and learning opportunity.

If on-demand learning is to be truly responsive, it must react to more than platform-detected demand. It needs to be responsive to the needs, aspirations, responsibilities and futures that learners and communities see for themselves. If on-demand learning is to be truly personalized, it should not be limited to pre-defined market segments or algorithmic profiles. To be truly flexible, on-demand learning must be able to support diverse infrastructures, epistemologies, languages, assessment practices and modes of recognition.

The challenge is not just to add more Southern content to the platforms already in place, or to translate the interfaces into more languages, although this can be helpful. The more fundamental challenge is to reconsider the epistemic structure of on-demand learning itself. Learners and communities need to be able to co-construct what is considered a demand, what is considered knowledge, what is considered evidence of learning, and what types of futures education should support. Only then can on-demand learning transcend flexible delivery and be a force for human flourishing epistemically just, cognitively plural, and locally accountable.

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References

Abu-Salih, B., & Alotaibi, S. (2024). A systematic literature review of knowledge graph construction and application in education. *Heliyon*, *10*(3). https://doi.org/10.1016/j.heliyon.2024.e25383

Asif, N., & Panakaje, N. (2022). Paradigm shift-the role of educational technology and internet in Indian education system. *International Journal of Case Studies in Business, IT, and Education (IJCSBE), ISSN*, 2581–6942. https:doi//ssrn.com/abstract-4527175

Balanzó-Guzmán, A., & Ramos-Mejía, M. (2023). Towards epistemic diversity in sustainability transitions: An exploration of hybrid socio-technical systems. *Sustainability Science, 18*(6), 2511–2531. https://doi.org/10.1007/s11625-023-01370-9

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development, 49*(4), 193–224. https://doi.org/10.1159/000094368

Bijker, W. E. (1997). *Of bicycles, bakelites, and bulbs: Toward a theory of sociotechnical change*. MIT Press.

Capecchi, I., Borghini, T., De Rosa, A., Bernetti, I., & Souto, R. (2025). Metaskills4tclf Erasmus+: Development of a virtual reality technology for skills development in the textile, clothing, leather and footwear industries. In *Proceedings of the International Conferences on Mobile Learning 2025 and Educational Technologies 2025* (pp. 177–184). IADIS Press.

Choe, K., Lee, C., Lee, S., Song, J., Cho, A., Kim, N. W., & Seo, J. (2024). Enhancing data literacy on-demand: Llms as guides for novices in chart interpretation. *IEEE Transactions on Visualization and Computer Graphics*. https://doi.org/10.1109/TVCG.2024.3413195

Choi, S. B., Yoon, J.-H., & Lee, W. (2020). The modified international standard classification of occupations is defined by the clustering of occupational characteristics in the Korean Working Conditions Survey. *Industrial Health, 58*(2), 132–141. https://doi.org/10.2486/indhealth.2018-0169

Connell, R. (2009). *Southern theory. The global dynamics of knowledge in social science.* https://doi.org/10.4324/9781003117346

Cui, L. (2010). *The adoption of on-demand learning in organizations in the United States.* Southern Illinois University at Carbondale.

De Sousa Santos, B. (2015). *Epistemologies of the South: Justice against epistemicide.* Routledge.

Díaz-Gibson, J., Whittaker, R., Civís, M., Fagerström, P., Addae-Bohane, A., Kudzi, A., Lerena, M., & Jelenjev, L. (2023). *Learning ecosystems trilogy: Weaving our relational capacity for flourishing futures. Report 1: An evolutionary framework for flourishing learning ecosystems.* http://hdl.handle.net/20.500.14342/3599

Dubazana, Y. (2025). Equity-driven curriculum design: Blended learning for inclusive education in the global south. In *Enablers, barriers, and challenges for inclusive curriculum* (pp. 227–250). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3373-1000-8.ch010

Eyraud, B., Béal, A., Bruno, C., Miranda, I., Lemard, V., & Lequien, J. (2023). Epistemic injustice and recognition of knowledge. *Swiss Journal of Sociocultural Anthropology/revue Suisse D'anthropologie Social Et Culturelle, 28*(2), 105–126.

Farisani, T. R. (2022). The impact of social and institutional networks in sustaining South African rural small, medium and micro enterprises during the crisis. *Acta Commercii, 22*(1), 1–14. https://doi.org/10.4102/ac.v22i1.1007

Forkosh-Baruch, A., Voogt, J., & Knezek, G. (2024). Moving forward to new educational realities in the digital era: An international perspective. *Technology, Knowledge and Learning, 29*(4), 1685–1691. https://doi.org/10.1007/s10758-024-09785-8

Fricker, M. (2007). *Epistemic injustice: Power and the ethics of knowing*. Oxford University Press.

Gairola, R. (2021). Lessons on-(the)-line: Blended learning and pedagogy of (the) digitally oppressed. In *Blended learning and the Global South: Virtual exchanges in higher education* (pp. 21–38). Fondazione Università Ca'Foscari Venezia. https://doi.org/10.30687/978-88-6969-529-2/002

Giri, P. C. (2025). Not just content: Piloting on-demand learning through participant-centered instructional design. *NPRC Journal of Multidisciplinary Research, 2*(6), 75–88. https://doi.org/10.3126/nprcjmr.v2i6.80845

Gurumurthy, A., Chami, N., & Alemany, C. (2019). Gender equality in the digital economy: Emerging issues. *Feminist Digital Justice Issue Paper*, *1*. https://ssrn.com/abstract=3872572

Hafkin, N. J. (2006). *Cinderella or cyberella? Empowering women in the knowledge society.* Kumarian Press.

Hamburg, I. (2011). Instant learning on demand and communities. *Problems of Education in the 21st Century*, *28*(1), 33–41.

Hang, N. T. (2021). Educating and training labor force under Covid 19: Impacts to meet market demand in Vietnam during globalization and integration era. *JETT, 12*(1), 179–184.

Imran, M., & Almusharraf, N. (2024). Digital learning demand and applicability of quality 4.0 for future education: A systematic review. *International Journal of Engineering Pedagogy*, *14*(4). https://doi.org/10.3991/ijep.v14i4.48847

Jackson, N. (2012). *Exploring learning ecologies.* Lulu.com.

Joynes, C., Rossignoli, S., & Amonoo-Kuofi, E. F. (2019). *21st Century Skills: Evidence of issues in definition, demand and delivery for development contexts.*

Kayyali, M. (2024). Digital literacy in higher education: Preparing students for the workforce of the future. *International Journal of Information Science and Computing*, *11*(1), 53–73. https://doi.org/10.30954/2348-7437.1.2024.6

Latour, B. (2005). Reassembling the social: An introduction to actor-network-theory. *Oxford University Press.* https://doi.org/10.1093/oso/9780199256044.001.0001

Mays, T. (2022). Challenges and opportunities for open, distance, and digital education in the Global South. In *Handbook of open, distance and digital education* (pp. 1–16). Springer Singapore. https://doi.org/10.1007/978-981-19-0351-9_20-1

Means, A. J. (2018). Platform learning and on-demand labor: Sociotechnical projections on the future of education and work. *Learning, Media and Technology, 43*(3), 326–338. https://doi.org/10.1080/17439884.2018.1504792

Megahed, N., Yakout, S., Darwish, T., & Wahba, K. (2021). Learning trends, strategies and considerations: An evaluation of the hyprid E-learning practice at the regional it institute using demand-driven learning model. *International Journal of Internet Education, 20*(2), 10–41.

Mignolo, W. (2011). The darker side of western modernity: Global futures, decolonial options. *Duke University Press.* https://doi.org/10.2307/j.ctv125jqbw

Munda, S. W. (2024). Demand driven university education provision: Implication for equity and quality. *International Journal of Education and Social Science Research, 7*(03), 65–81.

Neiman, A. M. (1986). Education, power, and the authority of knowledge. *Teachers College Record: THe Voice of Scholarship in Education, 88*(1), 64–80. https://doi.org/10.1177/016146818608800105

Omotoso, S. (2026). *Closing the digital divide: Strategies for building human rights literacy through mobile technology in the global south.* Retrieved February 22, 2026, from pdf.

Pinto, R., Perez, A. L., Gonçalves, G., Lampón, J. F., & Pérez-Moure, H. (2025). A proposed educational framework for professional upskilling in smart manufacturing: On-demand microlearning units. *Procedia Computer Science, 253*, 2039–2048. https://doi.org/10.1016/j.procs.2025.01.265

Shaheen, S. A., Cohen, A. P., Broader, J., Davis, R., Brown, L., Neelakantan, R., & Gopalakrishna, D. (2020). *Mobility on demand planning and implementation: Current practices, innovations, and emerging mobility futures.*

Srivastava, M., & Jena, S. S. (2015). Recognition of Prior Learning (RPL) and Skill Deficit: The Role of Open Distance Learning (ODL). *Journal of Learning for Development, 2*(1), Article n1.

Tabo, G. O. (2020). *Designing infrastructures for learning: Technology and human praxis.* Aalborg Universitetsforlag.

Trondsen, E., & Vickery, K. (1997). Learning on demand. *Journal of Knowledge Management, 1*(3), 169–180. https://doi.org/10.1108/13673279710800718

Visvanathan, S. (2009). The search for cognitive justice. *Centre for the Study of Developing Societies* (pp. 1–10). http://www.india-seminar.com/2009/597/597_shiv_visvanathan.htm

Wark, N., & Ally, M. (2019). A paradigm shift in ODL: From disengaged students to transformative learners and leaders. https://Wcol2019.Ie, 1026.

Yang, F., Wang, M., Shen, R., & Han, P. (2007). Community-organizing agent: An artificial intelligence system for building learning communities among large numbers of learners. *Computers & Education, 49*(2), 131–147. https://doi.org/10.1016/j.compedu.2005.04.019

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Part II
Technologies and Practices

AI, Mobile Platforms, Micro-credentialing, Modular Pathways, and Institutional Readiness

Chapter 5
From Heat to Headset: Virtual Firefighting and the Lived Body in Training



Charlott Sellberg and Martin Viktorelius

Abstract This chapter critically examines virtual reality (VR)-based firefighting training through an embodied perspective on professional learning, situating current developments within broader shifts toward technology-mediated on-demand training. Drawing on a series of video-based ethnographic studies of fireground training, we argue that while VR is commonly promoted as scalable, efficient, and safe, the bodily, sensory, material, and collaborative dimensions through which firefighting skills are developed remain underexamined in current research on VR training. Our analysis foregrounds how professional competence emerges through embodied coordination, sensory attunement to heat, smoke, and spatial conditions, and sustained collaborative interaction, processes that current VR systems only partially support. We show that meaningful training in safety–critical domains depends on engaging with the corporeal and multisensory realities of professional practice and offer a situated critique of technical solutionism alongside a call for phenomenological as well as practice-based approaches to the study and design of embodied skill development in firefighting VR.

Keywords Virtual Reality (VR) · Firefighting · Embodied learning · Professional competence

5.1 Introduction

Virtual reality (VR) technology creates environments that combine visual, auditory, and motor feedback, drawing users' attention away from the physical world and fostering a sense of presence through head-mounted, fully enclosing systems (Paulsen, 2026). Since consumer-grade systems became widely available in the

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mid-2010s, research on this medium has expanded rapidly across fields such as computer science, engineering, neuroscience, and psychology, with particular attention to embodied sensation and immersive experience (Palmquist et al., 2025). In the literature, immersion refers to the system's ability to engage the senses through integrated sensory feedback, creating a sense of being present in the virtual environment (Makransky & Petersen, 2021; Voşki et al., 2025). A closely related, and partially overlapping, concept is embodiment. In VR literature, embodiment captures the perception of inhabiting and controlling a virtual body, encompassing self-location, the sense of being spatially situated in the environment; agency, the feeling of initiating and controlling actions; and body ownership, i.e., the perception that the virtual body is one's own (Kilteni et al., 2012; Palmquist et al., 2025; Petersen et al., 2022). Together, immersion and embodiment are seen as integral in shaping how users perceive and respond to VR, with immersion providing the sensory framework and embodiment grounding users in a body that they experience as their own. While immersion and embodiment in a virtual world can create a sense of escapism (Haj-Bolouri, 2023) and awe (Voşki et al., 2025), or invoke feelings of empathy (Zahiu et al., 2023), it is less clear how such notions contribute to research on embodied professional learning, particularly in relation to the development of skilled, coordinated, and situationally responsive practice.

In contrast to an instrumental and technologized understanding of embodiment, the notion of embodied professional learning, as developed in contemporary educational and organizational science, offers a much richer conceptualization of what it means to be a learning person (Gherardi, 2025; Green & Hopwood, 2015; Loftus & Kinsella, 2021). It emphasises professional knowing as enacted through bodily and intercorporeal participation in situated sociomaterial practice. Learning is understood as taking place through movement, perception, affect, rhythm, and sensory engagement with people, tools, spaces, and tasks. From this perspective, professional knowledge is formed through habituated ways of seeing, interacting, and responding, sedimented in the body over time, often through repeated, improvised, and tacit bodily engagement with complex situations, rather than through momentary experiences generated by technological fidelity. The body is not treated merely as a perceptual vehicle, substitutable by just any digital perspective, but as a "vehicle of being" (Dall'Alba, 2009), a bearer of habitus, practical judgment, and affective attunement, inextricably entangled with the material world in socially organized, normatively saturated practice (Dall'Alba et al., 2018). The ontological entwinement of the subject-object relation is most clearly expressed in what Dall'Alba and Sandberg (2014), drawing on the phenomenological tradition, call a lifeworld perspective on professional learning, emphasizing that learning, as any other aspect of our being-in-the-world, is always already entwined with others and things.

Across both marketing materials and academic discussions, firefighting training in VR is frequently presented as efficient, scalable, and safe (e.g., Engelbrecht et al., 2019; Markopoulos & Luimula, 2020; Wheeler et al., 2024), arguments that align closely with an on-demand learning logic. On-demand learning emphasizes accessibility and immediacy, allowing learners to engage with skills and knowledge precisely when needed, often independently of traditional temporal, spatial, or institutional

constraints (Calzada, 2024). Supported by mobile learning environments, micro-credentials, and adaptive digital ecosystems, on-demand learning becomes modular, personalized, and closely tied to employability and lifelong adaptability (Ahsan et al., 2023; Hooi et al., 2025). In this sense, VR training for firefighters can be understood as part of a wider educational shift toward just-in-time, skill-oriented, and learner-driven training, where access, efficiency, and measurable competence are prioritized. While these features promise flexibility and efficiency, they also raise important questions about the limits of technologically mediated and self-directed skill acquisition, highlighting a tension between the just-in-time logic of on-demand learning and the deeply embodied, sensory demands of professional competence. This chapter critically examines this tension by approaching VR-based firefighting training through an embodied perspective on professional learning. By placing contemporary discussions of VR-based training in dialogue with ethnographic insights from fireground exercises, the chapter explores what may be gained, transformed, or lost when training is reconfigured through VR.

5.2 Background

This section provides a brief philosophical and theoretical backdrop of embodiment in professional learning and an empirical background on VR training. We begin by tracing how contemporary accounts of embodied professional learning emerge from critiques of Cartesian dualism and post-Cartesian epistemologies. We then outline how phenomenology and practice-based theories offer perspectives on embodiment, situating knowledge and learning in the embodied, socially organized, and materially mediated practices of professionals (Sect. 2.1). Building on these conceptual foundations, we engage in a critical reading of literature reviews on embodiment in VR-based training, highlighting how conventional approaches to VR research regularly reduce the body to a medium of sensory input or a site of measurement (Sect. 2.2). Finally, we consider phenomenological studies on embodiment in VR (Sect. 2.3) and practice-based studies of VR training (Sect. 2.4).

5.2.1 Phenomenological and Post-Humanist Perspectives in Practice-Based Theories of Embodied Learning

Contemporary accounts of embodied professional learning often emerge from a critique of epistemological traditions that conceive knowledge as a representational relation between a knowing subject and the external world (Green & Hopwood, 2015; Dall'Alba & Sandberg, 2014; Strati, 2007). Within Cartesian and post-Cartesian

thought, the body is largely treated as a mechanical interface for cognition, a perspective that Damasio (1994) critically challenges. Phenomenology marks a reorientation of philosophy by grounding questions of knowledge in an analysis of *being*, rather than treating epistemology as an abstract, foundational problem detached from lived experience. In Husserl's work, the introduction of the concept of the *lifeworld* (Lebenswelt) signals a move to treat the lived, embodied experience as the ground of all meaning and knowledge (Husserl, 1989). The lifeworld is not private or subjective in a psychological sense; it is intersubjective, historical, and normatively structured, and indeed, learned since knowledge is always already embedded in a world of practical concerns, shared orientations, and bodily engagement.

These thoughts were further explored by Heidegger, who replaces the subject-object relation with the concept of *being-in-the-world*, conceiving understanding as a mode of existence, captured in the notion of *Dasein* (Heidegger, 2005). For Heidegger, tools, bodies, and environments form a relational whole in which meaning is disclosed through use rather than through representation. From this perspective, professional knowing is not primarily reflective or propositional but enacted through skilful coping in concrete situations. Learning, correspondingly, involves transformations in how the world is encountered as meaningful and actionable. Merleau-Ponty further explored this ontological perspective by placing the lived body at the centre of perception and understanding, arguing that the body is not an object in the world but the subject of perception, the means through which the world is experienced (Merleau-Ponty, 1962). His account of *habit* is particularly significant for theories of professional learning. For professional learning, habits are embodied ways of inhabiting the world, habits through which 'sensible knowledge' (Strati, 2007), perception, attention, and action become progressively *attuned* to the relevant features of situations (Ingold). Learning, in this sense, can be understood as a process of accommodation, whereby repeated bodily engagement reorganizes one's practical orientation toward the world.

While phenomenology offers a powerful account of how professional perception and understanding are grounded in embodied engagement with a cultivated lifeworld, practice-based studies extend this perspective by analysing how such embodied ways of sensing and acting are socially organized, coordinated, and sustained within professional practices (Hopwood, 2016; Sandberg & Tsoukas, 2011; Willems, 2018; Yakhlef, 2010). Drawing on the practice turn in social theory, and the influential work of Merleau-Ponty, Bourdieu and Schatzki among others, these studies show how professional knowing is both enacted by individual bodies and minds and shaped by the social, material, and normative organization of practice. Bourdieu's notion of *habitus* illuminates how dispositions, perceptual sensitivities, and practical judgement are formed through repeated engagement in historically and socially structured practices, enabling practitioners to navigate complex situations with skill and attunement (Bourdieu, 1990). Schatzki (2002) highlights how social, material, and normative arrangements coordinate action, structure attention, and shape what counts as competent performance within a practice.

Gherardi (2025), among other researchers such as Barad (2007), Fenwick (2010) and Orlikowski (2007), articulates a post-humanist perspective emphasizing the role

of materiality in embodied agency and learning. By de-centring the human being as the sole seat of agency and conceptualizing the human as "always and already in a process of becoming-with other nonhumans and more-than-humans" (Gherardi, 2025 p. 56), the inherent relationality of the lived body is made visible. Embodied professional knowing, therefore, is always enacted in situated activity, intelligible and actionable only through participation in historically developed, socially organized practices. From this perspective, learning involves a process of becoming, a transformation in embodied dispositions, perception, and judgement, as practitioners take up, reproduce, and gradually reshape the shared ways of doing, feeling and perceiving that define a profession (Dall'Alba, 2009; Dall'Alba et al., 2018; Loftus & Kinsella, 2021). This conceptualization contrasts, as seen in the next section, with mainstream research on VR-based training, research that we see adopting the logic of on-demand learning and the emphasis on immediacy, modularity, and accessibility that draws on the assumption that competencies can be acquired just-in-time and easily transferred between contexts if the training context is "realistic", detaching embodied professional learning from the social, material and corporal conditions in which professional expertise traditionally develops.

5.2.2 Notions of Embodiment in the Literature on Firefighting Training in VR

Literature reviews on firefighting training in VR show that embodiment is frequently treated as a general experiential quality associated with immersion, presence, and realism. Wheeler et al.'s (2021) systematic review of immersive VR firefighter training makes this pattern explicit. Among the six studies that meet basic human-factors criteria, embodiment is largely subsumed under broader constructs such as presence, user experience, and stress induction. While physical elements such as gear or stressors are sometimes included, these are rarely examined in terms of how they shape firefighters' sensing, bodily coordination, or material engagement during action. As a result, embodiment functions primarily as an assumed benefit of immersion rather than as an analytic object in its own right (Wheeler et al., 2021).

This tendency to generalize embodiment is also evident in how bodily experience is operationalized across studies. Rather than examining how professional judgment emerges through specific bodily orientations, postures, and tactile engagements, most studies emphasize whether immersive systems succeed in generating convincing sensory impressions. Wheeler et al. (2021) note that evaluations focus on whether VR feels realistic, enjoyable, or stressful, leaving unexamined how trainees learn to act within the constraints of virtual environments. Some reviews advance a more articulated conception of embodiment by linking it to action and sensorimotor engagement, yet still stop short of a situated account. For example, Abish et al.'s (2021) review of 20 VR training studies foregrounds psychomotor skills, spatial reasoning, and interaction with manipulable virtual objects as central mechanisms

of learning. Here, embodiment is tied to trainees' ability to enact movements that resemble real-world tasks and to participate actively through gesture-based interaction rather than passive observation (Abish et al., 2021). The review emphasizes VR's multimodal characteristics and frames learning as emerging from bodily engagement with three-dimensional representations. Moreover, embodiment is primarily conceptualized as an individual capability supported by technological affordances, with limited attention to how movements are socially organized, normatively oriented, or shaped by professional practices and situational demands.

A further step toward formalizing embodiment is found in research that treats it as an objectively measurable phenomenon. Halbig and Latoschik's (2021) systematic review of 1,119 studies on physiological sensing in VR centres on Illusions of Virtual Body Ownership, where users experience avatars as their own bodies. Embodiment is operationalized through physiological indicators such as skin conductance, heart rate, EEG activity, and respiration synchronization, which are used to measure presence, threat responses, and sensorimotor adaptation (Halbig & Latoschik, 2021). While this approach extends embodiment beyond subjective reports, it frames bodily experience as a set of internal states that can be quantified and optimized. In doing so, embodiment is detached from the practical, interactional contexts in which professional skills are enacted and assessed. Such techno-functionalist conceptions of embodiment are particularly evident in reviews focused on firefighter training. Hancko et al. (2025), in a review of 38 studies, describe immersive technologies as providing realistic visual, auditory, and haptic feedback in safe, controllable environments. Embodiment is primarily discussed in terms of interface realism, simulated hose recoil, thermal cues, or biometric monitoring, and is valued insofar as it supports cognitive and procedural outcomes such as hazard recognition and situational awareness (Hancko et al., 2025). In this framing, the body appears mainly as a receiver of sensory input or as an object of measurement, rather than as an active, situated participant in fireground work. Embodiment is thus instrumentalized, serving performance metrics and system validation rather than providing insight into how bodily knowing is developed in practice.

Taken together, these literature reviews reveal a dominant pattern in the research on VR for firefighting training, where embodiment is conceptualized as immersion, sensorimotor activation, or physiological response, qualities that can be designed, measured, and optimized within technological systems. In philosophical terms, this aligns with a Cartesian or post-Cartesian epistemology, treating the body primarily as a conduit for information or as an object of measurement rather than as an active, situated participant in meaning-making activities. While such approaches acknowledge the importance of bodily engagement, they largely abstract embodiment from the social and material conditions of developing professional competence. In doing so, they align with an on-demand logic in which learning is treated as an outcome that can be elicited through technologically produced conditions, reflecting an instrumental view of learning where pedagogical work is displaced by technological optimization (Selwyn, 2021).

5.2.3 *Toward a Relational Epistemology of the Phenomenology of VR*

Phenomenology is increasingly used in research to conceptualize digital and virtual environments, yet it has given rise to divergent interpretations of the kind of reality these environments constitute (Erofeeva, 2025). According to Erofeeva (2025), some scholars argue that virtual environments constitute distinct realms of experience, which can be understood as finite provinces of meaning. From this perspective, digital spaces are not merely technologically mediated extensions of everyday life but are structured by their own cognitive styles, modes of attention, and experiential logics, setting them apart from the ordinary life-world. Others, however, resist treating digital environments as separate realities, arguing that online interactions remain anchored in everyday social life, even as technologies reshape the conditions of perception, co-presence, and interaction, fundamentally transforming the basic structures of experience (Erofeeva, 2025). Firefighting in VR highlights the tension between extension and transformation, as the diversity of training scenarios it affords cannot be reduced to a single, uniform experience. Importantly, the perception and interpretation of a fire are inseparable from the practices in which participants are engaged. A novice and an experienced professional enact different patterns of action, attend to different cues, and recognize different hazards because their engagement is shaped by prior participation in, and familiarity with, the organized practices of firefighting. What counts as a meaningful sign of danger, how it is interpreted, and which responses are deemed possible or appropriate are thus not purely individual judgments but emerge from the participant's situated involvement in these socially and materially organized practices.

Phenomenology offers a lens for understanding these experiences, particularly the embodied ways in which participants engage with VR. By engaging, and to some extent deceiving, the senses in realistic and plausible ways, VR prompts the mind–body system to recalibrate habitual cognitive and bodily coordinates without fundamentally distorting them (Cantone, 2023; Haj-Bolouri, 2024). From a phenomenological perspective, the effectiveness of VR simulations lies not in sensory fidelity, but in their ability to support meaningful, effortful action as experienced from the first-person perspective. The virtual environment is not merely observed; it is inhabited and enacted. Presence arises when participants commit to the space as meaningful for action, and immersion is sustained when attention to the real world passively recedes, emerging from curiosity, interest, and alignment of perception and action at the level of the lived body (Haj-Bolouri, 2024).

Central to these experiences is the visual modality, which dominates the establishment of presence in VR (Cantone, 2023; Kelly et al., 2023). In his study on firefighting training among professionals in the railway sector, Haj-Bolouri (2024) shows that participants' experiences of authenticity in firefighting VR are closely tied to the coordination and enactment of sensory information. Visual cues, such as smoke density, colour shifts, and the dynamic spread of flames, enable detection of emerging hazards and assessment of proximity, intensity, and risk. Auditory cues,

including variations in fire sounds, wind effects, and alarms, complement vision and support ongoing attunement to the evolving situation. Even when other sensory modalities, such as smell or heat, are absent, participants rely on the interplay of available cues to orient their actions in ways that reflect their embodied knowledge and familiarity with firefighting practices. Importantly, the authenticity of the VR experience does not reside in the presence of multiple sensory channels but emerges from context-sensitive integration of cues that make the scenario intelligible and actionable within ongoing practices (Haj-Bolouri, 2024). Participants' ability to act freely and intentionally within this visually anchored space further strengthens presence, as interaction becomes transparent rather than mediated.

However, Haj-Bolouri (2024) emphasizes how immersion in VR is fragile and can be disrupted when technological mediation becomes salient, interrupting the alignment of perception, action, and attentional focus. His concept of *immersed flesh* offers a phenomenological lens for understanding this fragility by framing immersion as a dynamic, relational process of embodied engagement (Haj-Bolouri, 2025). In particular, the notion aims to highlight the lived, first-person experience of the body as it negotiates the interplay between physical, virtual, and intersubjective worlds, showing how moments of disruption reveal the delicate coordination through which immersive experiences are sustained.

5.2.4 Practice-Based Perspectives of VR Training

While phenomenological explorations on VR emphasize the first-person experience of embodiment in VR, they also point to the inherently relational and situated nature of immersion and presence. Studies that take on practice-based perspectives build on such insights but shift the focus from individual experience to collaborative, socially organized processes, showing that embodiment in immersive virtual reality is achieved through participants' coordinated use of talk, gesture, bodily orientation, and mediational tools (Paulsen et al., 2024). This shifts analytical attention away from immersion, presence, and performance metrics toward what participants actually do in and around VR environments, including how activities are designed, how environments structure participation, and how collaborative practices are sustained and negotiated. As a result, Paulsen et al. (2024) conclude that collaborative learning in virtual reality affords a combined space for practice and reflection, in which learning is experienced as engaging while remaining detached from the risks of actual professional practice. Meanwhile, Paulsen et al. (2024) note that current designs continue to struggle with usability, realism, and the facilitation of social interaction. On this basis, Paulsen et al. (2024) call for studies that examine what unfolds within immersive environments themselves, rather than relying on post-hoc evaluations or abstract claims about learning outcomes, thereby opening up possibilities for situated analyses of embodied and collaborative professional learning.

Taking on such an approach, Kohonen-Aho and Haddington (2023) conducted detailed analyses of video-recorded interaction in VR settings, combining recordings

of participants' bodily conduct, screen activity, and talk to trace how coordination is achieved and disrupted across physical and virtual domains. Their analysis shows that participants do not experience the virtual environment as a fully coherent extension of their bodies but instead orient simultaneously to their physical bodies, the virtual avatar, and the surrounding material and social environment. This *dual embodiment* produces situations in which attention, action, and accountability are distributed across physical and virtual domains, requiring participants to continuously manage mismatches between what is seen, felt, and made relevant in interaction (Kohonen-Aho & Haddington, 2023). Similar patterns are identified in studies of collaborative 360-degree VR in teachers' professional development. Paulsen and Davidsen (2025) show how participants immersed in shared 360-degree VR environments orient across multiple domains, including the recorded activity, each other's embodied and verbal conduct, and the technological tools mediating the interaction.

Moreover, these studies show that co-ordination in immersive settings is not given but a continuous interactional accomplishment, seen through practices such as pausing and replaying the video, pointing, bodily reorientation, and talk (Kohonen-Aho & Haddington, 2023; Paulsen & Davidesen, 2025). Through these practices, participants establish joint attention and make particular moments and actions relevant for collective scrutiny. At the same time, Kohonen-Aho and Haddington (2023) demonstrate that such co-ordination is inherently fragile, as participants must manage ongoing mismatches between physical and virtual domains. These mismatches surface as communication and co-ordination problems that break the immersion, including delayed responses, misaligned gestures, ambiguous orientations, or breakdowns in shared reference. Rather than constituting mere technical failures, such troubles become sites of interactional work, as participants actively repair them in situ. It is through this ongoing work of managing and repairing co-ordination that embodiment in VR emerges as contingent and negotiated, rather than relying on immersion or realism.

Furthermore, Paulsen and Davidsen (2025) show that moments in which the flow of the recorded activity is suspended, for example, in response to emerging ambiguities or competing interpretations, should not be understood as threats to learning. Instead, these moments create shared reflective spaces in which participants collaboratively examine how actions are accomplished and why they matter within the broader activity. This finding aligns with research on other forms of simulation-based training, which similarly demonstrates how interruptions, pauses, and shifts in activity can function as productive moments for reflection, coordination, and sense-making rather than as disruptions to learning (Hindmarsh et al., 2014; Rystedt & Sjöblom, 2012; Sellberg & Solberg, 2024). In this sense, disruptions, hesitations, and shifts in orientation emerge as central resources for collaborative sense-making and embodied professional learning across a range of simulated environments. Hence, learning outcomes are not determined by the medium itself, but through the ways instructional methods leverage the unique potential of VR, such as high levels of engagement and agency amongst trainees (Condrad et al., 2024; Makransky & Petersen, 2021). Serving as an illustrative empirical contrast to the predominant conception of embodiment found in the VR literature, the next section describes

our case study of firefighting training demonstrating the relational, intercorporal and material nature of embodied learning.

5.3 An Ethnography of Maritime Firefighting Training

The empirical material was collected during ethnographic fieldwork conducted in the autumn of 2020 at two maritime universities offering basic safety training and refresher courses for maritime personnel. Before data collection, all participants were informed about the study in line with the ethical standards outlined by the Swedish Research Council, including information about how the data would be used, handled, and stored, as well as the right to withdraw at any time without consequences (Vetenskapsrådet, 2017). Participation in the study was voluntary, and written informed consent was obtained from all participants. This chapter focuses on the live-fire and smoke-diving exercises in these courses, which constitute a core component of safety training in the maritime domain. The data corpus comprises three firefighting courses conducted across the two sites, covering six days of training, involving 57 students and 15 instructors. All courses followed a similar pedagogical structure, combining instructor-led briefings, hands-on exercises, and subsequent debriefings. The exercises involved navigating confined and low-visibility environments, handling hoses and breathing apparatus, and coordinating team-based actions in response to simulated fire scenarios.

To capture the embodied and mobile character of the exercises, the study was designed as a *mobile video ethnography.* This approach enabled us to follow participants in motion and document activities as they unfold across space, materials, and bodies (Brown & Lackova, 2020). To capture the exercises, GoPro™ cameras were mounted on the helmets or chests of both students and instructors, providing first-person video traces of participants' movements, sensory orientations, and interactions within specific contextual and affective configurations (Sumartojo & Pink, 2017). In addition, the exercises were filmed from a distance using handheld smartphones in a "go-along" manner (Vannini, 2017). The combination of body-mounted and external perspectives made it analytically possible to relate participants' actions to the broader organization of the exercise, including instructor interventions, spatial arrangements, and the progression of the scenario. To complement the video data, semi-structured interviews were conducted with seven instructors, and five focus group interviews were conducted with 40 students who had participated in basic safety training. The interviews addressed participants' experiences of the exercises, their understandings of instructional aims, and their reflections on bodily demands, coordination, and realism in training.

The analysis proceeded iteratively across several stages, combining thematic analysis with fine-grained video-based interaction analysis (Derry et al., 2010). Rather than following a strictly linear sequence, the process involved moving back and forth between close examination of specific moments and broader comparisons across the

data corpus. Initially, the full data corpus was reviewed to establish an overall understanding of the structure, sequencing, and pedagogical intentions of the firefighting exercises. This involved examining how the exercises were described in formal course documentation and instructor briefings, as well as how they were enacted in practice. From this broader mapping, analytically interesting episodes were selected for closer analysis. These typically involved moments where instructors explicitly directed participants' attention to embodied dimensions of training. These episodes were then transcribed in detail using multimodal transcription conventions, capturing verbal interaction as well as gesture, posture, movement, gaze, orientation to equipment, and engagement with the material environment. Particular attention was given to the sequential unfolding of instruction: what occasioned instructions, how bodily action was observed, attended to, and topicalized, and how sensory distinctions were socially organized and discussed during training (Heath et al., 2010). Following this detailed analysis, the focus shifted again to compare similar instances across the wider data corpus to identify collections of recurring practices and to identify the pedagogical methods through which firefighting was taught across exercises.

5.4 Empirical Findings

In contrast to how embodiment is often depicted in commercial and academic circles debating VR, that is, as a result of technical immersion, our ethnographic study focusing on multimodal interaction during onboard firefighting training of maritime students, illustrates how embodied professional learning is dependent on a broader set of sociomaterial and bodily activities and interactions, performed by both students and instructors. These bodily interactions cannot easily be transferred to a virtual, technologically designed world, but require an openness and responsiveness to the material, social, and sensory contingencies emerging in the training context. Below, we describe five contingencies structuring the learning of master mariner students in firefighting exercises: exploring the limitations of one's own capabilities (Sect. 4.1), relational dynamics and bodily co-ordination with others (Sect. 4.2), exploring material affordances and physical properties (Sect. 4.3), from sensory experiences to cultivated sensing (Sect. 4.4), and learning through embodied reflection (Sect. 4.5) encountered during our fieldwork at maritime training centres.

5.4.1 Exploring the Limitations of One's Own Capabilities

One of the core learning objectives in this type of training is for students to explore the body's limitations and to understand how physiological strain shapes human performance. This includes how stress affects perception and decision-making, how exhaustion influences reaction and coordination, and how oxygen deprivation impacts cognition and motor skills. During training, particular attention is given to

bodily signals as an early warning system, alongside a pedagogical emphasis on techniques for managing stress, fatigue, and reduced oxygen levels. These themes are explored through physically demanding activities such as navigating dark and confined spaces, operating with protective equipment like breathing apparatuses, and dragging rescue mannequins representing unconscious casualties to safety. Importantly, instructors do not treat bodily experience as uniformly relevant throughout these activities. Instead, they deliberately direct students' attention toward or away from their appearing corporal field depending on the situation, through three recurring instructional orientations (Viktorelius & Sellberg, 2022).

In certain situations, instructors foreground the lived body in order to help students cope with distress. This typically occurs in situations of overload, where bodily reactions such as panic, exhaustion, or dizziness interfere with participation. By directing attention inward, toward one's breathing, posture, or bodily sensations, instructors support students in regulating their bodily responses to stress, regaining control, and re-entering the activity. In these situations, the body is treated as something that must be acknowledged and controlled before effective action can resume. At other times, instructors background the lived body to enable outward-directed, task-focused action. In these situations, explicit attention to discomfort, fear, or fatigue would risk disrupting performance. Instead, instructors orient students toward external objects, procedures, or coordinated actions, deliberately setting bodily sensations aside in order to sustain momentum and continue the task. The instructors' deliberate foregrounding and backgrounding of bodily experience reflects the core insight of contemporary theories of embodied professional learning: that perception, attention, and judgement are enacted through the lived body within a socially and materially structured practice (Dall'Alba, 2009; Loftus & Kinsella, 2021). Learning to handle fire emergencies at sea, therefore, involves cultivating the capacity to respond skilfully and adaptively to situations of intense distress, integrating physiological signals, task demands, and collective expectations into embodied ways of feeling and coping within professional activity.

5.4.2 Relational Dynamics and Bodily Coordination with Others

A further instructional emphasis concerned the understanding of survival as a collective rather than an individual accomplishment. During training, instructors repeatedly directed students to actively enact coordination with their teammates, such that learning emerged through the joint organization of bodily action under extreme conditions. This became particularly evident in exercises involving the evacuation of a mannequin (representing an unconscious casualty from a burning building), where students were exposed to intense heat, smoke, and the physical strain of carrying a heavy body. In one such episode, a student became overwhelmed by fatigue and

communicated that she could no longer continue. Rather than treating this as an individual failure, the instructor redirected the remaining team members to redistribute the load and adjust their coordination.

This moment illustrates how learning did not reside solely in executing procedures or completing tasks, but in the *relational dynamics* of bodily experience. As one student's strain became visible and communicable, the instructor's guidance and the team's adaptive coordination together shaped what students learned about their own bodily limits and the interdependence of action under stress. In this way, instructors invited students to orient not only to their own bodily sensations, but also to the embodied experiences of others. By encouraging students to anticipate and respond to how strain, fatigue, or disorientation might be experienced by others, instructors demonstrated and cultivated a form of professional seeing in which bodily awareness can be distributed across the team. Through this instructional orientation, physiological strain became a shared concern rather than a private experience. Students learned not only how stress, fatigue, and oxygen deprivation affect perception, decision-making, and motor coordination, but also how to attune to the bodily cues of others and adjust collective action accordingly. The body thus functioned as a relational and social reference point, embedded in the coordinated actions of the team (Viktorelius & Sellberg, 2026).

5.4.3 *Exploring Material Affordances and Physical Properties*

During training, students' learning is inseparable from their engagement with the material world. Their interactions with firefighting equipment (hoses, nozzles, air bottles), protective gear (breathing apparatuses, thermal protective clothing), objects (mannequins, tables, ladders), and features of the physical environment (walls, floors) actively shape how coordinated actions unfold. It was the material affordances and physical properties of these entities, the deliberate push and pull of the hose to communicate direction and pace, the heaviness of a mannequin when lifted and dragged toward the exit, or the sudden obstruction of a wall hidden in the darkness, that made the situation meaningful for learning. Through engaging with these materials and adapting their bodily responses, students developed embodied experiences that are inseparable from the physical properties of the equipment, objects, and space (Viktorelius & Sellberg, 2022). Moreover, by observing how students navigated these material challenges, instructors could assess their ability to handle the situation and provide corrective guidance, supporting both the development of individual skills and the coordination of team action. In this way, learning was both social and material: students learned to act with and alongside others while attuning to the constraints and affordances of the environment, integrating relational and bodily knowledge into their professional practice.

5.4.4 From Sensory Experiences to Cultivated Sensing

Sensory engagement plays a central role in firefighting training, as the conditions encountered in a room, particularly temperature, determine which firefighting techniques are appropriate for a given situation. Experiences of the sensoriality of firefighting and the role of professional touch emerged as key aspects of training, both as contexts for training and as topics of instruction (Sellberg & Viktorelius, 2026). For instance, students were instructed to remove their gloves and reach above their heads while kneeling at the entrance of a room, using their hands to feel the temperature and assess conditions. Another example highlighting the importance of sensory experience occurred during search-and-rescue exercises conducted in complete darkness. In these exercises, students navigated the space by keeping low, spreading out, and maintaining one hand on the wall to maximize their search field and stay oriented. In these searches, the students used their hands and feet to feel walls, floors, and obstacles, forming mental representations of the room's layout and locating the missing person lying on the ground. These practices illustrate how firefighting training cultivates a distinctive mode of *being-in-the world*, characterized by embodied attunement, sensory responsiveness, and action-oriented perception.

In both cases, learning was grounded in first-hand bodily and sensory engagement, allowing students to develop an embodied understanding of firefighting conditions that unfolds through active participation in structured sensory environments. Instructors deliberately cultivated students' perception within a professional lifeworld, guiding them to attend to aspects of the environment that are meaningful within the norms, practices, and expectations of firefighting (Husserl, 1989). Through this pedagogical cultivation, students learned not only to explore heat safely and communicate their sensations to others but also to interpret the environment, anticipate risks, and adjust their actions in ways that reflect shared professional standards. Sensory experience, therefore, was never immediate or purely individual; it was embedded in an intersubjectively shaped and historically situated lifeworld, in which perception, action, and judgment are inseparable. In this way, students moved from raw sensory input to a skilled, professionally attuned mode of sensing fire conditions, illustrating how embodied knowing is cultivated through guided participation, reflection, and socially structured experience (Sellberg & Viktorelius, 2026).

5.4.5 Learning Through Embodied Reflection

During the debriefings that followed exercises, students consistently engaged in reflections that connected their performance in the simulation to real-life shipboard practice. These reflections frequently centred on their lived bodily experiences in extreme environments, providing insight into the concrete physicality of professional tasks, such as the time required to become fully dressed and equipped, the rapid onset of fatigue during intense firefighting, and the necessity of supporting

one another to manage physically demanding work (Viktorelius & Sellberg, 2023). Importantly, reflections were permeated by students' subjectively lived, first-person bodily experiences: they described sensations such as a racing heart, anxiety, the visual perception of darkness, heat from the fire, the strangeness of breathing through a mask, and pain in their knees from crawling. In these narratives, the body was far from absent or transparent in awareness; rather, it was thematized as an object of reflection, bringing pre-reflective embodied experience into explicit consciousness. Following Merleau-Ponty's notion of the body as a "subject-object" (1962), students' reflections regularly articulated the dual character of the body as both biological organism and lived, subjective experience. Importantly, reflections did not merely recount immediate sensations; students compared and contrasted different temporal and subjective perspectives to highlight the difference between imagining an action and performing it. These accounts also illustrated how embodiment and environment are inseparably intertwined: the simulated task shaped students' bodily experiences, while their embodied responses simultaneously structured their perception of the task environment. We also found that the instructors valued such reflections highly, as they allowed students to link practical action to professional understanding, consolidate learning from the exercises, and appreciate the fundamental bodily work required for effective, coordinated firefighting.

5.5 Discussion

Taken together, our findings challenge the assumption that professional practices developed in fireground training can be transferred into virtual environments in a rather straightforward way, assuming that visual resemblance with fireground training is key to learning in VR. In VR, bodily strain is largely simulated rather than lived, which reduces access to corporeal warning signals such as fatigue, breathing resistance, and fine-grained coordination with others. As a result, instructional practices that in fireground training rely on directing attention toward or away from the lived body are transformed, with pedagogical focus shifting toward technological, visual, or representational cues. Similarly, bodily coordination in VR is shaped by forms of dual embodiment, where participants must orient simultaneously to their physical bodies and their virtual avatars (Kohonen-Aho & Haddington, 2023). This can fragment the relational dynamics through which teams learn to attune to one another's bodily signals and adjust collective action under stress. Material interactions are also reconstructed: the weight, inertia, resistance, and gravitational pull of hoses, mannequins, and architectural spaces are largely abstracted, limiting learners' opportunities to extend their pre-reflective coping skills through direct engagement with the material environment.

However, rather than viewing VR as a medium that should reproduce bodily authenticity or immersive fidelity, we approach VR-based firefighting training in

relation to fireground training as a distinct configuration of embodied entanglement. While fireground training organizes sensory experience, movement, interaction, material conditions, and affect into a coherent whole oriented toward action, VR reconfigures these relations in specific ways. Learning, in this sense, does not arise from isolated tasks or representations, but through participation in shared situations in which meaning is constituted through the coordination of bodies, tools, and environments. From this perspective, the limitations of VR-based training are not primarily a matter of insufficient realism, nor immersion, but of how VR reorganizes the conditions under which embodied professional learning becomes possible. Learning in fireground training, as our analysis shows, involves incorporating specific tools and bodily techniques into one's bodily repertoire and expanding bodily responsiveness to unfamiliar and demanding situations. When training is reorganized through VR, what is learned is therefore not simply the "same practice in another format", but a different configuration of embodied entanglement, offering a situation of fundamentally different qualia. Hence, VR does not merely alter the medium of training; it reshapes the experiential conditions through which professional competence is formed, with consequences for how bodies, technologies, and collective action are brought into relation.

This raises critical questions about which dimensions of embodied professional learning VR can meaningfully support, and which aspects of professional competence may be transformed, attenuated, or lost when training is organized around virtual environments. Recognizing these reconfigurations is crucial for the pedagogical use of VR in training firefighting. Rather than treating VR as a substitute for fireground training, the value lies in how it can be positioned in relation to other training modalities. Designing meaningful VR interventions requires careful consideration of which competencies can be developed virtually, which competencies require physical experience of real fireground conditions, and how reflection can be structured to help students understand the specific affordances and limitations of different training situations, as well as how these translate to real fire emergencies. From this standpoint, VR might be understood as a potential pedagogical bridge between classroom-based instruction and fireground exercises. While such integration may not be cost-effective nor easily scalable, VR can provide a safe environment in which novices develop an initial orientation to firefighting procedures, such as task sequencing, communication standards, and decision-making protocols, prior to fireground training (Wijkmark et al., 2022). For experienced professionals, VR can offer a safe immersive space for experimentation, allowing them to explore alternative strategies, test decision-making under atypical or extreme scenarios, and refine their situational awareness without the physical risks of a live fireground (Haj-Bolouri, 2024). Importantly, the pedagogical value of VR should not be reduced to rather brittle perceptions of realism, immersion, or sense of presence in the virtual environment. Previous studies on VR training in practice demonstrate that learning frequently emerges in moments where the flow of activity is suspended, for instance, when ambiguities arise or when participants orient to competing interpretations of the unfolding situation (Kohonen-Aho & Haddington, 2023; Paulsen & Davidsen, 2025). These studies show that such suspensions create shared reflective spaces in

which participants collaboratively examine how actions are accomplished and why they matter within the broader activity. Consequently, VR-based firefighting simulations support learning not only by offering safe conditions for rehearsal and experimentation, but by enabling collective sense-making through moments of hesitation, breakdown, and re-orientation that are integral to embodied professional learning.

Overall, our findings can be understood in relation to a broader on-demand learning discourse, in which digital forms of professional training are framed as efficient, scalable, and readily available when needed, without the need for access to costly training centres. Within this discourse, marketing claims about VR training, emphasizing efficiency, realism, and scalability, are frequently reproduced in scientific publications (e.g., Engelbrecht et al., 2019; Markopoulos & Luimula, 2020; Wheeler et al., 2021). Across empirical studies and reviews, these claims often appear as assumptions about what VR can do rather than questions to be critically examined. Determining whether such claims originated in commercial promotion or were subsequently amplified by the academic literature, however, is difficult, as both domains circulate similar evaluative criteria, such as presence, immersion, and cost-effectiveness. Nevertheless, this convergence has important implications: shaping what is studied, how training effectiveness is assessed, and which aspects of professional practice are rendered visible. In particular, sensory, motoric, and social dimensions of skilled performance, those elements that emerge through bodily interaction and coordination in situ, remain underexamined when both marketing and scientific narratives prioritize the aspects of VR that are easily measurable, scalable, and marketable. Recognizing this overlap allows us to explain empirical gaps in the VR literature as the product of a broader discursive ecosystem in which commercial and scientific logics mutually reinforce one another. The challenge for training providers, researchers, and policymakers is not to take realism, immersion, or efficiency as self-evident indicators of training quality, but to critically examine the assumptions about learning and professional competence that underpin contemporary investments in on-demand, technology-mediated training solutions. For them to be able do so, further research into the phenomenological and interactional aspects of VR is needed.

References

Abich, J., IV., Parker, J., Murphy, J. S., & Eudy, M. (2021). A review of the evidence for training effectiveness with virtual reality technology. *Virtual Reality, 25*(4), 919–933.

Ahsan, K., Akbar, S., Kam, B., & Abdulrahman, M. D. A. (2023). Implementation of micro-credentials in higher education: A systematic literature review. *Education and Information Technologies, 28*(10), 13505–13540.

Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.* Duke University Press.

Bourdieu, P. (1990). *The logic of practice.* Polity.

Brown, K. M., & Lackova, P. (2020). Wearable cameras: From adventure filmmaking to adventurous researching. In P. Vannini (Ed.), *The Routledge international handbook of ethnographic film and video.* Routledge.

Calzada, I. (2024). Artificial intelligence for social innovation: Beyond the noise of algorithms and datafication. *Sustainability, 16*(19), 8638.

Cantone, D. (2023). The simulated body: A preliminary investigation into the relationship between neuroscientific studies, phenomenology and virtual reality. *Foundations of Science, 28*(4), 1011–1020.

Conrad, M., Kablitz, D., & Schumann, S. (2024). Learning effectiveness of immersive virtual reality in education and training: A systematic review of findings. *Computers & Education: X Reality, 4*, Article 100053.

Dall'Alba, G. (2009). Learning professional ways of being: Ambiguities of becoming. *Educational Philosophy and Theory, 41*(1), 34–45.

Dall'Alba, G., & Sandberg, J. (2014). A phenomenological perspective on researching work and learning. In S. Billett, C. Harteis, & H. Gruber (Eds.), *International handbook of research in professional and practice-based learning* (pp. 279–304). Springer.

Dall'Alba, G., Sandberg, J., & Sidhu, R. K. (2018). Embodying skilful performance: Co-constituting body and world in biotechnology. *Educational Philosophy and Theory, 50*(3), 270–286.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain.* Putnam.

Derry, S. J., Pea, R. D., Barron, B., Engle, R. A., Erickson, F., Goldman, R., Sherin, B. L., et al. (2010). Conducting video research in the learning sciences: Guidance on selection, analysis, technology, and ethics. *The Journal of the Learning Sciences, 19*(1), 3–53.

Engelbrecht, H., Lindeman, R. W., & Hoermann, S. (2019). A SWOT analysis of the field of virtual reality for firefighter training. *Frontiers in Robotics and AI, 6*, 101.

Erofeeva, M. (2025). Why does social virtual reality feel so real? A phenomenological study of spatiality, embodiment, and continuity between digital and physical realities. *Human Studies*, 1–23.

Fenwick, T. (2010). Re-thinking the "thing": Sociomaterial approaches to understanding and researching learning in work. *Journal of Workplace Learning, 22*(1–2), 104–116.

Gherardi, S. (2025). What is the place of the human being in practice theories? An answer from a posthumanist position. *The Journal of Practice Theory, 1*, 53–64.

Green, B., & Hopwood, N. (2015). *The body in professional practice, learning and education: Body/practice.* Springer.

Heath, C., Hindmarsh, J., & Luff, P. (2010). *Video in qualitative research: Analysing social interaction in everyday life.* Sage.

Heidegger, M. (2005). *Introduction to phenomenological research.* Indiana University Press.

Haj-Bolouri, A. (2023). The experience of immersive virtual reality: A phenomenology inspired inquiry. *Communications of the Association for Information Systems, 52*(1), 782–814.

Haj-Bolouri, A. (2024). Safe spaces for immersive safety training in virtual reality: A phenomenological conceptualization. *International Journal of Virtual Reality, 24*(1), 1–22.

Haj-Bolouri, A. (2025). The philosopher's corner: The "immersed flesh": A phenomenological conceptualization of immersive virtual reality embodiment. *ACM SIGMIS Database: THe DATABASE for Advances in Information Systems, 56*(2), 13–30.

Halbig, A., & Latoschik, M. E. (2021). A systematic review of physiological measurements, factors, methods, and applications in virtual reality. *Frontiers in Virtual Reality, 2*, Article 694567.

Hancko, D., Majlingova, A., & Kačíková, D. (2025). Integrating virtual reality, augmented reality, mixed reality, extended reality, and simulation-based systems into fire and rescue service training: Current practices and future directions. *Fire, 8*(6), 228.

Hooi, K. K., Yen, C. L., Mcxin, T., & Yanan, W. (2025). From degrees to skills: Are micro-credentials the future of workforce development? *Journal of Information & Knowledge Management*, 2550084.

Hopwood, N. (2016). *Professional practice and learning: Times, spaces, bodies, things* (Vol. 15). Springer.

Husserl, E. (1989). *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy: Second book.* Kluwer Academic Publishers.

Hindmarsh, J., Hyland, L., & Banerjee, A. (2014). Work to make simulation work: "Realism", instructional correction and the body in training. *Discourse Studies, 16*(2), 247–269.

Kelly, N. J., Hallam, J., & Bignell, S. (2023). Using interpretative phenomenological analysis to gain a qualitative understanding of presence in virtual reality. *Virtual Reality, 27*(2), 1173–1185.

Kilteni, K., Groten, R., & Slater, M. (2012). The sense of embodiment in virtual reality. *Presence: Teleoperators and Virtual Environments, 21*(4), 373–387.

Kohonen-Aho, L., & Haddington, P. (2023). From distributed ecologies to distributed bodies in interaction: Capturing and analysing "dual embodiment" in virtual environments. In *Ethnomethodological conversation analysis in motion* (pp. 111–131). Routledge.

Loftus, S., & Kinsella, E. A. (2021). *Embodiment and professional education: Body, practice, pedagogy.* Springer Singapore.

Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. *Educational Psychology Review, 33*(3), 937–958.

Markopoulos, E., & Luimula, M. (2020). Immersive safe oceans technology: Developing virtual onboard training episodes for maritime safety. *Future Internet, 12*(5), 80.

Merleau-Ponty, M. (1962). *Phenomenology of perception.* Routledge & Kegan Paul.

Orlikowski, W. J. (2007). Sociomaterial practices: Exploring technology at work. *Organization Studies, 28*(9), 1435–1448.

Palmquist, A., Olsson, E., Soellaart, A., Johansen, N., Goethe, O. (2025). Embodied without matter: An analysis of embodiment definitions in VR game design research. In X. Fang (Ed.), *HCI in games. HCII 2025. Lecture notes in computer science* (Vol. 15816). Springer.

Paulsen, L. (2026). *Learning in/with video: 360° virtual reality as a tool for mediating meaning making in teacher mentoring.* Aalborg University Open Publishing.

Paulsen, L., Dau, S., & Davidsen, J. (2024). Designing for collaborative learning in immersive virtual reality: A systematic literature review. *Virtual Reality, 28*(1), 63.

Paulsen, L., & Davidsen, J. (2025). Activity-based collaborative virtual reality: Conceptualising immersive virtual reality for collaborative learning. *International Journal of Computer-Supported Collaborative Learning*, 1–25.

Petersen, G. B., Petkakis, G., & Makransky, G. (2022). A study of how immersion and interactivity drive VR learning. *Computers & Education, 179*, 104429.

Rystedt, H., & Sjöblom, B. (2012). Realism, authenticity, and learning in healthcare simulations: Rules of relevance and irrelevance as interactive achievements. *Instructional Science, 40*(5), 785–798.

Sandberg, J., & Tsoukas, H. (2011). Grasping the logic of practice: Theorizing through practical rationality. *Academy of Management Review, 36*(2), 338–360.

Schatzki, T. (2002). *The site of the social: A philosophical exploration of the constitution of social life and change.* Pennsylvania State University Press.

Sellberg, C., & Viktorelius, M. (2026). "Sauna hot": Instructed sensing in firefighting exercises. In W. Gibson, N. Ruiz-Junco, & D. vom Lehn (Eds.), *Sensing life: The social organization of the senses in interaction.* Taylor & Francis.

Sellberg, C., & Solberg, M. (2024). Reconceptualizing simulations: Epistemic objects and epistemic practices in professional education. *Philosophy & Technology, 37*(3), 77.

Selwyn, N. (2021). *Education and technology: Key issues and debates.* Bloomsbury Publishing.

Strati, A. (2007). Sensible knowledge and practice-based learning. *Management Learning*, *38*(1), 61–77.

Sumartojo, S., & Pink, S. (2017). Empathetic visuality: GoPros and the video trace. In *Refiguring techniques in digital visual research* (pp. 39–50). Springer International Publishing.

Vannini, P. (2017). Low and slow: Notes on the production and distribution of a mobile video ethnography. *Mobilities, 12*(1), 155–166.

Vetenskapsrådet. (2017). *Good research practice.* Vetenskapsrådet.

Voşki, A., Petersen, G. B., Steinbrecher, F., Wong-Parodi, G., & Fauville, G. (2025). Underwater virtual reality for awe, ocean connectedness, and pro-environmental behavior: A randomized controlled trial. *Sustainability Science*, 1–19.

Viktorelius, M., & Sellberg, C. (2022). The lived body and embodied instructional practices in maritime basic safety training. *Vocations and Learning, 15*(1), 87–109.

Viktorelius, M., & Sellberg, C. (2023). Bodily-awareness-in-reflection: Advancing the epistemological foundation of post-simulation debriefing. *Educational Philosophy and Theory, 55*(7), 809–821.

Viktorelius, M., & Sellberg, C. (2026). Learning to survive: Bodily techniques and teamwork in maritime emergency training. In L. Filliettaz, E. Berger, A.-S. Horlacher, & A. C. Ticca (Eds.), *Developing interactional competences at and for work: Analyzing talk-in-interaction in professional and training contexts.* Springer.

Wheeler, S. G., Engelbrecht, H., & Hoermann, S. (2021). Human factors research in immersive virtual reality firefighter training: A systematic review. *Frontiers in Virtual Reality, 2*, Article 671664.

Wheeler, S. G., Hoermann, S., Lukosch, S., & Lindeman, R. W. (2024). Design and assessment of a virtual reality learning environment for firefighters. *Frontiers in Computer Science, 6*, 1274828.

Wijkmark, C. H., Heldal, I., & Metallinou, M. M. (2022). Virtual reality support of cognitive processes in firefighter skills training. In *2022 1st IEEE International Conference on Cognitive Aspects of Virtual Reality (CVR)* (pp. 27–34). IEEE.

Willems, T. (2018). Seeing and sensing the railways: A phenomenological view on practice-based learning. *Management Learning, 49*(1), 23–39.

Yakhlef, A. (2010). The corporeality of practice-based learning. *Organization Studies, 31*(4), 409–430.

Zahiu, A., Mihailov, E., Earp, B. D., Francis, K. B., & Savulescu, J. (2023). Empathy training through virtual reality: Moral enhancement with the freedom to fall? *Ethics and Information Technology, 25*(4), 50.

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Chapter 6
Seeing and Being Seen: How Might On-Demand Learning be Reimagined Through AI-Enabled Smart Glasses?

Bec Marland, Janine Arantes, and J. Andrew Welsman

Abstract On-Demand Learning is no longer confined to online modules or self-paced study. It increasingly describes learning that unfolds within the flow of work itself. On-Demand Learning involves bespoke personalized access to knowledge and support delivered across multiple modes, formats, spaces, and times. On-Demand Learning creates new possibilities for emerging technologies such as AI-enabled (Artificial Intelligence) smart glasses to embed learning directly within everyday practice. AI-enabled smart glasses, worn on the head with AI-sensing and support, point toward a future where information, guidance, and feedback are delivered in real time, transforming how people learn, perform, and develop skills. This chapter uses the case of pre-service teachers to explore this shifting paradigm, imagining a near-future Work Integrated Learning (WIL) environment in which wearable devices mediate access, feedback, and professional identity. In these hypothetical classrooms, AI-enabled smart glasses offer heads-up captioning for hearing-impaired teachers, spatial audio for those with low vision, and adaptive visual or audio overlays for dyslexic learners, rendering practice immediate and inclusive. Yet the same devices enable constant visibility, recording, and algorithmic interpretation, where consent blurs and privacy dissolves. This chapter considers the transnational reporting systems (OECD), which hold education systems accountable by defining what counts as quality, equity, and effectiveness in teacher preparation and On-Demand Learning. Drawing on Bronfenbrenner and Ceci's (1994) bioecological systems theory, the chapter examines how these tensions might coexist when conceptualized through the lens of educational ecology and argues that the use of AI-enabled smart glasses within the context of WIL opens the door to a new form of On-Demand Learning one that compels us to ask: How might On-Demand Learning be reimagined through AI-enabled smart glasses? The study finds that smart glasses do not

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simply extend On-Demand Learning but reconfigure the conditions of teaching and learning, raising new governance tensions around consent, privacy, safeguarding, and professional autonomy across sectors. It also highlights uneven global futures, where digital poverty, ableism, North-South asymmetries, and commercial models risk new exclusions.

Keywords AI-enabled smart glasses · On-demand learning · Work Integrated Learning (WIL) · Initial teacher education · Ecological · Disability inclusion

6.1 Introduction

This chapter positions AI-enabled smart glasses as a new form of On-Demand Learning that alters the landscape of work and learning. In a world where education is shaped by global power brokers such as the OECD (2025) and World Bank (2025) schools are expected to align with data-driven performance, accountability, reporting digitally mediated, and On-Demand Learning. Unlike online or blended delivery modes, this form of "on-demand" learning occurs within the lived environment of practice. It is different, in that it is continuous, always on, deterministic, context-aware, and responsive to change as it happens. For pre-service teachers engaged in Work Integrated Learning (WIL), AI-enabled smart glasses create new possibilities for just-in-time feedback, adaptive support, and accessibility in real classroom settings (Kuhn et al., 2016; Zhang & Wang, 2024). They extend the notion of On-Demand Learning from digital access to cognitive and sensory augmentation in professional life. Yet this immediacy carries profound tension. When others also wear AI-enabled smart glasses, the pre-service teacher who is "seeing" becomes one who is also "being seen." Data capture moves in all directions, enabling recording, algorithmic processing, and synthetic reproduction to create new conditions of exposure (Arantes & Welsman, 2025). Deepfakes, unauthorized sharing, and the circulation of manipulated images become possible outcomes of systems designed for inclusion and efficiency (Arantes, 2026). What offers a bridge to equity and inclusion, also brings a network of surveillance and associated risks.

By analysing these tensions, the chapter critically examines the sociotechnical foundations of On-Demand Learning on placement and the potential implications for PSTs. In the context of the study the pre-service teachers are students enrolled in education degrees, studying to be teachers and required to undertake a period of placement in K-12 schools. As university students, their strengths related to technology-enhanced learning environments are likely to vary. While specific opportunities for AI-enabled smart glasses are gaining recognition particularly in the health sciences for simulations (Ghavami et al., 2025; Romare & Skär, 2023), there is limited understanding of how their presence impacts pre-service teachers from a rights perspective, and the tensions around consent, privacy, safeguarding, and professional autonomy.

This chapter reimagines On-Demand Learning as a form of workforce education that is both flexible and ethically complex, and far from online self-paced units of

work or MOOCs (Lazarus, 2019). Work Integrated Learning with AI-enabled smart glasses serves as a lens through which the changing relationship between learning, work, and technology can be reimagined. Placements as workplaces governed by rights, responsibilities, and vulnerabilities enable us to interrogate the presence of AI-enabled smart glasses to consider the epistemological and ontological assumptions and principles that guide career-focused applications of On-Demand Learning through and with smart glasses. The following explores what AI-enabled smart glasses might reveal about the future possibilities of On-Demand Learning, and how immediacy and adaptability might support or threaten a sustainable educational future.

Research question: How might On-Demand Learning be reimagined through AI-enabled smart glasses?

6.2 The ITE Context

While many professional training programmes position the workplace as central to learning—such as nursing homes, facilities, and centres—this chapter foregrounds the distinct educational context of Initial Teacher Education (ITE). In ITE across the world, workplace learning is undertaken as school-based practicum. As such, the school is not merely a site of training but a core pedagogical space in which pre-service teachers learn to teach, interpret curriculum, and enact professional judgement in school classrooms with their students. Through these placement *practicum* experiences, pre-service teachers (hereafter also referred to as PSTs) develop their professional identities, skills, and competencies in authentic educational settings, situated within the ostensibly supportive ecosystem of the school (Grainger Clemson et al., 2025). Still, unspoken sociotechnical risks remain, warranting urgent attention given their potential to reshape professional boundaries, ethical responsibilities, and the lived realities of those within the classroom (Hutson & Ceballos, 2023).

The vulnerability of teachers, PSTs and K-12 students has been widely recognized, typically within the context of a global teacher shortage crisis (OECD, 2025; World Bank, 2025). Backdropped by high PST attrition rates, research has highlighted that many PSTs demonstrate a lack of classroom readiness, career confidence, and preparedness for the profession (Flower et al., 2017; Núñez-Regueiro et al., 2023). PSTs are assumed to be vulnerable to inconsistencies in the delivery of initial teacher education courses, weaknesses in school professional mentoring programmes, and susceptible to various stressors such as challenging student behaviours (Du Plessis et al., 2025). Despite researchers arguing for strengthened AI governance to regulate the development and deployment of AI (Marland & Arantes, 2026), the risk to PSTs from wearable technologies such as AI-enabled smart glasses is an emergent and overlooked risk in ITE settings, both within university and K-12 classrooms. AI-enabled Smart Glasses in this paper are considered to be wearable devices built into

eyeglasses frames with or without prescriptions, and use sensors, connectivity and AI to capture, process and in some instances display digital information or constantly record in real time. According to Arantes and Welsman (2025), they are "body-worn, align recording with the wearer's field of view, and enable continuous, hands-free operation; [where] activation can be subtle, with limited external indicators compared to overt phone handling" (p. 6).

The Initial Teacher Education context is inherently complex, as PSTs transition from the role of student to that of teacher. During this period, PSTs must negotiate multiple and sometimes competing expectations, meeting university assessment and accreditation requirements while developing professional relationships with mentor teachers and engaging effectively with school students. This complexity is heightened by the fluidity of learning spaces in ITE, where the classroom may be physical, online, or blended, encompassing hybrid and self-paced modes of study. As a result, PSTs, the institutions and regulatory bodies that govern university–school partnerships are required to operate within increasingly On-Demand Learning environments.

The ITE context spans university and school settings and is shaped by intersecting regulatory and policy frameworks that position PSTs simultaneously as learners and emerging professionals. Within these institutional ecologies, universities and schools are responsible for safeguarding all stakeholders while supporting PSTs to develop robust, evidence-informed pedagogical practices responsive to innovation and technological change. At the same time, On-Demand Learning has reshaped how PSTs engage with their education, privileging flexible, self-paced, just-in-time, and often asynchronous learning experiences, including videos, and other digital content. Nonetheless, these ongoing changes raise important questions about how On-Demand Learning itself will be affected and whether the evolving needs of education systems have been fully considered.

6.3 On-Demand Learning

> The next millennium will be the beginning of a learning revolution unlike anything witnessed in many years. Learners will be able to learn things when they want to learn things, whether it is at 3 a.m. or at 10:00 p.m. Learners want to learn in their homes, in their cars, in their cubicles at work, on the manufacturing floor, and while they are away from their home offices. (Hartley, 2000, p. xi)

Hartley describes one of the most profound shifts to have affected educational practice in the last century. No longer is education defined by historical notions of learning as having to occur in particular places, spaces and times; learning opportunities are now ubiquitous (Cope & Kalantzis, 2009). Traditional institutions and timetables, involving "bricks and mortar" schools with prescribed semesters and class loads, are no longer the sole means by which learning is accessed and experienced. A proliferation of learning modalities and optionality has occurred; in addition to in-person, real-time experiences, learners now have the choice of remote and/

or asynchronous learning opportunities. Many institutions offer online degrees and other qualifications that are self-guided, self-paced, and recognized by employers as equivalent to those obtained via traditional delivery methods. "Intensive" learning options have also emerged, in which students complete a narrow course of study over weeks instead of months (Thomas et al., 2025). In such formats, students might engage in condensed "blocks" of learning on a single topic (e.g., of four weeks' duration); students report that studying one subject at a time makes it "easier to focus" and "more manageable" (Klein et al., 2019, p. 55). The above speaks to a recognition that institutions must cater to a new generation of learners who expect greater flexibility in the ways they engage with formal education pathways.

Formal credentialling pathways such as multi-year degrees and diplomas are no longer the only acceptable evidence of learning. Both accredited and non-accredited microcredentials are an increasingly popular alternative form of structuring learning that caters to the need for On-Demand Learning, bespoke learning needs (Oliver, 2019). Rather than engaging in an extensive syllabus over a protracted period of time (e.g., "a two-semester introduction to environmental engineering"), microcredentials offer learners the option of engaging with highly targeted knowledge and skill sets, thereby catering to specific and/or time-dependent learning needs (e.g., "Aquatic Sampling Methods for Environmental Engineers").

What is clear from the trends described above, is that learners are increasingly demanding *bespoke, On-Demand Learning* opportunities, delivered and accomplished on their terms and in places, spaces, and times of their choosing. Technology, in terms of both software and hardware, has been a key enabler of this. Advances in telecommunication accessibility and speed, the decreasing cost of computing hardware (tablets, laptops, mobile phones), and a proliferation of educational content (via burgeoning online ecosystems) has entailed a vast diversification of possibilities for On-Demand Learning. In this respect, wearable technologies represent a rather unexpected addition to conversations on its evolution. Wearable technologies have been with us for some time; eyeglasses, wristwatches, and abacus rings (Zheng et al., 2018) were some of the first exemplars of technology to augment sight, tell time, and calculate. With the dawn of the computational age, it wasn't long before electronic equivalents of wearables (e.g., smart watches, smart rings) were developed. AI-enabled smart glasses are a relatively recent addition to the wearable category and with their hands-free form factor, they present both novel risks and opportunities with respect to On-Demand Learning.

6.4 Smart Glasses: An On-Demand Learning Opportunity?

The origin of AI-enabled smart glasses can be traced to the 1960s with the pioneering work of Sutherland (1968) and the "head-mounted three-dimensional display." In this early exemplar of wearable computing technology, the user could orient their head in different postures to view a simulated environment seen through a headset. These "glasses" were large, rather cumbersome, and connected by cables to an apparatus on

the ceiling above the wearer; these were not see-through glasses in the conventional sense but instead were an early form of virtual reality. In the time that followed, head-mounted computerized hardware found applications in specialized environments such as the military and medicine. Head-mounted computerized displays have a varied history and their specific evolution as a form of technology has followed diverse trajectories. Broadly speaking, three categories of head-mounted computer technology have emerged: (a) head-mounted displays which present immersive simulated environments to the wearer (i.e., virtual reality, VR), (b) augmented reality displays involving the overlay of a graphic/digital interface on the wearer's visual field, and (c) headsets without visual overlays. For the purpose of this analysis, we will focus on a form of wearable technology that allows the user to interact with both digital and physical environments simultaneously via a head-mounted wearable (i.e., smart glasses with see-through lenses, and either with or without a digital overlay on the visual field).

The introduction of Google Glass (GG) in 2012 was a widely publicized example of wearable tech. Google Glass was positioned as a device for taking photographs, dictating texts, sending emails, listening to music, and searching the internet; however, sales to the public were discontinued in 2015 (Zuraikat, 2020). In addition to their significant cost, GG did not conform to the conventional aesthetics of eyewear; they were clearly "tech" worn on the face. Some viewed potential wearers of GG with concern, derision, or suspicion (Kudina & Verbeek, 2019); in an experimental study on the effects of GG on social interaction (Due (2015, p. 169) it was noted that "*the use and functionalities of GG interfere with social interaction on many levels, which is part of the big media story about rude Glassholes.*"

The phenomenon of "Glassholes" speaks to the significant social friction created when many of the functionalities of smartphones are incorporated into visible technologies worn on the face. Whereas the visibility of GG arguably contributed to social friction, contemporary versions of smart glasses are distinguished from GG by their discrete appearance. As noted by Iqbal and Campbell (2023, p. 326) in reference to another brand's smart glasses: "*Users need a specific way to hold the phone when recording but Ray-Ban stories smart glasses are similar to ordinary glasses and indistinguishable for a common human passing by…*" In addition to their low-profile, contemporary AI-enabled smart glasses are distinguishable from previous generations by the addition of AI features and the proposition by some manufacturers that prescription lenses can be integrated into the frame. AI-enabled smart glasses are currently available either with or without heads-up displays. Some of the most recent examples have both AI capabilities and the ability to interact with an in-built visual display on the lens via manipulation of other connected wearables such as rings or wristbands. A near-future imagining of smart glasses would suggest scenarios in which many of the functions of smartphones and desktop computation have been integrated into AI-enabled smart glasses. For example, a worker engaged in electrical or plumbing work in confined spaces might use smart glasses to record evidence of work completed or a physician engaged in surgery might communicate in real time with remote consultants. The above applications hinge on a hands-free mode of interactivity, as Due (2014, p. 2) noted:

> It is, roughly speaking, like having a smartphone attached to the face. However, unlike the smartphone or other wearables (Pentland, 1998) and body-integrated technologies, which require the user to look down or away, smart glasses allow one to look straight out at the world without having to rely on the use of one's hands. This provides a completely different interaction situation and radically new applications.

Earlier forms of smart glasses have been positioned as educational tools for making video recordings of lectures, tele-mentoring, student evaluation, engaging in augmented reality, and "understanding the listener's experience and nature, student concentration evaluation etc." (Kumar et al., 2018, p. 1). Contemporary AI-enabled smart glasses with multimodal functions present new possibilities for interactivity with (and interpretability of) auditory and visual environments. With respect to On-Demand Learning, one can imagine a range of scenarios wherein a student might apply the functions of AI-enabled smart glasses to engage in alternative methods of meaning-making, finding and engaging with information, and for interacting with peers or instructors. For instance, imagine a student of biology who is conducting outdoor field work in a stream environment. In such a situation, they might be wading through a stream, passing a net back and forth as they collect samples to assess invertebrate diversity. In addition to the functions suggested by Kumar et al. (2018), a learner might be "calling up" images or text on their heads-up display to compare/contrast what they saw or heard, querying AI to assist them in interpreting what they see, and communicating that understanding to peers. Whereas non-AI-enabled smart glasses were proposed as tools to facilitate the collection and distribution/transmission of information and media, AI-enabled smart glasses represent something altogether different. As examined by Pulungan and Nora (2025), adaptive AI technologies interjected into learning environments could have important implications for how students engage in meaning-making and in their interpretation of those interactions. This might be especially consequential in highly relational environments such as initial teacher education, in which PSTs navigate educational spaces that span both adult learning environments such as university campuses and school classrooms. As discussed in the next section, AI-enabled smart glasses are likely to play an important role in supporting disability inclusion within these complex learning environments.

6.5 Smart Glasses as Assistive Technologies

AI-enabled smart glasses offer significant potential to enhance accessibility for students with disabilities and diverse learning needs. While AI-enabled smart glasses have clear application for hearing impairment (heads-up captions), for those with low vision (spatial audio), and for dyslexic learners (adaptive visual or audio overlays), initial research suggests that AI-enabled smart glasses have broader potential to support people with disabilities including ADHD, autism, and mental health conditions (Government United Kingdom, 2025; Olinic et al., 2025). The proliferation of AI-enabled smart glasses might suggest an over-reliance on medicalized

or technological interventions (American Psychiatric Association, 2022) an issue that disability advocates have fought against (Oliver, 1983). Nonetheless, the social model of disability affirms the right to choose supports and interventions as a form of empowerment and anti-oppressive practice (Thomas, 2004).

Consistent with the Sustainable Development Goal 4 SDG4 from the United Nations (2025), emerging forms of education should be flexible, equitable, and learner-centred, to advance inclusive and quality education for all. Furthermore, the United Nations Convention on the Rights of Persons with Disabilities UNCRPD (2006), stipulates that students with disabilities have the right to participate in education on an "equal basis" as their peers, and to engage in education that is meaningful, inclusive and accessible; within the Convention, assistive technology is promoted through a universal design approach. Therefore, teachers and PSTs are poised to consider the inclusive possibilities of AI-enabled smart glasses, based on global human rights imperatives. Article 2 of the convention states:

> "Universal design" means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design [this includes] assistive devices for particular groups of persons with disabilities where this is needed.

Emerging wearable technologies such as AI-enabled smart glasses resonate with Universal Design for Learning (CAST, 2024), as they can embed multiple modes of access to support diverse learners without requiring differentiated or retrofitted interventions. Marland et al. (forthcoming) illustrate that some forms of assistive technology are limited by current specifications and capabilities; drawing on an example of a student with dyslexia who requires real-time text-to-speech, or speech-to-text support, that rely on multiple discrete devices and applications, such as C-reader pens that are compatible only with certain teaching tools. Similarly, assistive technologies implemented for students with visual or hearing impairments, ADHD, or autism are often condition-specific and externally attached, reinforcing a fragmented and individualized approach to support. By contrast, AI-enabled smart glasses offer a hands-free format, have the potential to seamlessly integrate into the classroom environment, removing learning barriers and operationalizing inclusive practice in real time. Arguably, AI-enabled smart glasses meet six of the UDL principles outlined by the Centre for Excellence in Universal Design (2026); equitable use, flexible use, simple and intuitive, perceptible information, low physical effort, and the size and space of the device is appropriate for the environment. By way of example, the heads-up captions suit those with hearing impairment, spatial audio supports those with low vision, and adaptive visual or auditory overlays have affordances for those with dyslexia. For students in a primary or secondary school, this translates to learner agency, and opportunities to engage in previously unimagined ways; a child with a vision impairment receiving real-time information about people or objects in front of them discreetly through the audio output in the smart glasses' frames. Such learner agency is mirrored in the professional agency afforded to the PST with a disability during placement, who benefits from the same dynamic accessibility adjustments

through AI-enabled smart glasses capable of delivering real-time information about people and objects in their environment.

6.6 Bronfenbrenner Bioecological Systems Theory

Bronfenbrenner and Ceci's (1994) Bioecological Systems Theory provides the conceptual foundation for this chapter to explore near-future WIL environments, framing how tensions coexist within the same educational ecology. A bioecological perspective has been applied by a variety of researchers to conceptualize the impacts and influence of technology in educational environments (Tong & An, 2024). For instance, according to Fulantelli, Taibi, and Scifo (2021) "the Internet and the social media should no longer be considered as a tool to connect to a virtual reality that is separate from the real world, but as a place in which users live daily" (p. 1). Similarly, Sullivan (2025) considered the influence of technology on the development of children through a bioecological systems-level lens, noting both benefits as well as "sacrifices and risks" (p. 37) stemming from digital environments and technology.

Bronfenbrenner and Ceci's (1994) Bioecological Systems Theory locates the individual at the centre of their environment or their *ecology,* surrounded by five systemic levels of developmental and systemic influence, highlighting the interplay of systemic layers and changes that occur over time. The paradigm comprises the following systemic layers: *the microsystem*, *mesosystem*, *exosystem*, *macrosystem*, and *chronosystem* (Renn & Smith, 2023).

Bioecological Systems Theory positions the pre-service teacher as an individual whose experience of AI-enabled smart glasses forces us to reconsider how "On-Demand Learning" could be shaped by multiple, interacting layers of influence. At the microsystem level, attention is directed to the lived environment of classroom practice, whereas the mesosystem captures the relationships between the pre-service teacher and student, their mentor, and school. The exosystem represents the institutional and technological structures that indirectly govern these experiences, and the macrosystem encompasses the broader cultural, ethical, and legislative frameworks, such as inclusion policy, and the manosphere. Finally, the chronosystem recognizes temporal change, tracing how the normalization of wearable technologies over time redefines teacher identity, consent, and professional presence and academic freedom (Marín et al., 2023). Together, these layers illuminate how the methodology approach, speculative inquiry from Haraway (2016) might lead to new possibilities "How might On-Demand Learning be reimagined through AI-enabled smart glasses?" in the context of ITE, where students are dually performing the role as pre-service teachers.

Figure 6.1. illuminates how Bronfenbrenner and Ceci's (1994) Bioecological Systems Theory provides the analytical structure through which these scenarios are interpreted, and it is by situating the hypothetical pre-service teacher within interacting layers of influence, that the model enables a nuanced reading of how these tensions manifest simultaneously. The methodology is intentionally qualitative,

interpretive, and critical. It draws on feminist, disability-justice, and psychosocial perspectives to interrogate whose interests are served when learning becomes datafied and "always on" through AI-enabled smart glasses. It reinstates a focus on equity and surfacing the rights of pre-service teachers who may be marginalized. In doing so, the methodology enables a forward-looking analysis of On-Demand Learning that is both imaginative and grounded in theory, to provide a conceptual framework for understanding how AI-enabled smart glasses in WIL contexts could simultaneously advance inclusion and introduce new forms of vulnerability. This approach not only informs future research and design but also contributes to anticipatory governance ensuring that accessibility, consent, and duty of care remain foundational to sustainable educational futures.

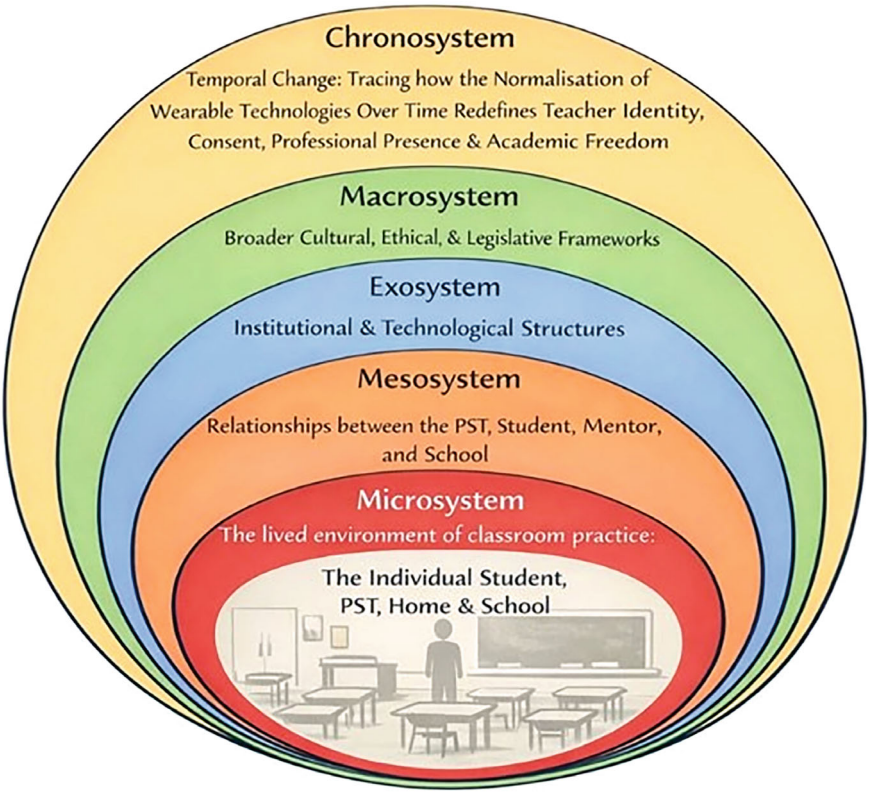


Fig. 6.1. On-Demand Learning in the age of AI-enabled smart glasses: A bioecological systems' view of the levels comprising Work Integrated Learning (WIL) and the experience of Pre-Service Teachers (PSTs). *Note.* Image generated using ChatGPT5 (Open AI, January, 19, 2025). Prompts included detail from each systemic layer (listed in diagram) and asked for an individual (student/pre-service teacher) in a classroom at the centre of the concentric layers

6.7 Speculative Fabulations Theoretical Background

This chapter adopts Haraway's (2016) conceptual and scenario-based methodological approach, speculative inquiry (through the tool of speculative fabulation). The speculative approach is used to examine how On-Demand Learning might be reimagined through the introduction of AI-enabled smart glasses in Work Integrated Learning (WIL) contexts for PSTs. Because such technologies are only emerging within education, a speculative, theoretically informed methodology allows for the ethical, pedagogical, and psychosocial implications to be explored before their widespread implementation. This anticipatory stance aligns with the principles of responsible innovation and with this book's broader purpose of rethinking the philosophical and practical dimensions of On-Demand Learning, amid rapid technological and socioeconomic change.

Speculative inquiry constitutes a generative and imaginative research orientation aimed at exploring theoretically grounded plausible, possible, and preferable futures, rather than being confined to existing conditions (Haraway, 2013; Marland et al., forthcoming). It is employed to interrogate dominant assumptions, latent power relations, and articulate alternative imaginaries that exceed current social and institutional structures. As a methodological approach, speculative inquiry has been taken up across contemporary scholarship, including the work of Horvath and Steinberg (2023).

The chapter employs five hypothetical (one for each systemic layer), yet plausible, future scenarios that illustrate how smart glasses could transform professional practice, accessibility, and supervision within teacher education placements. These scenarios are constructed through a synthesis of current developments in wearable technologies, AI integration in education and existing accessibility research. They are designed to elicit reflection on the lived experience of pre-service teachers who might use or encounter such devices during placement through narrative-driven exploration of (1) agency, (2) relational ethics, and (3) systemic governance that would not yet be observable through empirical study.

Over an eleven-week period in December–February 2025–26, the three academic authors engaged in four structured sessions both online and in-person, designed to facilitate shared meaning-making. Applying speculative inquiry, the academics developed five speculative fabulations embedded in each systemic layer of Bronfenbrenner and Ceci's (1994) bioecological model. To ensure rigour, the speculative process was grounded in collaborative note-taking and iterative discussion, consistent with Lincoln and Guba's (1985) view that credibility arises through ongoing engagement and peer deliberation. The speculative fabulations were human-generated, with all researchers involved in their refinement. These records supported collaborative interpretation and promoted consistency within theoretical grounding, while iterative discussions helped maintain coherence between emerging themes and the study's focus on inclusion, governance, and commercial influence.

The academics began by developing guiding question prompts, firstly to identify relevant stakeholders, and then to probe at complex systemic and stakeholder

interactions at each layer; with a particular focus on the impacts on PSTs. This theoretical positioning enabled greater criticality, lateral thinking and oversight of hidden systemic issues and perspectives by assuming different "hats" or perspectives (De Bono, 1985) where stakeholder rights may converge. The academics aimed to restructure their initial conceptual understandings and engage in a process to increase multi-directional insight, with the potential to consider those stakeholders and issues that have been systemically silenced. This process translated Bronfenbrenner and Ceci's (1994) systemic layers into open-ended prompts intended to support discussion and speculation of the ethical, social, and policy implications of AI-enabled smart glasses in education, particularly in On-Demand Learning environments. Following this, three additional one-hour sessions were conducted, centred on iterative thematic exploration, speculative exchange, and collaborative note-taking. These discussions centred on analysing "how might On-Demand Learning be reimagined through AI-enabled smart glasses?" within plausible possible futures that have yet to be fully considered. Guided by this question and systemic question prompts to illuminate systemic tensions, the authors examined how AI-enabled smart glasses might shape future experiences of privacy, consent, access, and power in On-Demand Learning spaces.

6.7.1 SpecFab#1 Microsystem: The Lived Environment of Classroom Practice

The following speculative fabulation imagines a near-future moment in which AI-enabled smart glasses are introduced into Work Integrated Learning placements for PSTs. It is not a prediction, but a theoretically informed provocation designed to make visible emerging sociotechnical dynamics.

Before the lesson begins, the pre-service teacher is introduced to the new On-Demand programme utilizing smart glasses. They try them on and notice the weight of the glasses on their face. Slight and almost imperceptible, it isn't the glasses themselves, but they question how might the wifi directed that close to my head impact me if I wear these all day? When the device activates, a faint visual overlay appears, not intrusive, not diminishing attention, but present either way. The pre-service teacher becomes aware that their field of vision is being "watched."

As they begin teaching, information arrives through the glasses. A short prompt about the sequence of an activity, then another drawing attention to the need to mark the roll. The pre-service teacher initially is laughing, with the novelty of the prompts, and adjusts their behaviours accordingly. But there is something niggling at them. Is this something I like? As they begin teaching, information about individual students and the content continues to arrive. If they say an explanation slightly incorrectly, they get a prompt to correct the comments, and they find themselves changing. They become conscious of how they are standing, how long they pause, and how often they look down at their notes. They're not being told explicitly to do this, but

they sense that their actions are being rendered legible by their mentor teacher and although they may not be directly watching them in the classroom, they can watch the recording after class, which is uncomfortable. But in the same sense, for the pre-service teacher, who has partial hearing loss, live captioning of student questions and focused amplification of voices, drowning out background noise appears relatively seamlessly during the class. This tension between being constantly watched but allowing greater accessibility does not go past the pre-service teacher.

They do not miss key words and their confidence increases. Fundamentally changing how they engage with students, and their internal deliberations optimize the teaching and student engagement. They adjust pacing upon the prompt of the AI-enabled smart glasses, and at the end of the class they feel both supported and unsettled. While their attention has been partially distributed, between students, content and the AI-enabled smart glasses themselves, what they are left with, is that the On-Demand Learning didn't feel spontaneous. It felt controlled and enabling all at the same time. In this microsystem, on-demand learning is not a programme or policy. It is an embodied condition in work integrated learning (WIL). It reshapes how the pre-service teacher experiences the act of teaching.

6.7.2 SpecFab#2 Mesosystem: Relationships Between the Pre-Service Teacher and Student, Their Mentor, and School

The following speculative fabulation imagines a near-future classroom scenario to surface the ethical, pedagogical and governance tensions that may arise as AI-enabled smart glasses are introduced into Work Integrated Learning placements for pre-service teachers. It is not a prediction, but a theoretically informed provocation designed to make visible emerging sociotechnical dynamics.

At 9:02am, a pre-service teacher steps into a Year 6 Classroom wearing AI-enabled smart glasses issued through the university's on-demand learning programme. From the outside, the glasses appear unremarkable, with thin frames prescription lenses, but once activated the effectively begin to mediate the mesosystem of classroom practice. As students settle in their seats, an indistinguishable heads-up display overlays onto the teacher's field of vision. Key lesson prompts appear at their periphery, aligned to the curriculum plan approved by their mentor teacher. When a student raises their hand, facial recognition is disabled according to policy, but name recall appears with those that have opted in, drawing data from the school's learning management system.

For the pre-service teacher, the glasses provide real-time cognitive scaffolding. During a hands-on experience, the system flags a potential safety issue before it occurs based on visual cues and audio prompts arrive to the pre-service teacher and student in tandem, guiding them to turn off a Bunsen burner that was not lit, preventing gas leaks. Although not part of the on-demand programme, the heads-up display to support

hearing provides significant accessibility for the pre-service teacher, fundamentally making classroom teaching a much more accessible experience. All of which unfolds within the act of teaching itself.

Yet this same immediacy subtly reshapes the emotional texture of the classroom. This is because the pre-service teacher and students are aware that the glasses are capable of recording, and live streaming, as technically disabling the glasses removes other fundamental aspects needed. As such, students joke "Are you recording us?" Further, as the lesson progresses the system adapts. The students are aware of the On-Demand Program using AI-enabled smart glasses, and that it will flag them for lack of motivation if they do not engage at regular intervals. The pre-service teacher receives a flag, that there is prolonged student disengagement in one group and suggests a prompt. The glasses have started recording, analysing the students voice, tone, facial expressions and body language, and suggest that the teacher tries peer evaluation. The question about "Are you recording us?" now seems redundant as the system turns on and off based on the algorithmic feedback provided in the systems. While the suggestion is helpful, the pre-service teacher starts to feel a tension. Do I need this? In this moment, the pre-service teacher's uncertainty is not merely emotional, but epistemic, signalling how professional judgement itself is being reshaped through continuous algorithmic mediation. They follow the prompt, and they recognize that agency is being shared with a machine, initiating disturbed activity between human expertise and machine influence.

At the end of the lesson, the pre-service teacher takes a moment to listen to the brief reflective summary. They are hearing about pacing indicators, moments of high student interaction, where their instructions could improve and so on. The feedback although immediate, efficient and framed as supportive, leaves the pre-service teacher feeling watched. And further, questions will this inform my mentoring meeting. Will this pass or fail me? It doesn't feel like a private pedagogical space anymore. Within this classroom mesosystem, on-demand learning feels like something amazing, but also slightly uneasy. And despite this flurry of tensions, the pre-service teacher, like their students, quickly adjust. AI-enabled smart glasses are woven into the conditions under which teaching occurs.

This speculative classroom illustrates how AI-enabled smart glasses could reconfigure the mesosystem of teaching as a site of continuous on-demand learning. Accessibility, feedback and support while embedded directly into practice could enhance inclusion and professional growth; but could also make the pre-service teacher's lived experience on placement one of constant negation between support and exports. In this context, on-demand learning, is not simply about immediacy. It becomes about how teaching itself could be transmuted when learning, monitoring and interpretation via algorithmic could simultaneously intimate what quality means, for teaching and learning. This mesosystem scenario functions as an analytic device rather than a forecast. Bronfenbrenner and Ceci's (1994) framework foregrounds how On-Demand Learning mediated by AI-enabled smart glasses reconfigures classroom practice, becoming part of the mundane everyday; while also reconfiguring classroom practice, professional agency, student interaction and perceptions of consent.

6.7.3 SpecFab#3 Exosystem: Institutional and Technological Structures that Indirectly Govern These Experiences

The following speculative fabulation imagines a near-future moment in which AI-enabled smart glasses have become a widely adopted and indispensable accessibility tool in higher education. In this imagined context, the technology has fundamentally reshaped approaches to disability inclusion, transforming how students access and engage with On-Demand Learning in their undergraduate and postgraduate degrees.

This scenario is centred on an accessibility department at a large metropolitan university responsible for the provision of ITE courses. The "accessibility hub" facilitates advice and support services to students with disabilities, including ITE students who are dually recognized as pre-service teachers. Initially, there were regulatory barriers to the hub promoting the use of AI-enabled smart glasses as an accessibility tool; however, these concerns were superseded by the inclusive potential of the technology.

The accessibility team arrives at the Monday morning briefing with agendas in hand. The director guides the discussion on departmental priorities and strategic direction, which hinges on their most successful innovation to date: the widespread adoption of AI-enabled smart glasses. The director reads an email of gratitude from a visually impaired ITE student, one of many "thank you" emails she has received this week from students with disabilities. In the email, the student testifies how AI-enabled smart glasses have "revolutionized" his participation through their seamless integration, marvelling at the benefits of the audio recording features, real-time audio description, and camera-enabled spatial and navigational support. He thanks the director for her role in championing the "Smart Glasses Universal Access to Learning Act" 2.0, which affirms students' entitlement to use smart glasses for accessibility purposes within teaching spaces and across the broader university.

A learning designer shares an anecdote, recalling a now-abandoned proposal to conduct pilot studies on risk mitigation, before AI-enabled smart glasses were adopted as a universal accessibility tool. The studies were sidelined once it became apparent that AI-enabled smart glasses were already being worn in classrooms by non-disabled students, albeit discreetly and without formal recognition. The learning designer sighs with a sense of relief, describing the "leaps" and "bounds" in disability access and inclusion, since the implementation of AI-enabled smart glasses. No longer are educators, learning designers and accessibility professionals alike scrambling to find low-tech solutions to remove learning barriers in the classroom. For the first time, there is an accessibility tool that is universal and beneficial for students with a range of disabilities, and the best part of all is that a big tech company has just sponsored free AI-enabled smart glasses for all eligible first year students.

Emboldened by the newly created "Smart Glasses Universal Access to Learning Act" 2.0, the team decides that AI-enabled smart glasses are the preferred accommodation and accessibility tool in On-Demand Learning; they will be widely recommended in access plans for students who are formally diagnosed with disabilities such as dyslexia, vision or hearing impairment, and schizophrenia. However, in an

untimely interruption of their meeting, a student waves at the team through the glass doors, while wearing their AI-enabled smart glasses. Almost apologetically, the student gestures to the side of their glasses pointing to a minuscule white dot, to reassure everyone that they are not being covertly video recorded. It is an awkward moment, as the team members remain uncertain if the camera light indicator on the glasses was activated or not.

This speculative scenario illustrates how the response to AI-enabled smart glasses, at exosystem level, could redefine On-Demand Learning in ITE for students with disabilities, and those who interact with them. The scenario highlights how AI-enabled smart glasses might be viewed from a social justice and human rights lens, as the glasses are well-positioned within established universal design for learning frameworks (CAST, 2024), enabling proactive accessibility, bringing a timely and celebrated solution to multiple exclusionary classroom barriers.

6.7.4 SpecFab#4 Macrosystem: Broader Cultural, Ethical, and Legislative Frameworks, Such As Inclusion Policy and the Manosphere

The following speculative fabulation occurs in the context of a near-future podcasting studio. The scenario involves an everyday occurrence in the realm of popular culture, wherein a leading personality in edutech media and their co-host discuss the need for innovations to fix education. In this imagining, the participants draw from a range of places, spaces, and ideological positionings. The narrative is told from the perspective of an academic who has been invited to comment on the use of AI-enabled smart glasses in schools.

I straightened in my seat, conscious of the light on the hosts' glasses; I was live on the podcast's social media channel. The host looked at his phone, amazed that his first-person perspective, as viewed from his glasses, was being projected in real time to the phone in his hand. His co-host chimed in, explaining how he had taken a pair of the glasses snowboarding; he had been lost on one of the runs and the glasses' on-board AI had helped him to navigate back to the lodge. Turning to me, the host asked if I had seen any smart glasses being worn on my campus. I replied in the affirmative: yes, they seemed to be everywhere…colleagues, students, administrators alike.

One of the hosts interrupted, asking if I had heard about a court case involving a local school, where a PE teacher was recording footage of students to give them play-by-play feedback with AI-assisted analytics during basketball practice. In that case, the glasses were hacked by cybercriminals and used to manufacture a series of deep fakes of students. Turning to the other guest, a political candidate, the host asked about an appropriate systemic response. The candidate replied forcefully that the glasses should be banned, as they were simply too much of a risk. The politician justified his position by reference to past mobile phone bans and a need to "get back to basics."

The co-host jumped in, explaining how impressed he had been by an example of a child with a hearing impairment, whom he saw on social media. In that case, the child had been playing baseball with AI-enabled smart glasses. The co-host was awestruck that the child was "reading" the umpire's calls (who was standing behind the student) on their smart glasses, in real time, while also receiving a read-out on the display of the ball's speed and the quality of their swing. He ended by questioning why that same child was denied the smart glasses in a school setting. I leaned in, picking up a sample pair of glasses from the middle of the table. I raised the point that government policy had exception clauses for medical and assistive uses in place for devices like smartphones, yet AI-enabled smart glasses were omitted from most schools' policy.

Nevertheless, I explained that people were discovering unexpected circumstances in their everyday lives where smart glasses were proving useful, both for learning and as assistive tools. I noted that PSTs in my faculty were wearing them in the lecture hall, which made me wonder how schools managed their use when those same students were on placement in schools. I concluded by highlighting the lack of clarity in government policy on what acceptable use of AI-enabled smart glasses looked like in schools, for teachers, students, or caregivers.

The above scenario illustrates how wearable technologies such as AI-enabled smart glasses might be perceived due to intersecting cultural, ethical, and political prerogatives and subtexts intersecting at the macrosystem level. For some, like the hosts in the scenario, AI-enabled smart glasses are the newest "lifestyle" tech product; for them, the perception of risk and harm is a secondary concern relative to the product's innovative utility. For others, such as the political candidate in this scenario, a blanket ban on the tech in schools might be proposed to gain political currency. Positioning AI-enabled smart glasses as an unequivocal threat to children's safety ignores the many cases where the technology is used to support less-than-visible needs. In a culture where wearable tech is most visible as a lifestyle accessory, it would be unsurprising that the affordances of AI-enabled smart glasses as an On-Demand Learning tool or an accessibility device might be neglected or displaced by other anxieties associated with emerging technologies.

6.7.5 SpecFab#5 Chronosystem: Time, Consent, and Identity

The following speculative fabulation returns to the same pre-service teacher over time. It is not designed to be a prediction, but a theoretically informed provocation about what changes when AI–enabled smart glasses become ordinary: when "on-demand learning" is no longer a "programme," but instead an "expectation" embedded in professional learning and life.

In their first placement, the pre-service teacher experiences the glasses as a paradox; they were both empowering and unsettling. Live captions supported their partial hearing loss; prompts helped with pacing and feedback felt immediate, scaffolded, and structured; however, the teacher didn't leave the classroom and as such,

also felt watched. They were aware that the classroom could be live-streamed, replayed, recorded, and instructed—or interpreted later. Consent, in this context, was a camera light.

Five years later, and they are a graduate teacher, but the classroom ecology has shifted. AI-enabled smart glasses are no longer "innovative"—but standard practice. They are issued alongside laptops at induction, integrated into the mentoring process and normalized through policy language that rebrands them as "evidence" of quality teaching. Students no longer ask, "are you recording?" because the recording has become "always on" and ambient. The teachers' professional identity, therefore, changes in response to this temporal drift and in mentoring meetings, colleagues refer back to the point of view (POV) videos of interactions with students, that are then triangulated with learning outcomes and students' experience via the edtech's new teaching dashboards. The teacher finds themselves teaching for the archive—avoiding "risks" through improvisation, choosing "safer" examples and hesitating twice, before tackling controversial content. Within a Philosophy of Education course, the teacher pauses. Although no policy explicitly prohibits particular topics, the conditions of constant potential observation, digital, zeros and ones, capture the human relations in the classroom—always on, reshape pedagogical decision-making. Teaching becomes something not enacted for the present moment, or for future building of relationships and learning; but for future retrieval, analysis and reinterpretation.

Then an incident makes this "time" visible. A brief classroom exchange, although mundane and unremarkable, is filmed POV and circulates months later in an online channel—but captioned and paired with synthetic audio that shifts the tone and intent. It is difficult to decipher whose glasses made the recording, but the teacher learns the chronosystem level lesson: it is not only the ways in which their teaching has changed, because they know they are being recorded, but also because the durability, portability and editability of their professional presence is on the front line.

In this chronosystem scenario, On-Demand Learning through AI-enabled smart glasses is reimagined as a line of small everyday events that are structured into an arc of normalisation. While on this arc, we see inclusion and access expand, consent becomes procedural, and teaching becomes performative—far more than what was experienced during the so-called digital revolution. On-Demand Learning that was reimagined through AI-enabled smart glasses has become a constant negotiation of time, temporality and truth. The critical question, then, shifts from how On-Demand Learning can be reimagined, to how education systems govern the ongoing transformation over time.

6.8 Synthesis

The preceding sections have built the chapter as an ecological argument (Bronfenbrenner & Ceci, 1994), rather than a technological review. On-demand learning, AI-enabled smart glasses and disability access through speculative fabulations (Haraway,

2013, 2016) have been described as interactions that reorder what on-demand learning could look like in a changing world. What follows is a synthesis that draws these strands together, to do three things.

First, it consolidates the chapter's central claim: AI-enabled smart glasses do not simply add a new channel for on-demand learning, they reconfigure the conditions under which teaching and learning are experienced. We argue that they can shift on-demand learning form "choice" and "flexibility"; to "ambient mediation." A continuous, context-aware and increasingly so-called means to make evidentiary what quality teaching does and doesn't look like. We move beyond the risk-opportunity binary and treat inclusion and surveillance as co-produced tensions within the same ecology, rather than competing narrative.

Second, these tensions take on new governance questions that matter across sectors, where expectations about consent, duty of care, safeguarding, and professional autonomy differ (Barber, 2002; Keefe, 2022; United Nations, 1990, 2006). Identifying minimum conditions for use: privacy by design, meaningful consent, limits on data retention and use and protections from downstream harms are brought into the classroom.

Third, the global inequities of "on-demand" futures are uneven. Digital poverty, ableism, asymmetries in the global north and south, and commercial subscription models can produce new exclusions, although education focuses on providing universal access (Marland et al., 2026). As a result of this thinking, we shift beyond the normative challenge of *How might On-Demand Learning be reimagined through AI-enabled smart glasses?* and move toward questions of what ethical, rights-based, and accountable conditions should allow AI-enabled smart glasses in education.

In explicitly defining a methodology and theoretical framework with which to work, the authors acknowledge the potential for certain perspectives and possibilities to be overlooked in the surfacing of this chapter's conclusions and recommendations. As such, it is worth noting that the mode of speculative fabulation is limited by the lived experiences of the authors and the analytical lens they apply. Similarly, the application of Bronfenbrenner and Ceci's (1994) bioecological perspective to the specific circumstance of pre-service teacher education sets defined boundaries on the analytical context which may entail the omission of yet-to-be-surfaced possibilities. Nevertheless, the authors would propose that the context of pre-service teacher education, involving a broad continuum of educational environments and participants ranging from early childhood to tertiary education, is a useful "ecology" in which to do the conceptual work of exploring the impacts and potential of emerging technologies.

The authors of this paper argue that AI-enabled smart glasses are both an opportunity and a warning with respect to On-Demand Learning; the technology shows how immediacy and adaptability can support sustainable educational futures only when grounded in rights-based principles of consent, duty of care, and accountability. In doing so, the chapter treats AI-enabled smart glasses in Work Integrated Learning (using the context of Initial Teacher Education), as a source of productive tensions within the same educational ecology. It calls for anticipatory governance of AI in

education that recognizes inclusion and consent as interdependent, drawing on AI-enabled smart glasses to exemplify the new terrain of On-Demand Learning where professional knowledge, personal safety, and human dignity are continuously negotiated. The contribution of this chapter is therefore to rethink On-Demand Learning, not as convenience or technological novelty, but as a question of how societies choose to balance adaptability with ethics in the evolving conditions of work and education.

6.9 Conclusion

This chapter has treated AI-enabled smart glasses as more than a new delivery mechanism for On-Demand Learning—rather it has read the context of initial teacher education on work integrated learning with AI-enabled smart glasses ecologically. AI-enabled smart Glasses reorganize the conditions under which On-Demand Learning is experienced in work integrated learning. Not simply "available when needed," but ambient, embodied and infrastructural. Across the 5 ecological layers, the technology's promise and peril are not competing storylines to be resolved, but rather co-produced realities of the same system. The question, therefore, is not whether AI-enabled smart glasses will enter educational workplaces (as they already are), but what kind of On-Demand Learning we are willing to institutionalize. We need anticipatory governance that is both rights-based and ecologically literate. At a minimum, this requires moving beyond procedural consent (the camera light, a checkbox, and a policy clause) and toward meaningful consent that is informed and part of established regulations and legislations at work. If On-Demand Learning is to stay functional in a changing world with AI-enabled smart glasses as mundane artefacts in the classroom, there is a need to consider what "always on" recording means, so that deterministic data through a POV camera does not become the precondition for quality teaching and learning.

References

American Psychiatric Association. (2022). Diagnostic and statistical manual of mental disorders (5th ed., text rev.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425787

Arantes, J., & Welsman, A. (2025, August 1). AI Governance for Education (AIGE) Working Paper No. 1 Smart glasses, live streaming, doxing, and Deepfakes. *Live streaming, doxing, and Deepfakes.*

Arantes, J. A. (2026). Experiential scenarios and the Onto-AI lexicon of "being innovative" in initial teacher education. In *Policy and practice for ethical AI integration in education* (pp. 257–278). IGI Global Scientific Publishing.

Barber, T. (2002). "A special duty of care": Exploring the narration and experience of teacher caring. *British Journal of Sociology of Education, 23*(3), 383–395. https://doi.org/10.1080/01425690220000015427

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bioecological model. *Psychological Review, 101*(4), 568–586. https://doi.org/10.1037/0033-295x.101.4.568

CAST. (2024). *Universal design for learning guidelines version 3.0*. Centre for Applied Special Technology. https://udlguidelines.cast.org

Centre for Excellence in Universal Design. (2026). *About universal design: The 7 principles*. https://universaldesign.ie/about-universal-design/the-7-principles

Cope, B., & Kalantzis, M. (2009). Ubiquitous learning: An agenda for educational transformation. In *Ubiquitous learning* (pp. 3–14). University of Illinois Press.

De Bono, E. (1985). *Six thinking hats*. Penguin Books.

Du Plessis, A. E., Matthews, J., Mainsbridge, C., Razmjoee, M., & Gorry, D. (2025). Examining attributes of preservice teachers' vulnerability: Exploring challenging lived experiences during professional experience placements. *International Journal of Educational Research, 134*, 102832. https://doi.org/10.1016/j.ijer.2025.102832

Due, B. L. (2014). *The future of smart glasses: An essay about challenges and possibilities with smart glasses* (Vol. 1, pp. 1–21). Centre of Interaction Research and Communication Design, University of Copenhagen.

Due, B. L. (2015). The social construction of a Glasshole: Google Glass and multiactivity in social interaction. *PsychNology Journal, 13*(2), 149.

Flower, A., McKenna, J. W., & Haring, C. D. (2017). Behavior and classroom management: Are teacher preparation programs really preparing our teachers? *Preventing School Failure: Alternative Education for Children and Youth, 61*(2), 163–169. https://doi.org/10.1080/1045988X.2016.1231109

Fulantelli, G., Taibi, D., & Scifo, L. (2021). *The ecological systems theory of human development to explore the student-social media interaction*. "Carol I" National Defence University. https://doi.org/10.12753/2066-026X-21-019

Ghavami Hosein Pour, B., Karimian, Z., & Hatami Niya, N. (2025). A narrative review of advancing medical education through technology: The role of smart glasses in situated learning. *BMC Medical Education, 25*, 359. https://doi.org/10.1186/s12909-025-06949-7

Government, United Kingdom. (September 11, 2025). *Smart glasses and AI filter apps among new tech to transform the mental health of millions* [Press release]. https://www.gov.uk/government/news/smart-glasses-and-ai-filter-apps-among-new-tech-to-transform-the-mental-health-of-millions

Grainger Clemson, H. G., Craig, L., Easton, E., & White, M. (2025). *Improving the school placement: navigating and negotiating expectations in an ITE partnership*. https://doi.org/10.31219/osf.io/j5ymd_v1

Haraway, D. (2013). SF: Science fiction, speculative fabulation, string figures, so far." *Ada: A Journal of Gender, New Media, and Technology, 3*(1), 1–18. https://scholarsbank.uoregon.edu/bitstreams/e419ecd4-1e69-4d35-a8aa-00ad55244761/download(open in a new window)

Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.

Hartley, D. E. (2000). *On-demand learning: Training in the new millennium*. HRD Press.

Horvath, K., & Steinberg, M. (2023). Social classification and the changing boundaries of learning. a neopragmatic perspective on social sorting in digital education. *Learning, Media and Technology, 48*(4), 566–580. https://doi.org/10.1080/17439884.2023.2219900

Hutson, J., & Ceballos, J. (2023). Rethinking education in the age of AI: The importance of developing durable skills in industry 4.0. *Journal of Information Economics*, *1*(2), 26–35. https://doi.org/10.58567/jie01020002

Iqbal, M. Z., & Campbell, A. G. (2023). Adopting smart glasses responsibly: Potential benefits, ethical, and privacy concerns with Ray-Ban stories. *AI and Ethics, 3*(1), 325327.

Keefe, E. S. (2022). From detractive to democratic: The duty of teacher education to disrupt structural ableism and reimagine disability. *Teachers College Record, 124*(3), 115–147.

Klein, R., Kelly, K., Sinnayah, P., & Winchester, M. (2019). The VU way: The effect of intensive block mode teaching on repeating students. *International Journal of Innovation in Science and Mathematics Education, 27*(9) https://doi.org/10.30722/IJISME.27.09.004

Kudina, O., & Verbeek, P. P. (2019). Ethics from within: Google Glass, the Collingridge dilemma, and the mediated value of privacy. *Science, Technology, & Human Values, 44*(2), 291–314. https://doi.org/10.1177/0162243918793711

Kuhn, J., Lukowicz, P., Hirth, M., Poxrucker, A., Weppner, J., & Younas, J. (2016). gPhysics—Using smart glasses for head-centered, context-aware learning in physics experiments. *IEEE Transactions on Learning Technologies, 9*(4), 304–317.

Kumar, N. M., Krishna, P. R., Pagadala, P. K., & Kumar, N. S. (2018, August). Use of smart glasses in education-a study. In *2018 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC, 2018 2nd International Conference on* (pp. 56–59). IEEE. https://doi.org/10.1109/I-SMAC.2018.8653666

Lazarus, J. (2019). Hacking the MOOC: Towards a postdigital pedagogy of critical hope. *Postdigital Science and Education, 1*(2), 391–412. https://doi.org/10.1007/s42438019-00063-w

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (pp. 289–331). https://doi.org/10.1016/0147-1767(85)90062-8

Marín, V. I., Carpenter, J. P., Tur, G., & Williamson-Leadley, S. (2023). Social media and data privacy in education: An international comparative study of perceptions among preservice teachers. *Journal of Computers in Education, 10*(4), 769–795.

Marland, B., & Arantes, J. (2026). Reframing AI governance in education: Insights from the social model of disability. *Learning, Media and Technology, 1–16*. https://doi.org/10.1080/17439884.2025.2595443

Marland, B., Welsman, A., & Arantes., J. (forthcoming). Seeing clearly? A policy Brief for smart glasses in education. *The Australian Journal of Human Rights.*.

Núñez-Regueiro, F., Escriva-Boulley, G., Azouaghe, S., Leroy, N., & Núñez-Regueiro, S. (2023). "Motivated to teach, but stressed out by teacher education": A content analysis of self-reported sources of stress and motivation among preservice teachers. *Journal of Teacher Education, 75*(1), 76–91. https://doi.org/10.1177/00224871231181374

OECD (2025), *Education at a Glance 2025: OECD indicators*. OECD Publishing. https://doi.org/10.1787/1c0d9c79-en

Olinic, M.-S., Stretea, R., & Cherecheş, C. (2025). Wearables in ADHD: Monitoring and Intervention—Where are we now? *Diagnostics, 15*(18), 2359. https://doi.org/10.3390/diagnostics15182359

Oliver, B. (2019). *Making micro-credentials work for learners, employers and providers.* https://dteach.deakin.edu.au/wp-content/uploads/sites/103/2019/08/Making-microcredentials-work-Oliver-Deakin-2019-full-report.pdf

Pulungan, N. K., & Nora, Y. E. (2025). Students' experiences and meaning-making in AI-based adaptive learning in higher education. *Journal of Educational Innovation and Research, 1*(10), 424–434.

Renn, K. A., & Smith, B. R. G. (2023). Ecological models in higher education research: Overview and synthesis. *New Directions for Higher Education, 11–22*. https://doi.org/10.1002/he.20491

Romare, C., & Skär, L. (2023). The use of smart glasses in nursing education: A scoping review. *Nurse Education in Practice, 73*, 103824.

Sullivan, J. (2025). Children growing up digital: Applying Bronfenbrenner's ecological systems theory to technology and play. *International Journal of the Whole Child, 10*(2), 32–39. https://libjournals.mtsu.edu/index.php/ijwc/article/view/2676

Sutherland, I. E. (1968, December). A head-mounted three dimensional display. In *Proceedings of the December 9-11, 1968, fall joint computer conference, part I* (pp. 757–764).

Thomas, C. (2004). Rescuing a social relational understanding of disability. In C. Barnes & G. Mercer (Eds.), *Implementing the Social Model of Disability: Theory and Research* (pp. 32–47). The Disability Press.

Thomas, M. B., Muscat, A., & Marland, B. (2025). Building a picture of the block model: A scoping review. *Journal of Block and Intensive Learning and Teaching, 3*(1), 3–25. https://doi.org/10.15209/jbilt.1357

Tong, P., & An, I. S. (2024). Review of studies applying Bronfenbrenner's bioecological theory in international and intercultural education research. *Frontiers in Psychology, 14*, 1233925. https://doi.org/10.3389/fpsyg.2023.1233925

United Nations. (1990). *Convention on the Rights of the Child*.

United Nations. (2006). *United Nations Convention on the Rights of Persons with Disabilities.*

United Nations. (2025). *Sustainable development goals: Goal 4 quality education.* https://www.un.org/sustainabledevelopment/education/

World Bank. (2025). *Teachers.* Retrieved February 1, 2026, https://www.worldbank.org/en/topic/teachers

Zhang, Z., & Wang, X. (2024). Wearable sports smart glasses real-time monitoring and feedback mechanism in physical education. *EAI Endorsed Transactions on Pervasive Health and Technology*, *10*, Article 5531. https://doi.org/10.4108/eetpht.10.5531

Zheng, M., Liu, P. X., Gravina, R., & Fortino, G. (2018). An emerging wearable world: New gadgetry produces a rising tide of changes and challenges. *IEEE Systems, Man, and Cybernetics Magazine, 4*(4), 6–14.

Zuraikat, L. (2020). Google glass: A case study. *Performance Improvement, 59*(6), 14–20. https://doi.org/10.1002/pfi.21919

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Chapter 7
AI-Guided Reflection to Bridge Formal Learning and Work



Viktoria Pammer-Schindler, Eileen Kennedy, Vanessa Echeverria, and Allison Littlejohn

Abstract Formal on-demand online courses offer professionals a structured way to acquire knowledge that is relevant to their work, and can complement workplace learning. However, connecting between such formal learning and work brings two essential challenges: (1) identifying and articulating work-grounded learning objectives and mapping them to formal learning; and (2) transferring knowledge newly acquired in the learning space to the workplace. Reflection, guided by AI tools, may be a useful way to support these processes. This chapter first frames reflective practice as a way of working—with continuous reflection alongside work—and then presents three cases where AI-guided reflection bridged formal learning and work. In a socio-technical design space, AI tools can prompt and structure reflection, provide feedback, and offer data analytics as a "looking glass" on work practice. In doing so, they steer attention and shape how professionals reflect. At the same time, professionals retain agency to choose, configure, and use tools; but professionals' competence is a pre-requisite for effective such reflective practice. Subsequently, our vision for technology-oriented research is to further develop systems that (1) facilitate the articulation of learning needs, (2) facilitate knowledge transfer by using rich and multimodal evidence from the workplace to support AI-guided reflection, and (3) expand interaction affordances towards more situated and embodied AI-guidance (e.g., multimodal sensing and analytics, ambient prompts, voice-first

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coaching, agentic companions) that may better fit workplace constraints and ways of working, and (4) help professionals further develop their agency in reflective practice through such hybrid, multimodal and embodied AI. In parallel, a challenge for workplace learning-oriented research is to examine AI-guidance in-situ and to develop socio-technical AI design patterns, as combinations of technology design and usage. Formal on-demand learning providers are uniquely positioned to take up such AI-guidance as part of their offerings, with a recommendation to provide both tools and training in using tools, and teaching, coaching, and mentoring to build professionals' reflection competence.

Keywords AI in education · Technology-enhanced professional learning · Workplace learning · Reflection · Learning analytics · Socio-technical design

This chapter explores whether and how AI-guidance can facilitate professional learning through reflective practice. The literature shows a gap between learning in a formal classroom setting and applying the knowledge to work (Eraut, 2009; Littlejohn, 2023). This chapter explores ways to bridge this gap by connecting ongoing work with formal learning, such as on-demand learning. In particular we discuss identifying learning needs and transferring knowledge from formal learning settings to work practice as two key challenges for professionals; and AI-guidance and data analytics potential to support these processes.

In Sect. 7.1, we start by exploring the separate socio-technical spaces of work and formal learning and the need for professionals to connect them; and then theorise how reflection is one way to bridge formal learning and work. In Sect. 7.2, we present three case studies of AI-guidance in diverse socio-technical settings, and with different AI-guidance tools.

Section 7.3 synthesises theory and case studies, and lays out the socio-technical design space focusing on the role of tools in reflective practice and professionals' agency. In Sect. 7.4, we revisit the challenges professionals face when bridging between on-demand learning and work, identify socio-technical design and research challenges, and highlight opportunities for on-demand learning providers to facilitate reflective practice by integrating offerings around AI-guidance into their digital environments.

7.1 Theorising Reflective Learning as a Key Learning Mechanism for Lifelong Professional Learning

7.1.1 Professional Learning and Formal Learning

In rapidly changing labour markets, professional learning needs to be continual and sustained across the career lifespan (Jarvis, 2004; Littlejohn & Pammer-Schindler, 2022; Tynjälä, 2008). Professional learning is understood not as a sequence of isolated, pre-planned training events, but as a continuous, active, social, and practice-based process embedded in everyday work (Wilson & Berne, 1999). Professionals learn through a combination of formal learning, workplace practice, informal interactions, and experiences beyond work, all of which contribute to their evolving knowledge, skills, and professional identity (Tynjälä, 2008).

Within the wider context of professional learning, formal learning settings offer professionals a structured way to acquire knowledge that is relevant to their work, complementing the other ways of learning. Formal learning may be carried out either in-person or remotely, through synchronous or asynchronous interaction. Key characteristics are pre-defined learning objectives, content designed for the purpose of achieving these objectives, and facilitation of learning by a teacher. **On-demand learning** is a term generally understood to mean a **formal learning format that is accessed by professionals in response to their learning needs, identified in their ongoing work activities** (Hung et al., 2006). Further, we understand on-demand learning as practically associated with distance education formats that prioritise digital and flexible access to learning resources, usually with opportunities for certification including stackable micro-credentials that can be combined into micro-degrees (e.g., Ahsan et al., 2023; Peterson & Cox, 2025).

However, this focus on formal learning and credentialing rather than knowledge transfer from the classroom to the workplace may (inadvertently) lead to a problem. While informal and situated workplace learning is, by definition, tightly interwoven with work practice, formal learning settings are not well-integrated with practice. Although separating work and learning can be beneficial—by providing dedicated time and space for learning and designing activities whose primary purpose is not immediate task performance—there are questions around whether knowledge learned can easily be transferred to work. This makes it important to bridge work and learning.

This leads to two interrelated but distinct challenges: the first challenge is in connecting work goals and learning goals by (1) *identifying learning needs and how to address them.* This challenge requires continual monitoring of ongoing work practices, then judging them in sufficient depth to identify whether more learning is needed. Questions to be asked are, whether there are aspects of work practice that could be improved; whether these go beyond the professionals' current knowledge and competence; what specifically is the learning need, and how this can be reached. This is not a trivial task.

Assuming the professional can articulate his or her needs and a suitable formal learning setting is identified, there is then a second challenge around (2) how to *transfer knowledge acquired through formal training into work practice.* The challenge lies in having to contextualise and apply the knowledge that has been processed (~acquired) in a per definition decontextualised formal learning setting (Eraut, 2009). This is not to say that formal learning does not lead to learning; however the application of knowledge that has been learned in a different setting is not straightforward. This problem of knowledge transfer is well documented in the literature and constitutes a challenge on its own (ibid.; Littlejohn, 2023).

Reflection is understood as having the potential to act as a bridge between knowledge learned in a formal learning setting and the application of that knowledge in the workplace.

7.1.2 Reflective Practice

Schön's (1983) research on reflective practice defines the terms "reflective practice" and "reflective practitioner" as denoting ways of working, and people who engage in this way of working. In reflective practice, operative work is closely intertwined with the ongoing activity of monitoring, questioning and evaluating work; and strategic planning and goal setting for operative work.

Below we describe two specific structured representations of reflective practice in which work and reflection (monitoring, questioning, evaluating ongoing work; strategic planning and goal setting for future work) are intertwined.

In a **process view of reflection** (Fig. 7.1, cp. Krogstie et al., 2013), we can see reflection as a process in which ongoing work is continuously monitored (upward arrows with question marks in Fig. 7.1). Due to this monitoring, further reflection phases may be triggered[1] (longer downward with the small blizzard in Fig. 7.1). Via this process, ongoing work is connected to reflection. When the learner is ready, they move to the next phase of scoping and setting the scene. This phase involves identifying a particular issue that the learner wants to reflect on, then planning details of the actual reflection session. A "reflection setting" could be as simple as noticing an issue and thinking about the issue in the moment, engendering reflection. The term "reflection session", highlights that reflection happens at specific times in discrete settings. Often, one or more cycles of scoping and reflecting (cycles between scoping, setting the scene and reflection session) ensue. The final phase is applying insights that have arisen through reflection (termed "apply outcome" in Krogstie et al., 2013). This last phase focuses on goal setting (what should be changed) and strategic planning (how to make the change). Subsequently, reflection continues to accompany work

[1] Note that Krogstie et al. (2013) describe monitoring as part of work practice, but we view monitoring and questioning/evaluating as part of the reflection activity. This perspective is more in line with the object-oriented view of reflection (see below; and in Pammer-Schindler & Prilla, 2021); more helpful in the context of this chapter; and more in line with related theories such as self-regulated learning (Pintrich, 2004; Zimmerman, 2000).

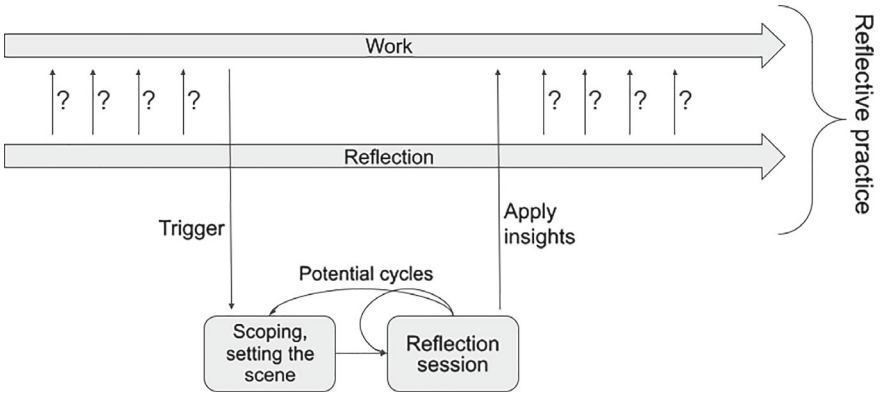


Fig. 7.1 Ongoing work and reflection together form reflective practice

practice after first insights are applied to (=transferred into) practice via continual monitoring and evaluation.

In an **object-oriented view of reflection** (Fig. 7.2, cp. Pammer-Schindler & Prilla, 2021), the focus is on the activity of reflection. Here, ongoing work practice is the object of reflection, which can be monitored, questioned and evaluated; and in which goals for adapting work practice are set and plans are made on how to achieve such goals. This perspective emphasises reflection as an activity that is directed towards work practice, even though at each specific time and place of reflection, only selected and specific aspects of work practice may come under scrutiny. The reflective practitioner is the subject of reflection, i.e. directs and carries out reflection, with the intention and agency to change the reflection object (= work practice!) if needed. This perspective therefore emphasises that the quality of the reflection activity largely depends on this person's overall goals in (professional) life, competencies, and perspectives. These factors drive the reflection activity. Tools used for reflection as well as the social context in which reflection happens impact how the professional reflects, and on which specific aspects.

7.1.3 Reflective Practice as Connecting Between Ongoing Work and Formal Learning

So how could reflective practice help professionals connect between ongoing work and formal learning? Remember, that we consider two connections between ongoing work and formal learning to be challenging: The first is moving from work practice to formal learning (identifying learning needs, and how to address them). The second is to transfer newly acquired knowledge from the formal learning setting into work practice.

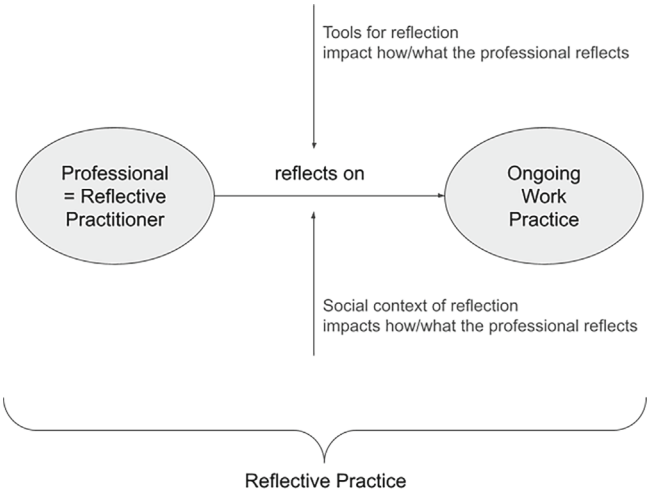


Fig. 7.2 Reflection as an activity has ongoing work practice as its object

Firstly, **reflective practice has the potential for professionals to identify learning needs**. As they continually monitor their own work practice, professionals may identify issues they experience in their work practice and understand the benefit of expanding their knowledge. Of course, learning needs can be identified with help: for instance, a supervisor, coach, or mentor could point out a learning need. Professionals may then decide, possibly with other colleagues—such as a supervisor, coach, or mentor—that a formal learning setting is best suited for them to acquire this knowledge. But knowledge can also be acquired in different ways; for example 'knowledgeable others' in the work social network may help the professional address the learning need. The red arrows, text and box in Fig. 7.3 illustrate this pathway from ongoing work practice, via the mechanisms of reflection, into formal learning.

Secondly, **professionals can use reflective practice to make formal learning more relevant to their ongoing work practice** (cp. Fig. 7.4). To do this the professional has to perform the following reflective steps:

- to review what has been learned through formal learning;
- to evaluate new knowledge in the context of ongoing work practice—what aspect of this knowledge is particularly useful and relevant (drawing on their agency);
- to decide which new knowledge should be transferred to work (goal setting);
- to plan how and when the new knowledge will be applied (strategic planning;
- and subsequently to monitor and evaluate work practice in light of new knowledge, acquired through formal learning;
- *which may trigger future reflection sessions.*

These steps bear similarity to typical self-regulation steps or phases (cp. Pintrich, 2004; Zimmerman, 2000); but self-regulated learning theory has been developed and mostly studied in the context of academic learning, whereas reflection theory

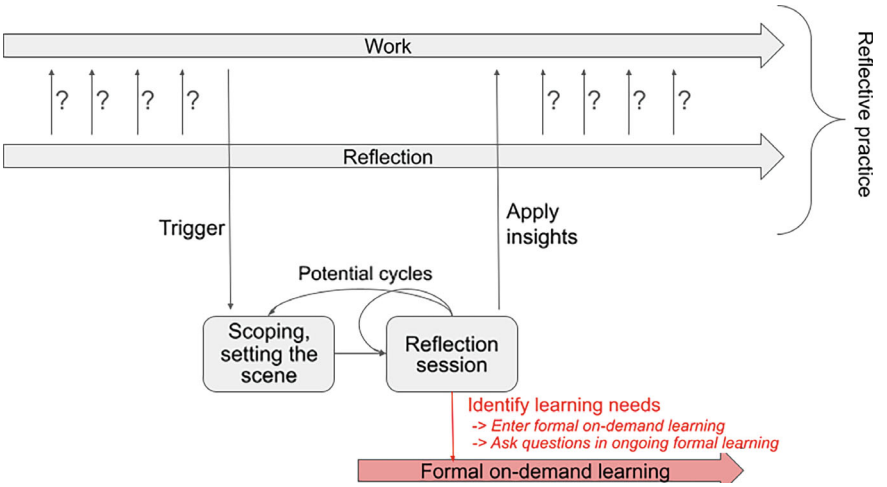


Fig. 7.3 The pathway from ongoing work practice, via the mechanisms of reflective learning, into formal learning

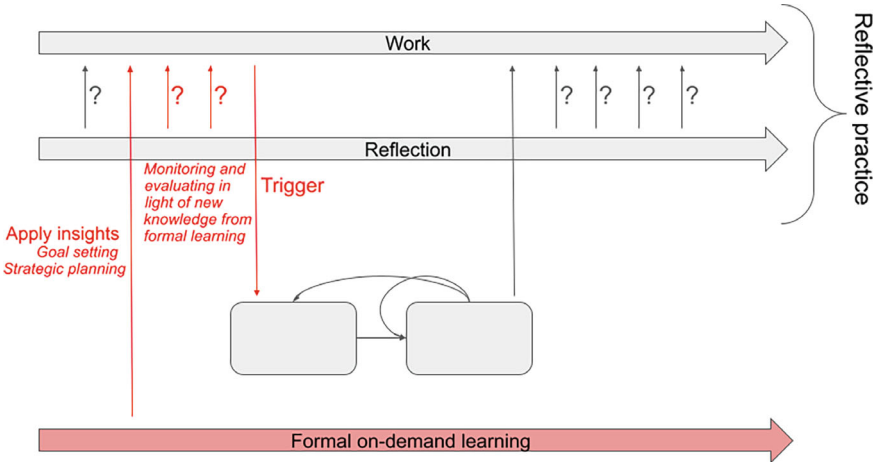


Fig. 7.4 The pathway from formal learning, via reflection, into work practice

has been developed and mostly studied in the context of work practice and workplace learning. In this work, we assume the underlying cognitive processes discussed in self-regulated learning and reflection theory to be similar, but the surrounding socio-technical context to be sufficiently distinct to not unnecessarily cross-over between these two bodies of literature and theories.

Clearly, such reflective practice is challenging; and the operative task of implementing planned change within work practice means the professional has to learn how to apply new knowledge in a new context (Eraut, 2009). Figure 7.4 (red pathways)

illustrates how knowledge can be transferred—via reflective practice—from a formal on-demand learning setting to the work practice setting: Taking formal learning as a starting point, the learner reviews what has been learned, assesses its workplace relevance, and decides on what should be transferred to work practice (=goal setting) and when and how to apply this new knowledge (=strategic planning). Subsequently, the professional monitors and evaluates work practice in light of the newly gained knowledge from formal learning, and with respect to the set goals. This pathway can be imagined as the professional developing the lens—informed by the formal learning—through which they will reflect on work practice.

This raises questions around whether and how AI can guide these reflective actions. Below we lay out three case studies, in order to ground our subsequent discussion of the potential and limits of AI to guide reflective practice.

7.2 Case Studies of AI-Guided Reflection

This section describes three case studies illustrating socio-technical interventions for supporting reflective practice as a bridge between formal learning and work. Strictly speaking, only the last case study qualifies as formal on-demand learning. Even so, the first two case studies show how technology-supported reflective practice can connect formal learning with work, offering insights for on-demand learning as well. In all the case studies, AI-guidance was iteratively co-designed with the target users and their representatives.

7.2.1 KnowSelf: Improving Time Management Practice Using Activity Log Data and Reflection Prompts

Time management is a pervasive challenge especially for professionals in knowledge-intensive jobs with high job autonomy and flexible schedules. A research prototype called **KnowSelf** was co-designed with IT and strategy consultants with the overall design goal to represent ongoing work in a manner that lends itself to reflecting on time use and management. Figure 7.5 shows a screenshot of the prototype. It provided two key functionalities:

1. Automatic activity logging plus individual note-taking; multiple visualisations aimed to answer typical questions that users might have about how they spent their working time.
2. Proactive reflection prompts to remind users to review their time use; and notify them of high worktime fragmentation.

The reflection prompts were technically simple, namely rule-based; and no feedback was given. An example prompt highlighted a high rate of switching between



Fig. 7.5 KnowSelf—A research prototype that captures fine-granular activity log data from a user's personal computer. (1) visualises worktime fragmentation per day and (4) visualises worktime fragmentation over multiple days. (2) provides a list of digital resources the user focused on, (5) visualises usage per a selected resource, and (3) provides statistics based on application

applications at either a pre-defined time or when a high number of switching was detected (*"On <date> between <from-time> and <to-time> you had higher switches than you usually have in that time. Do you have any idea why? […]"*).

Learning scenario: The prototype was investigated first in an exploratory study with seven IT consultants for two weeks (Pammer & Bratic, 2013), and subsequently in a six-week study at two sites, each with ten IT and technology consultants (Pammer et al., 2015; Fessl et al., 2017b). In all field studies, an introductory training/information session was given about time management, including typical time-management issues and strategies. These trainings were face-2-face and on-site; they were offered by the company with the researchers' support, with voluntary attendance for interested employees. In the second field study, usage of KnowSelf was embedded in time management coaching at one of the study sites. In this setting, KnowSelf was used as a tool in coaching, to be used in-between coaching sessions.

Note that this case study does not cover *digital* on-demand learning. We include it because it shows how data analytics and adaptive reflection prompts—used as simple AI-guidance—can support reflective practice that helps transfer knowledge from formal learning (face-to-face, on-site training) into daily work (see discussion below). It also highlights potential limits: the approach was more effective when

reflective practice was supplemented with coaching, even for a highly educated, self-directed user group (IT and strategy consultants).

Results from both studies highlight that the fine-granular activity log data—normally inaccessible to the reflective practitioners as there is simply no time in daily life to constantly take note of what they are looking at—helped users reach surprising and valuable insights. Substantial fragmentation of worktime was a major and relevant insight to users, together with more specific insights such as identifying concrete evidence for (too) much time spent on emails or Internet surfing (Pammer & Bratic, 2013). This highlights that relevant collected data about work, together with relevant analyses and understandable data visualisations can stimulate work-relevant insights. Results show that combining the data analytics tool with coaching was substantially more effective in terms of deciding to change time management behaviour, and changing (self-reported) time management behaviour (Pammer et al., 2015).

Discussion: These studies provide evidence that professionals derive relevant new insights when using data analytics designed for time management and adaptive reflection prompts to reflect on their work practice (Pammer & Bratic, 2013; Pammer et al., 2015; Fessl et al., 2017b). However, learning about and improving time management had been identified as a work-relevant learning/working objective prior to technology usage, such that we cannot consider that data analytics or AI-guidance technology contributed to identifying a learning need arising from work practice. Rather, we consider data analytics as having helped professionals transfer and contextualise knowledge about time management in their own work practice, as KnowSelf usage followed up on time management training, and was used between coaching sessions. In the context of the present chapter, this points towards the **potential for formal training to inform targeted data collection and data-driven reflection**. On the one hand, this potential could be developed as a learner-driven practice and community of practice in different fields, similar to the quantified self movement in personal areas of life (Li et al., 2010; Nafus & Sherman, 2014). On the other hand, this constitutes an opportunity for innovation of on-demand learning providers (cp. Sect. 7.4).

7.2.2 Rebo@Work—Conversational-Visual Reflection Guidance to Connect Between Curricular Learning Goals and Work for Apprentices

Learning Scenario: This research (Wolfbauer et al., 2023) is set in Austrian apprenticeship training. A vocational curriculum was used to guide apprenticeship learning, and both formal school-based education and practical work in companies that employ apprentices alternate. For most apprentices, their time is spent working in their companies. Apprentices' work is intended as instructional, supporting them to evolve from being novices to being skilled workers. However, it is easy for apprentices to lose sight of their curricular learning goals when they are immersed—for months—in

the workplace focused on work tasks. Therefore there is a need to support apprentices in connecting their training with their work.

Note that this case study does not describe formal *on-demand* learning. We include it to illustrate how technology-supported reflective practice can connect ongoing work practice with formal learning objectives, as an essential step for transferring what is learned in formal settings into the workplace.

Rebo@Work was designed to engage apprentices in reflection on their work, to identify how their recent work practice relates to the educational goals of their apprenticeship (pre-defined in a curriculum), and to formulate questions—if necessary—to their workplace supervisor. Following user-centred design steps (cp. Wolfbauer et al., 2023), Rebo@Work was implemented as a mixed conversational-visual interface, in which learning goals are visually displayed such that learners can navigate them (cp. Fig. 7.6); and where chatbot-style conversations are used to structure reflection. Apprentices as learners are given autonomy to decide about which aspects of their work they want to talk about with the chatbot agent—but they are requested to relate this discussion to pre-defined learning goals later in the conversation. The chatbot's adaptation mechanisms were based on simple, pre-defined rules for adaptive turns, and text similarity to identify learning goals that could be recommended to users should they need help in this regard.

Rebo@Work illustrates AI-guided reflection that prompts as well as structures reflection, and gives—very limited—feedback. It facilitates reflection that looks at work practice as the reflection object through the lens of learning goals; by taking a sequence of perspectives that are derived from reflection theory, and by connecting the learner back to real-world resources, such as their supervisor. This "way of

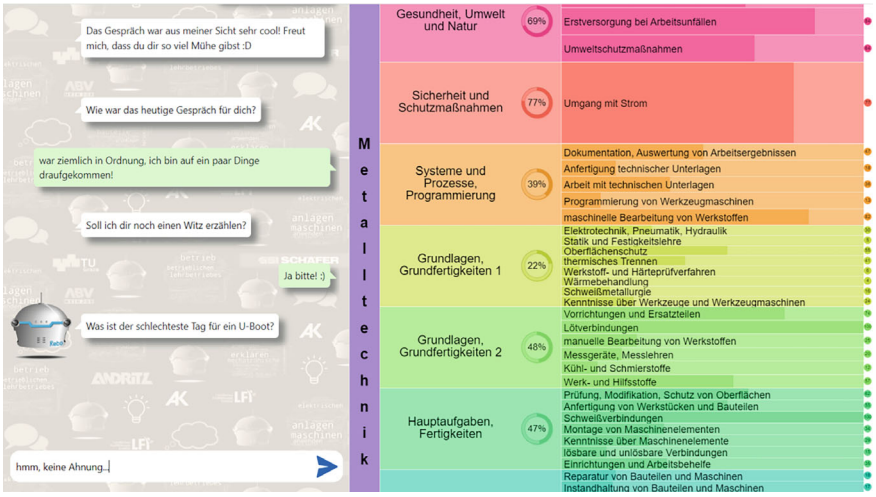


Fig. 7.6 Rebo@Work is a hybrid visual-conversational design, which shows categories of educational goals of apprentices (right-hand side; a detailed view with educational goals is available on click in each category), and the reflective conversation with the chatbot Rebo to the left

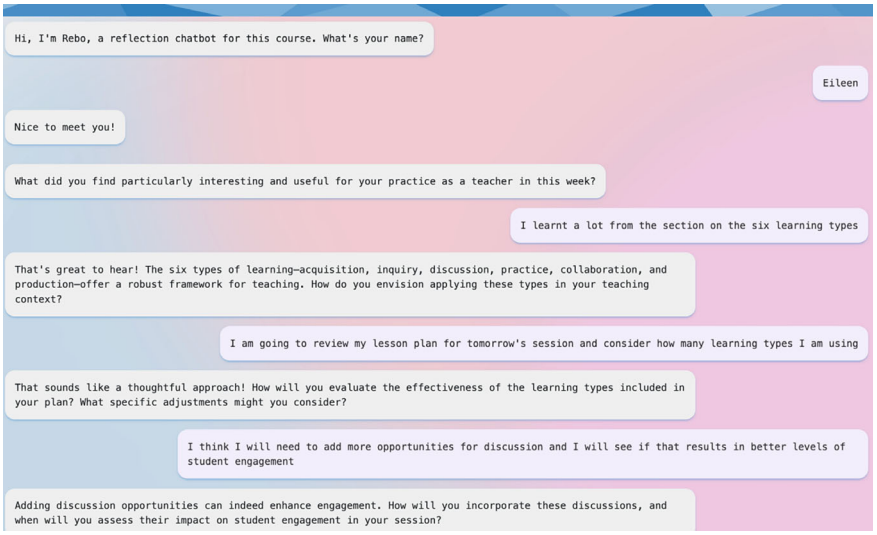


Fig. 7.7 The Reflect-and-Act chatbot's planning conversation, shown in this figure in the context of continued teacher education, focusing on instructional design. The conversation starts by asking the reflective practitioner to choose an aspect of the course content that is "particularly interesting and useful", thereby giving agency to the user. The planning conversation is accessible from within the course by link. Two weeks later, the Reflect-and-Act chatbot will send an email with a link to the reflection conversation

looking at the reflection object" is operationalised by the prompts and the chatbot's conversational structure, namely:

What did you do?

How did you feel?

How does this relate to set learning goals?

What did you learn?

What will you do similar/differently in the future?

Do you have questions for your supervisor?

This dialogue is intended to facilitate knowledge transfer from learning to working by first establishing a connection between the ongoing work practice and learning goals.

Discussion: In practical application in the field (Wolfbauer et al., 2023), apprenticeship trainers in companies were key stakeholders: on the one hand, when the apprentices work with Rebo@Work, this should reduce supervisor workload and it also means that the apprentices view their work from a learning perspective. On the other hand, supervisors were expected to set aside time for apprentices to use Rebo@Work, and were the first point of contact when they had questions about the tool. Thus, Rebo@Work was designed as a tool in a complex socio-technical system with the aim to connect between systems (formal and work-based learning) and stakeholders (apprentices and their supervisors) as a first step to knowledge transfer from

formal learning to practice. Secondly, when Rebo@Work asks apprentices whether there is a question for their supervisor, this constitutes a trigger to identify issues in work practice that should be taken up by people in a teaching role in the apprentices' environment (typically, this would mostly and ideally be their supervisors in the workplace; who have a mixed role as teacher/boss).

7.2.3 Reflect-and-Act Chatbot for Self-Directed Knowledge Transfer Between Formal Online Learning and Work Practice

The principle of AI-guided reflection is also employed via the **Reflect-and-Act chatbot.** This chatbot is embedded within scalable professional learning environments such as Co-designed Massive Open Online Collaborations (CoMOOCs—see below) (Kennedy & Laurillard, 2024; Kennedy et al., 2023), and makes connections from the course to work practice. In this case study, professionals are given the agency to freely choose which content from the course they want to transfer to their work practice.

CoMOOCs are technology-supported educational innovations for on-demand learning for professionals, particularly in challenging environments such as conflict and crisis settings, that use co-design with professionals to create flexible, digitally supported, collaborative learning experiences that enable professionals to share their practical knowledge with each other. Within the CoMOOC environment, the Reflect-and-Act chatbot supports the process of planning the application of newly acquired knowledge to practice, and reflection on this knowledge transfer and application (Kennedy et al., 2026).

A core design principle of the Reflect-and-Act chatbot is that it deliberately places agency and power in the hands of reflective practitioners in terms of choosing the topic that is transferred, and planning and reflecting on knowledge transfer. The Reflect-and-Act chatbot serves as an external stimulus and structured framework for reflection.

The chatbot's interaction is structured to respect the professional's agency:

- In a *planning conversation*, the agent prompts the reflective practitioner to identify what they found "interesting and useful" for their own practice, recognising that only the practitioner can determine what is relevant to their specific context. In this conversation, it also facilitates goal setting and strategic planning by asking teachers to think of a particular situation where they can apply what they learned.
- In a *reflection conversation*, the agent prompts the reflective practitioner to review how the plan went, and whether a face-2-face discussion with peers or mentors would be useful.
- The agent avoids providing authoritative advice, instead acting as a mirror or a tool for articulation that helps users clarify their own intentions and ideas.

The chatbot operationalises reflective practice through its conversational structure, prompts within this structure, as well as background knowledge about reflective conversations in order to give feedback. It is implemented using a contemporary Large Language Model (LLM) in the background to facilitate adaptive conversations at each step of the overarching conversational structure. To a limited degree, the chatbot also has background knowledge about the course content.[2]

Results: Experience with a non-adaptive version of the agent (i.e. scripted agent statements, without an underlying LLM powering adaptive conversations) shows that users developed relevant insights and plans, but that in particular plans lacked "specificity, measurability, and realism" (Kennedy et al., 2026). The adaptive and LLM-based version is currently running in two CoMOOCs in the context of continued teacher education, and the authors are planning to evaluate to what extent the implemented adaptive turns will be effective in helping professionals concretise and improve their plans and application of the CoMOOCs' content.

Discussion: In designing the chatbot, our intention was to use advanced language capabilities to enable naturalistic, context-aware dialogue, but ensure that the AI does not provide potentially harmful or irrelevant pedagogical advice in sensitive environments. Generic LLM chatbots often provide direct answers, suggestions, or advice, and may therefore indirectly undermine the learner's own critical thinking by offering ready-made solutions. In contrast, the Reflect-and-Act chatbot deliberately limits its capacity, so that the reflective practitioner remains the primary decision-maker regarding which and how knowledge from the course should be adapted to their specific work situation at hand.

By reining in the LLM's capacity to give unsolicited advice, the system ensures that the AI remains **a supportive tool for reflection guidance rather than an autonomous instructional agent**. This approach prioritises human and educational values, ensuring the tool respects the professional's culture and goals while providing a psychologically safe space for free expression and reflective dialogue.

7.3 Laying Out the Socio-Technical Design Space for AI-Guidance

In this chapter, we discuss AI-guidance as existing in a socio-technical design space from the following perspectives: What role can AI-guidance and data analytics play in reflective practice? We discuss this in general first for AI-guidance, and then secondly specifically for data-analytics-based guidance, and then revisit the case studies at an analytical level. Subsequently we discuss the professionals' agency in choosing, configuring, and using AI-guidance and data analytics in their reflective practice.

[2] Technically, this domain knowledge is implemented as a set of learning documents provided to the LLM-powered chatbot in a Retrieval-Augmented-Generation (RAG)-based approach.

7.3.1 Role of AI-Guidance and Data Analytics in Reflective Practice

1. *AI-Guidance to Trigger, Structure, and Give Feedback to Reflection*

Reflection can be facilitated by people in a professional teaching, coaching, mentoring or peer-support role (cp. Krogstie et al., 2013). The typical role of such reflection facilitators is to structure reflection sessions; and depending on their role, give feedback on different aspects of the reflective practitioner's statements.

By AI-guidance, we mean AI-based tools which are designed to simulate such a role, namely to trigger reflection via prompts, structure reflection, and give feedback to a reflective practitioner statements during reflection (Fessl et al., 2017a, 2017b; Ifenthaler, 2012; Krogstie et al., 2012). In all the case studies, AI-guidance was present—in the KnowSelf case study as adaptive prompting; in the other two case studies as conversational reflection guidance.

By prompting, we refer to the function of technology to remind the reflective practitioner to reflect in general or to concretely highlight interesting and unusual aspects in the ongoing work practice (cp. Fessl et al., 2017a), thus assigning to technology the role to **trigger reflection** (Krogstie et al., 2012), and to "make the user think" (cp. Ghajargar et al., 2018). A prompt is most often a single question ("*What would you do differently the next time?*") or a single sentence starter ("If *I had to give a single tip to a junior colleague, this would be …*") (cp. Fessl et al., 2017a). In the KnowSelf case study, single adaptive prompts were used.

By **structuring**, we refer to the function of technology to structure a reflection session. Structures could be provided using different *interaction designs*, such as visual or conversational. A simple visual structure could comprise multiple text fields to reflect on different questions or prompts. The Reflect-and-Act chatbot constitutes a conversational interaction design. Structuring helps users take into account different perspectives during reflection, and may suggest a coherent sequence. For instance, the learner could be prompted to progress from considering what is or was (description), to considering how practice should be (evaluation and goal setting), to how to achieve this (strategic planning). During reflection, an explicit structure helps users to separate the different metacognitive processes that are required (Wolfbauer et al., 2023). Further, repeated usage of computational reflection guidance is associated with learning how to reflect (ibid.).

By **giving feedback**, we mean that the reflective practitioners' statements are computationally analysed, and feedback is given either on aspects of the reflection process or on aspects of the reflection content. Feedback on aspects of the reflection process could concern for instance, whether the reflection statement is appropriately descriptive, evaluative, contains concrete goals or plans in the respective step of the reflection process. Such reflection analytics have been published based on student reflective essays (Cui et al., 2019; Kovanović et al., 2018; Ullmann, 2019), and within reflective conversations between an adaptive chatbot and apprentices (Wolfbauer et al., 2024). Feedback on aspects of the reflection content could concern the adequacy

of the practitioners' description of what is/has been happening, their evaluation, goals and plans.

Both the Rebo@Work and the Reflect-and-Act chatbot case studies illustrate how knowledge of the learning domain can be used to give feedback on the reflection content: within Rebo@Work, user statements are semantically matched to predefined learning goals and their explanations, thus helping ensure that apprentices conceptually connect their work to reasonably matching learning objectives. Within the Reflect-and-Act chatbot, technically the matching is at the level of learning materials rather than learning objectives; and the goal is similarly to ensure that learners formulate knowledge transfer plans that are in line with the course content.

Design Challenges & Risks for Reflective Practitioners: Defining the **interaction design, reflection stimuli to the user, and the reflection structure, as well as the feedback given by a system are key design choices**; and operationalise the designer's choices of what to pay attention to in reflection, and how to think about work practice as the object of reflection (cp. Pammer-Schindler & Prilla, 2021). Especially the possibility of automated feedback is constrained by AI-based systems' limits in terms of knowledge about reflection, the domain of working and learning, and situated practice. Moreover, **ongoing research is uncovering specific ways in which Large Language Model (LLM)-based systems' characteristics in language-based interaction are sufficiently different from language-based interaction amongst humans to lead to problems for human users**: hallucinations, i.e. presentation of statements as facts when they are really not, is one key issue that may be harmful in reflection; LLM-based systems' sycophantic (=overly pleasing) behaviour is another (Cheng et al., 2026). While hallucinations of an LLM-based agent as a tool in reflective practice may lead to the reflective practitioner receiving wrong advice, an agent's sycophantic behaviour could similarly reinforce wrong or problematic perspectives of the reflective practitioner. A more subtle but similarly not negligible long-term consequence might be the re-direction of reflective practitioners' capacity to engage in social interactions from humans to LLM-based conversational agents (cp. Seth, 2025).

2. *Data Analytics as a "Looking Glass" Through Which to Reflect Work Practice*

Data analytics played a role in only one of the case studies; and there is untapped potential for data analytics to support bridging between working and formal learning.

First, let us discuss the fundamental role that data analytics can play in reflective practice. Reflection can be considered a way to continually look at work practice holistically from a meta-perspective (cp. Fig. 7.2). A reflective practitioner may not need computational tools, but can rely on his/her imagination to think about work practice, to consider what is working well and what is not working well, then decide what can be done about this by setting goals, formulating plans, and so on. Computational tools can complement and extend such practice, by helping users to collect activity trace data about work practices, analysing data computationally and visualising it. By data, we here mean "atomic facts, basic elements of 'truth' without interpretation or greater context" (Donald Kraft in Zins, 2007). Thus, monitoring and

evaluating ongoing work practice, as part of ongoing reflective practice, becomes a technology-mediated practice.

Self-report and automatically logged activity trace data: Data are often understood as machine-created, quantitative, and therefore not easy for humans to understand, as machines do not understand how to interpret data they are collecting and, hence, "stupidly" collect it. However, the definition of "data" extends beyond 'digital' and includes manually written notes as well as digital videos or audio recordings, which may be recorded as 'self-report'. Such qualitative data may be powerful as an aid for human memory or when shared with others to provide professionals with resources they can reflect on and learn from.

Overall, there are nuanced trade-offs between different types of data collection (self-report vs. automatic) and data (self-reported, quantitative interaction log data, multimodal and qualitative data) in terms of ease of collecting data, professionals' agency in such data collection, relevance of data and potential privacy or confidentiality issues: on the one hand, automatically collected data can provide data normally inaccessible to human perception, for instance when it is measured by technical sensors (e.g., heart rate). Such data can be collected during workplace and organisational operations (Littlejohn, 2021; Pammer-Schindler & Prilla, 2021; Pammer-Schindler & Rosé, 2022; Ruiz-Calleja et al., 2021). On the other hand, there are constraints related to confidentiality and privacy when (re)using data collected for operative organisational purposes to support individual reflection, as well as ethical concerns. Pammer-Schindler and Rosé (2022) have highlighted ethical issues through real-world case studies, including a more in-depth discussion of the above KnowSelf case study. In general, secondary use of data collected for a different purpose can lead to ethical and legal problems (Nissenbaum, 1998).

Multimodal data: Contemporary developments in multimodal data analytics are able to capture qualitative data sources such as movement in physical space and spoken conversation (cp. Echeverria et al., 2019, albeit in a formal vocational training setting).

Of course, no set of data will be able to fully represent ongoing work practice; rather, collected data needs to be able to represent relevant aspects of work practice. For the purposes of reflection, the visual, data analytics based and partial representation of work practice complements the reflective practitioner's internal, mental, and also partial representation of work practice. Thereby, this visual representation can "create awareness of something that is worth being reflected on" (Pammer-Schindler & Prilla, 2021), and thereby trigger reflection.

Design Challenges & Risks for Reflective Practitioners: Which data are collected, how it is analysed and represented/visualised acts as "a modifier to the reflection activity" (Pammer-Schindler & Prilla, 2021). Subsequently, whoever chooses the data, analyses and visualisations substantially shapes the reflection activity. The **chosen data, analytics and visualisations constitute a "looking glass"**, an operationalisation of a concrete lens through which the professional will look at (=reflect about) their work practice. In this, different tools may allow users more or less agency in these choices. The **reflective practitioners' competent agency, in particular their digital and data literacy, as well as reflection competence, substantially**

shape the quality of such data-based reflection. This includes the competence to critically question the relevance of the collected data and data analyses to shed light on relevant aspects of work practice, the competence to develop actionable strategies based on data; and at a meta-level to assess the degree to which such a quantification/datafication of the (professional) self is appropriate for the selected learning/personal development goals (cp. the KnowSelf case study above; Nafus & Sherman, 2010 for an account of quantified self practice as self-directed and empowered technology-mediated practice; and Selwyn, 2019 for a more critical perspective on learning analytics as datafication, albeit in the context of formal education rather than workplace learning).

3. *AI-Guidance as Bridging Formal Learning and Work in the Case Studies*

How did AI-guidance and data analytics help professionals bridge between formal learning and work in the above case studies?

In the KnowSelf case study, the technological tool (AI-guidance plus data analytics) helped knowledge transfer—from time management training, or continued coaching—into work practice. The overarching learning objective of learning about and improving time management was set prior to the socio-technical intervention of "training + reflective practice facilitated by technology (KnowSelf) + coaching" (in one case study setting).

In the Rebo@Work case study, the tool helped to review ongoing work practice through the lens of (pre-defined via the apprentices' curriculum) learning goals. Therefore, we consider technology in this case study primarily to support knowledge transfer between formal learning and working; but we would argue that the directionality is less clear: firstly, the conversational structure also included prompts that asked apprentices to identify questions they had for their supervisors at work, with the intention to encourage help-seeking. In terms of connecting between working and learning, this means opening a path from ongoing work back to formal learning channels (even if the first suggested contact person is supervisors, as they are the ones available for questions on a daily basis for apprentices). In the Reflect-and-Act case study, the conversational agent facilitates knowledge transfer from formal learning to work practice, reflective practice subsequent to formal training; and opens a channel from practice to formal learning by asking learners about their desire for follow-up discussions with teachers and peers.

Thus, whereas we laid out two clear and distinct challenges—(1) identifying learning needs and (2) knowledge transfer—in the theory Sect. 7.2 above, in the practical use cases, we see back and forth between practice and formal training. Subsequently, **within the scope of the overarching learning objectives of the formal training, reflective practitioners continue to identify more concrete questions about their ongoing work practice** as part of this back and forth.

7.3.2 *Professionals' Agency in Using AI-Guidance*

Technology does not "make professionals reflect" and cannot—not on its own—bridge between formal learning and working. It's human agency that triggers reflection. Technology simply shapes professionals' reflections through the design of interaction design, prompts, structure, feedback; via the decision about which data are collected and how these are analysed and made visible (cp. Sect. 1.2, the object-oriented perspective on reflection depicted in Fig. 7.2). Beyond this, professional learning in the workplace depends on how practitioners interpret and act on workplace affordances—meaningful tasks, tools, guidance, feedback, and collaborative relationships (Billett, 2001; Engeström, 2001). Work-related learning is thus co-constructed through professionals' agency and organisational conditions (e.g., work design, mentoring, norms and accountabilities). It is therefore that rich learning environments—including AI-guidance—do not guarantee development without professionals' engagement and reflection in alignment with the socio-technical context of work. Therefore, in this section, we focus on professionals' agency in forming their reflective practice, based on the understanding that with the best possible technology design, it is its socio-technical embedding that acts as a key to effective workplace learning.

Technology design: By defining technical tools, technology designers shape professionals' reflective practice. Subsequently, technology design needs to be examined "in the wild", in order to understand socio-technical AI-design patterns, as combinations of technology design and usage. In terms of professionals' agency, **professionals or their companies have choice in which product to use but have limited choice in selecting specific features and affordances of the product**. Depending on the flexibility a tool offers for configuration, professionals have more or less choice in how to use a tool.

Socio-technical integration: Within each of the field studies, decisions were made by the research teams and stakeholder representatives on how to structure reflective practice and usage of AI-guidance (e.g., deciding on the 'initial time management' training and choosing whether to set up coaching; commissioning installation of activity logging in company computers, setting times and dates for apprentices' usage of Rebo@Work; integrating links to the Reflect-and-Act chatbot into the CoMOOC, etc.). At this level, depending on organisational structures and job roles, **professionals and other key stakeholders** (management, HR, IT, etc.) **use their agency to decide how material, technical tools are embedded into their work practice** at the technological level (system integration), organisational level (integration into work processes) and social/individual level (integration in work activities).

In all case studies, this socio-technical integration differed: in the KnowSelf case study, professionals autonomously allocated their working time towards deciding how to integrate technical and work activity. In the Rebo@Work case study, the apprentices' supervisors were important facilitators of reflective practice, by allocating time for reflection, and communicating reflective practice as "part of the job". In the Reflect-and-Act case study, the technical integration is important: If the link

was not "in the midst" of the online course, how would learners know about the available guidance?

Technology usage including configuration: In each of the field studies, professionals, acting as reflective practitioners, always had—and made use of—their agency in deciding about how to use the technologies: professionals had autonomy in deciding whether or not, and in what quality to reflect. In other words, reflection is discretionary: it cannot be ordered (cp. Kelloway & Barling, 2000 more broadly for all knowledge work). But of course, reflection can be encouraged, facilitated, motivated—or vice versa: discouraged, made cumbersome, frustrated—by the surrounding socio-technical system. However, **professionals can only use their agency effectively to reflect if they are competent**: in the reflection process (monitoring and evaluating own work; setting goals and planning strategies to achieve goals—often described as self-regulated learning competence in educational settings); in the learning and working domain (cp. Cuyvers et al., 2020; Jarvis, 2004; Kelloway & Barling, 2000; Kirschner et al., 2006; Li et al., 2026; Pintrich, 2004; Zimmerman, 2000); and need substantial digital, data and AI literacy in order to orchestrate the usage of tools with different roles in this interweaving of different activities (working, reflection, learning in a formal setting).

This points to a **trade-off between users' control over tools used in reflection, and required competence**. KnowSelf for instance gives users no choice over which data is collected automatically, how it is visualised, and only very little choice in which prompts are shown (only the frequency of proactive prompts could be changed). This has serious disadvantages, but a powerful advantage: KnowSelf was designed based on a substantial body of background literature on time management, common issues, and information visualisation design. Subsequently, choice of which data to collect, analyses and visualisations are expert choices. However, there are also off-the-shelf tools for AI-guidance and data analytics: the most general-purpose tools nowadays for conversational AI-guidance are off-the-shelf Large Language Model (LLM)-based chatbots like ChatGPT, Google Gemini, etc. The most general-purpose tools for data analytics for end users are Excel and other spreadsheet applications. Professionals have the choice to use such tools for reflection exactly as we described above—LLM-based chatbots as "sparring partners" in reflection; spreadsheet applications to collect, analyse, and visualise data about own work practice (or even using LLM-based chatbots also for this purpose). In comparison to the more purpose-specific and constrained tools that were used in the above-described case studies, such self-configured tools win in terms of control given to the professional in defining what aspects to focus on in reflection; which data to analyse and how (they don't facilitate data collection). At the other side of the coin, such configuration requires high levels of domain knowledge, reflection skills, digital and AI literacy in order to collect the right data and analyse and visualise it in a meaningful manner; and prompting an LLM to conduct a reflective conversation.

7.4 Discussion and Synthesis

In this chapter we revisit the challenges professionals face when bridging between on-demand learning and work, identify socio-technical design and research challenges, and highlight opportunities for on-demand learning providers to facilitate reflective practice by integrating offerings around AI-guidance into their digital environments.

7.4.1 Challenge 1: Identifying Learning Needs

It is challenging for professionals to identify their learning needs around their work practice (Littlejohn et al., 2012). None of our case studies above address this issue.

Socio-technical design and research challenges: **AI-guidance can help professionals to regularly reflect upon work and articulate their learning needs**. Via recommendation engines for learning objectives, courses, micro-degrees, etc. the task of identifying learning needs could become a task of choosing and deciding which of the recommended learning objectives/course fit, rather than constitute a completely open task of formulating learning needs (cp. Littlejohn et al., 2012). Domain knowledge in the working and learning domain could model typical learning needs of professionals in similar positions, workplace environments, tasks, etc. User interaction design for such recommendations could emphasise reflection of recommendations in relation to ongoing work practice, similar to the connective role laid out for reflection to facilitate knowledge transfer in this chapter. Risks with such recommendations are—as we now see in many different environments—that advertisement-focused business models will put paid-for advertised recommendations over the content-wise best recommendations. This relates to the socio-technical embeddedness of design teams and companies who develop technology. Professionals still and always will benefit from more expert peers, supervisors, coaches, and mentors who help with identifying issues and learning needs.

7.4.2 Challenge 2: Knowledge Transfer

In the use cases outlined in this chapter, AI-guidance was used in multiple ways to facilitate such knowledge transfer; however, data analytics appeared only in a single use case. Here, we see the potential for more: newly acquired knowledge could be used by professionals to drive purpose-specific data analytics to inform future reflective practice. This could be done by using off-the-shelf but domain-specific tools (as described e.g., in Khulbe et al., 2025 in the context of continued teacher education) or by professionals who self-configure data collection and analytics using off-the-shelf and domain-agnostic tools such as ChatGPT or spreadsheets (as frequently

described around quantified self literature, e.g., Li et al., 2010; Nafus & Sherman, 2014; and above towards the end of Sect. 7.3).

Socio-technical design and research challenges: As a specific technological opportunity, we see leveraging novel sensors and multimedia data analytics (Martinez-Maldonado et al., 2018) together with large language model technologies to collect and analyse data that represents subjective human experience and work practice in the physical space. Such data and analyses will constitute a new type of "looking glass" at work practice, and will aim to **facilitate knowledge transfer by using rich, embodied multimodal evidence from the workplace to support AI-guided reflection**. Future research is needed at the technical (multimodal data collection in the field; data analysis), interaction design (representing multimodal data, representing multiple viewpoints) and socio-technical level (ethical/legal considerations). Achieving this requires empirical evaluation focused on retention of knowledge by observing sustained changes in the workplace, and interdisciplinary, critical technology assessment. As a complement, due to new ethical risks around privacy and confidentiality in the face of richer multimodal data, scenario-based learning using automatically collected multimodal log data from real-world settings but curated for learning purposes may constitute a hybrid middleground (cp. Pammer-Schindler & Rosé, 2022—simulation-based training). Contemporary AI can facilitate this process of data review, content authoring and curation sufficiently to make the needed learning engineering viable in terms of required effort.

7.4.3 Challenge 3: Required Competences

Using AI-guidance to facilitate reflective practice highlights that professionals need good reflective practice competence.

- The ability to reflect—affective, behavioural, and cognitive capability to monitor and evaluate own work, redefine goals and plan for action appropriately.
- Competence in the epistemic domain—without which reflection could lack meaning.
- Digital and AI literacy to use AI-guidance and data analytics appropriately.

We therefore see substantial challenges for practitioners to have all these competencies.

Socio-technical design and research challenges: Future technologies should support the development of these competencies; while extant literature shows that **AI-guidance for reflection** (Wolfbauer et al., 2022) **and self-regulation** (Li et al., 2026; Littlejohn et al., 2012) **can help develop required competences**, empirical studies caution that AI can create a false sense of competence development, calling for critical scrutiny of AI-guidance (Gašević & Yan, 2026). Future research is needed that combines critical and design-oriented investigation that highlights patterns of technology design and usage that facilitate learning. Secondly, traditional formal knowledge-based approaches such as intelligent tutoring could be connected with

conversational and generative AI-based approaches, in order to combine language-based interaction with deterministic and theory-led feedback. Future research will have to connect to ongoing research in hybrid (symbolic, subsymbolic and language-technologies based) and responsible AI in this endeavour. For AI-guided reflection, the underlying need is to achieve reliable and correct feedback, to operationalise reflection theory; and to investigate interaction design beyond graphical user interfaces such as by voice and interaction with embodied AI agents. The latter may mean ambient prompts, voice-first coaching, or agentic companions that help professionals develop agency in reflective practice by in-situ, personalised and contextualised guidance.

7.4.4 Opportunities for On-Demand Learning Providers

In this challenging space, we see formal and digital on-demand learning environments as uniquely well placed to facilitate reflective practice through **including offerings for AI-guidance for reflection—thereby** making their service more effective. On-demand learning providers—as offering digital, formal learning environments, optimised for responding to workplace learning needs, and flexible access by learners—could offer domain-specific AI-guidance that helps professionals set goals on knowledge transfer to practice, and operationalise domain knowledge in the learning domain to help professionals reflect on this knowledge transfer—similar to the Reflect-and-Act chatbot we have presented above, which helps apprentices to think about their work in terms of learning objectives, as the basis for connecting learning content from formal learning to activities in the workplace. On-demand learning environments could go beyond this, by **providing tools and training for professionals to set up data analytics to monitor their future work practice** in light of knowledge newly acquired in formal learning; and last but not least teach, coach and mentor professionals to further develop their (metacognitive) reflection competence in order to become reflective practitioners as lifelong work-integrated learners.

7.4.5 Synthesis

As reflection constitutes a core strategy for lifelong professional learning that accompanies and interweaves with work practice, it can, in principle, bridge formal learning such as digital and formal on-demand learning, and work. Key challenges for professionals in making this connection are (1) to identify learning needs and (2) to transfer knowledge from formal learning to work.

In the context of formal on-demand learning, AI-guidance can operationalise this bridge by scaffolding reflection and articulating such reflective practice, complementing organisational initiatives such as one-on-one coaching or supervisor feedback: we envision data analytics to provide evidence from authentic work as a baseline in reflective practice and constituting a "looking glass" at work practice in which specifically selected aspects (collected data, analyses and visualisations) become more easily visible. AI-guidance, by prompting, structuring, and giving feedback to reflection, shapes what the professional pays attention to in reflection, and how to think about work practice as the object of reflection. Technically, future research could develop and investigate systems that (1) facilitate the articulation of learning needs, (2) facilitate knowledge transfer by using rich and multimodal evidence from the workplace to support AI-guided reflection, and (3) expand interaction affordances towards more situated and embodied AI-guidance (e.g., multimodal sensing and analytics, ambient prompts, voice-first coaching, agentic companions) that may better fit workplace constraints and ways of working.

Across all these discussions, we have conceptualised AI-guidance as socio-technically embedded tools of reflective practice, and have subsequently focused our discussion on identifying the professionals' agency in choosing, configuring, and using tools; and professionals' competence as the baseline pre-requisite for technology to be able to reach its potential. Subsequently, future systems design needs to understand tools from the ground up as impactful, but still only—tools in a socio-technical system, and account for professionals needing substantial metacognitive reflection, domain competence, and digital and AI literacy as a pre-requisite. Technically, future research could develop and investigate systems that aim for (4) responsible, hybrid, multimodal and embodied AI that helps professionals further develop their agency in reflective practice through theory-driven scaffolding, and reliable and correct feedback.

In turn, on-demand learning environments have the opportunity to take up AI-guidance as part of their offerings; with our recommendation being to provide both tools and training in how to use specific tools; and teaching, coaching and mentoring to build professionals' reflection competence.

Finally, looping back to our discussion of AI-guidance as existing in a socio-technical design space, we highlight that responsible technology design needs be conceptualised as socio-technical design, considering as relevant units of analysis: multiple stakeholders' interests and agency; technology usage in heterogeneous socio-technical systems; and socio-technical design patterns in the sense of combinations of technology design and usage, which are to be studied "in the wild" in order to take up realities of diverse workplaces and lived experiences of the professionals.

References

Ahsan, K., Akbar, S., Kam, B., et al. (2023). Implementation of micro-credentials in higher education: A systematic literature review. *Education and Information Technologies, 28*, 13505–13540. https://doi.org/10.1007/s10639-023-11739-z

Billett, S. (2001). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning, 13*(5), 209–214.

Cheng, M., Lee, C., Khadpe, P., Han, D., & Jurafsky, D. (2026). Sycophantic AI decreases prosocial intentions and promotes dependence. *Science, 391*(6792). https://doi.org/10.1126/science.aec8352

Cui, Y., Wise, A. F., & Allen, K. L. (2019). Developing reflection analytics for health professions education: A multi-dimensional framework to align critical concepts with data features. *Computers in Human Behavior, 100*, 305–324. https://doi.org/10.1016/j.chb.2019.02.019

Cuyvers, K., Van den Bossche, P., & Donche, V. (2020). Self-regulation of professional learning in the workplace: A state of the art and future perspectives. *Vocations and Learning, 13*(2), 281–312.

Echeverria, V., Martinez-Maldonado, R., & Buckingham Shum, S. (2019). Towards collaboration translucence: Giving meaning to multimodal group data. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI '19)* (Paper 39, pp. 1–16). Association for Computing Machinery. https://doi.org/10.1145/3290605.3300269

Ellingson, J. E., & Noe, R. A. (Eds.). (2017). *Autonomous learning in the workplace*. Routledge.

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work, 14*(1), 133–156.

Eraut, M. (2009). Transfer of knowledge between education and workplace settings. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context* (pp. 201–221). Routledge.

Fessl, A., Blunk, O., Prilla, M., & Pammer, V. (2017a). The known universe of reflection guidance: A literature review. *International Journal of Technology Enhanced Learning, 9*(2/3). https://www.inderscienceonline.com/doi/abs/10.1504/IJTEL.2017.084491

Fessl, A., Wesiak, G., Rivera-Pelayo, V., Feyertag, S., & Pammer, V. (2017b). In-app reflection guidance: Lessons learned across four field trials at the workplace. *IEEE Transactions on Learning Technologies, 10*(4), 488–501. https://doi.org/10.1109/TLT.2017.2708097

Gašević, D., & Yan, L. (2026). Generative AI for human skill development and assessment: Implications for existing practices and new horizons. In Organisation for Economic Co-operation and Development, *OECD Digital Education Outlook 2026: Exploring effective uses of generative AI in education*. OECD Publishing.

Ghajargar, M., Wiberg, M., & Stolterman, E. (2018). Designing IoT systems that support reflective thinking: A relational approach. *International Journal of Design, 12*(1), 21–35. https://www.ijdesign.org/index.php/IJDesign/article/viewFile/2972/799

Hung, D., Tan, S. C., & Chen, V. (2006). Learning on-demand via technologies that facilitate mobility: The issues of relevancy and access. *Educational Technology*. https://www.jstor.org/stable/44429347

Ifenthaler, D. (2012). Determining the effectiveness of prompts for self-regulated learning in problem-solving scenarios. *Journal of Educational Technology & Society, 15*(1), 38–52. http://www.jstor.org/stable/jeductechsoci.15.1.38

Jarvis, P. (2004). *Adult education and lifelong learning: Theory and practice*. Routledge.

Kelloway, E. K., & Barling, J. (2000). Knowledge work as organizational behavior. *International Journal of Management Reviews, 2*(3), 287–304. https://doi.org/10.1111/1468-2370.00042

Kennedy, E., Guo, X., Kopkow, A., Littlejohn, A., & Pammer-Schindler, V. (2026). The Reflect-and-Act Chabot: Fostering applied professional learning for teachers in challenging environments. In *Innovation and Education*. Brill.

Kennedy, E., & Laurillard, D. (2024). *Online learning futures: An evidence-based vision for global professional collaboration on sustainability*. Bloomsbury. https://www.bloomsbury.com/uk/online-learning-futures-9781350324237/

Kennedy, E., Laurillard, D., & Zeitoun, S. (2023). The Comooc model for global professional collaboration on sustainability. *EMOOCs 2023 : Post-Covid Prospects for Massive Open Online Courses - Boost or Backlash?, 350*, 291–303. https://doi.org/10.25932/PUBLISHUP-62480

Khulbe, M., Tammets, K., Ley, T., Coelho, R., Kurvits, J., & Cukurova, M. (2025). Exploring teachers' adoption of learning analytics enhanced pedagogical practices: A longitudinal intervention study. *Technology, Knowledge & Learning, 30*, 2011–2033. https://doi.org/10.1007/s10758-025-09896-w

Kirschner, P. A., Sweller, J., & Clark, R. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Kovanović, V., Joksimović, S., Mirriahi, N., Blaine, E., Gašević, D., Siemens, G., & Dawson, S. (2018). Understand students' self-reflections through learning analytics. In *Proceedings of the 8th International Conference on Learning Analytics and Knowledge (LAK '18)* (pp. 389–398). ACM. https://doi.org/10.1145/3170358.3170374

Krogstie, B. R., Prilla, M., & Pammer, V. (2013). Understanding and supporting reflective learning processes in the workplace: The CSRL model. In *Scaling up Learning for Sustained Impact. EC-TEL 2013. Lecture Notes in Computer Science*, 8095. Springer. https://doi.org/10.1007/978-3-642-40814-4_13

Krogstie, B. R., Prilla, M., Wessel, D., Knipfer, K., & Pammer, V. (2012). Computer support for reflective learning in the workplace: A model. In *12th IEEE International Conference on Advanced Learning Technologies (ICALT 2012)*. IEEE.

Li, I., Forlizzi, J., & Dey, A. (2010). Know thyself: Monitoring and reflecting on facets of one's life. In *CHI '10 Extended Abstracts on Human Factors in Computing Systems (CHI EA '10)* (pp. 4489–4492). Association for Computing Machinery. https://doi.org/10.1145/1753846.1754181

Littlejohn, A. (2021). Professional learning analytics. In A. Wise, D. Gasevic, A. Merceron, G. Siemens, & C. Lang (Eds.), *Handbook of learning analytics* (pp. 141–151). Society for Learning Analytics and Research.

Littlejohn, A. (2023). Challenges of digital professional learning: Digital technology systems are no substitute for human agency. In *Third international handbook of lifelong learning* (pp. 1201–1218). Springer International Publishing.

Littlejohn, A., Milligan, C., & Margaryan, A. (2012). Charting collective knowledge: Supporting Self-regulated learning in the workplace. *Journal of Workplace Learning, 24*(3), 226–238. https://doi.org/10.1108/13665621211209285

Littlejohn, A., & Pammer-Schindler, V. (2022). Technologies for professional learning. In C. Hartelis, D. Gijbels, & E. Kyndt (Eds.), *Handbook of research approaches on workplace learning*. Springer. https://doi.org/10.1007/978-3-030-89582-2_15

Li, X., Li, T., Yan, L., Li, Y., Zhao, L., Raković, M., Molenaar, I., Gasevic, D., & Fan, Y. (2026). FLORA: An advanced AI-powered engine to facilitate hybrid human-AI regulated learning. *Computers & Education, 243*, Article 105527. https://doi.org/10.1016/j.compedu.2025.105527

Martinez-Maldonado, R., Echeverria, V., Santos, O. C., Santos, A. D. P. D., & Yacef, K. (2018, March). Physical learning analytics: A multimodal perspective. *Proceedings of the 8th International Conference on Learning Analytics and Knowledge*, 375–379. https://doi.org/10.1145/3170358.3170379

Nafus, D., & Sherman, J. (2014). Big data, big questions | This one does not go up to 11: The quantified self movement as an alternative big data practice. *International Journal of Communication, 8*.

Nissenbaum, H. (1998). Protecting privacy in an information age: The problem of privacy in public. *Law and Philosophy, 17*(5/6), 559–596.

Pammer-Schindler, V., & Prilla, M. (2021). The reflection object: An activity-theory informed concept for designing for reflection. *Interacting with Computers.* https://doi.org/10.1093/iwc/iwab027

Pammer-Schindler, V., & Rosé, C. (2022). Data-related ethics issues in technologies for informal professional learning. *International Journal of Artificial Intelligence in Education, 32*, 609–635. https://doi.org/10.1007/s40593-021-00259-x

Pammer, V., & Bratic, M. (2013). Surprise, surprise: Activity log based time analytics for time management. *Extended Abstracts of the ACM SIGCHI Conference on Human Factors in Computing Systems.* https://doi.org/10.1145/2468356.2468395

Pammer, V., Bratic, M., Feyertag, S., & Faltin, N. (2015). The value of self-tracking and the added value of coaching in the case of improving time management. Design for teaching and learning in a networked world. In *EC-TEL 2015. Lecture Notes in Computer Science*, 9307. Springer. https://doi.org/10.1007/978-3-319-24258-3_41

Peterson, P. L., & Cox, C. B. (2025). Adapting to the future: How microcredentials fuel self-directed learning in the evolving workplace. *Industrial and Organizational Psychology, 18*(1), 139–142.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*(4), 385–407. https://doi.org/10.1007/s10648-004-0006-x

Ruiz-Calleja, A., Prieto, L. P., Ley, T., Rodríguez-Triana, M. J., & Dennerlein, S. (2021). Learning analytics for professional and workplace learning: A literature review. *IEEE Transactions on Learning Technologies, 14*(3), 353–366. https://doi.org/10.1109/TLT.2021.3092219

Schön, D. (1983—Reprint 2006). *The reflective practitioner—How professionals think in action.* Ahsgate.

Selwyn, N. (2019). What's the problem with learning analytics? *Journal of Learning Analytics,6*(3), 11–19. https://doi.org/10.18608/jla.2019.63.3

Seth, A. K. (2025). Conscious artificial intelligence and biological naturalism. *Behavioral and Brain Sciences*, 1–42. https://doi.org/10.1017/s0140525x25000032

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review, 3*(2), 130–154.

Ullmann, T. D. (2019). Automated analysis of reflection in writing: Validating machine learning approaches. *International Journal of Artificial Intelligence in Education, 29*, 217–257. https://doi.org/10.1007/s40593-019-00174-2

Wilson, S. M., & Berne, J. (1999). Chapter 6: Teacher learning and the acquisition of professional knowledge: An examination of research on contemporary professional development. *Review of Research in Education, 24*(1), 173–209.

Wolfbauer, I., Bangerl, M., Hamidovic, A., & Pammer-Schindler, V. (2024). *Reflection analytics in educational Chatbot Rebo: A field study with apprentices.* Technical Report. https://zenodo.org/records/14062181

Wolfbauer, I., Bangerl, M. M., Maitz, K., & Pammer-Schindler, V. (2023). Rebo at work: Reflecting on working, learning, and learning goals with the reflection guidance Chatbot for apprentices. *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems (CHI EA '23).* https://doi.org/10.1145/3544549.3585827

Wolfbauer, I., Pammer-Schindler, V., Maitz, K., & Rosé, C. (2022). A script for conversational reflection guidance: A field study on developing reflection competence with apprentices. *IEEE*

Transactions on Learning Technologies, 15(5), 554–566. https://doi.org/10.1109/TLT.2022.3207226

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7

Zins, C. (2007). Conceptual approaches for defining data, information, and knowledge. *Journal of the American Society for Information Science and Technology, 58*, 479–493. https://doi.org/10.1002/asi.20508

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Chapter 8
Microcredentialing Framework for On-demand Learning: Easing Tensions and Expanding Learning Pathways



Melinda dela Peña Bandalaria and Myra Collado Almodiel

Abstract The shift from what used to be a space for college degree holders to a preference for relevant skills or what individuals can do to further drive productivity, efficiency, and cost-effectiveness is reshaping the global labor market. The industry's growing preference for skills over college diplomas is being attributed to several factors, including the gap between what skills graduates possess and what employers demand, and the rapid technological advancements, including the integration of Artificial Intelligence in the workplace. The labor market continues to face challenges and disruptions, and the need for on-demand learning is growing as industry trends and requirements shape the knowledge and skills of the labor pool. This paper advances microcredentialing as a form of on-demand learning as a strategic framework to address the fast-changing competency requirements of the industry and provide a possible sustainability model for universities, enabling governments to propel economic growth, progress, and development, and ease the tension between the value of the college diploma and companies' skills-based hiring preferences. Using the University of the Philippines Open University (UPOU) as a case illustration, the study presents the microcredentialing models and frameworks in developing microcredentials and how they are being credited and stacked. This study highlights how microcredentialing can be a strategic framework to ease the tensions between the value-attached aspiration of having a college degree, and the increasing trend of skills-based hiring, given its features of responding to on-demand learning and carrying equivalent course credits for the learning engagements, to create pathways and bridges toward the value-laden academic degrees.

Keywords On-demand learning · Microcredentials · Skills-based hiring · Online learning

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8.1 Introduction

The world of work is changing. What used to be a space for college degree holders has increasingly shifted to a preference for relevant skills or what individuals can do to further drive productivity, efficiency, and cost-effectiveness. This shift can be attributed to the rapid modernization of technology which results in corresponding changes in the knowledge and skills of those using them, the skyrocketing cost of higher education "causing people to leave higher education with a three-year's-worth of knowledge and crippling debt" (The Adecco Group, 2020), the rise of remote and distributed work (Pong, 2024), transitioning to environmentally sustainable jobs (Bone et al., 2025) and ESG-compliant work place, and the technological revolution driven by the advent of Artificial Intelligence (Bone et al., 2025).

However, many still argue for the advantages and primacy of college degrees. Lawyers, medical doctors, teachers, and architects are just some of the jobs and professions that still require a certification confirming that the relevant academic degree and professional licensure have been obtained. In addition, many cultures, as in the case of Asia, still put a high value on college education and academic degrees. This can be rooted in "certain Confucian values", foremost of which is "the strong belief in the importance of education both for individuals and society at large" (Green & Phan, 2025).

The value that Asians place on higher education is also supported by admission and enrollment data outside the region. In the US, for instance, while only comprising 7.2% of the US population, Asians account for "more than 20% of the undergraduate student body at Ivy League universities, including Harvard, whose most recent incoming class is 29.9% Asians" (Amponsah & Haidar, 2023; Lee et al., 2024). Asian American students are also "more likely to complete high school and also more likely to earn bachelor's and postgraduate degrees" (Xie & Goyette, 2004, as cited in Lee et al., 2024). Previous studies have postulated that the high correlation between occupational attainment and social standing is a possible explanation (Liu & Xie, 2016). Maneejuk and Yamaka (2021) also observed that while secondary enrollment rates positively affect economic growth, higher education appears to be the key to future growth and sustainability.

The increasing predominance of the preference for skills-based hiring over college degree-based qualifications resulted in tensions and raised the question:

Are college degrees still relevant?

On a bigger scale, a few more questions are raised:

Does the degree conferment role of universities gear toward obsolescence?

How can universities transform their instruction function so as not to disrupt the century-old tradition and the rooted value placed on academic degrees?

8.2 The Industry's Growing Preference for Skills over College Diplomas

Recent studies suggest the increasing preference for job candidates' skills over college diplomas (Bone et al., 2025; Fuller, 2025). This shift can be attributed to the following:

1. The observation, which had surfaced, not just recently but many years back, of the "mismatch between the pace of evolution in formal education and the labour market" (Bone et al., 2025).

This mismatch is substantiated by a number of research findings:

- the workforce is not fully prepared with the skills needed for emerging Industry 5.0 jobs, nor are current educational curricula sufficiently aligned to these future needs (Chigbu & Makapela, 2025);
- there exists a difference between graduates possessed skills and employers demand, and between achievement level of students and achievement level demanded by employers (Uzair-ul-Hassan & Noreen, 2013);
- in China, almost a quarter of recent college graduates are "not working in jobs that are related to their college major (mismatched)", which, to some extent, reflects the quality of college education (Jiang & Guo, 2022);
- the gap between the knowledge structure, technical ability and practical experience of graduates cultivated by the higher education system and the needs of the industry has become more and more obvious with the rapid development and intelligent upgrading of manufacturing technology (Hua & Dizon, 2025);
- gaps between skills taught to graduates and the needs of the industries result in "weak talent pipeline, and specialized expertise scarcity" (Sanvictores, 2024); and,
- in Kenya, results of a study showed that the mismatch is a result of many factors which include among others "being forced by parents to pursue unwanted fields, inadequate training curriculum at colleges or universities, rapid technological changes" (Khakina, 2025, p. 258).

Indeed, formal educational institutions find it difficult to keep pace with rapidly changing labor market requirements and technological advancements (Alekseeva et al., 2021; Bone et al., 2025; Lutz et al., 2021).

2. The transition toward Green Economy or a human-centric and sustainable approach to innovation (Chigbu & Makapela, 2025; European Commission, 2021, Grego et al., 2024; Grybauskas & Cárdenas-Rubio, 2024; Shahidi Hamedani et al., 2024). This shift also accounts for the human factor, which drives changes toward the future of work, the relevant competencies for which can be learned outside a tertiary education institution and curriculum.
3. Rapid technological advancements like the increasing integration of Artificial Intelligence in the workplace are "reshaping the labor market" and demanding

new skills, the acquisition of which requires new approaches, which conventional providers find challenging (Bone et al., 2025). For AI job postings, for instance, the higher education premium has disappeared, "as postings offer comparable wages, whether they ask for a university degree or not, showing that candidates' AI skills and experience are as – or even more – valuable for firms than university degrees" (Bone et al., 2025).

4. Companies find it challenging to hire and retain suitable candidates when they limit themselves to individuals with higher educational degrees in specific fields (Bone et al., 2025).

8.3 The Value of Higher Education and a College Diploma

A college diploma has always been considered a "passport for upward economic mobility" and a door to many opportunities associated with better social standing. The granularity of this framework is provided by an extensive body of knowledge which argues for the value and advantages of higher education and college diplomas: boost earning potential (Bone et al., 2025; Brooks, 2024; Gagnon, 2024; Pew Research Center, 2016); increase chances of employment (Brooks, 2024; Gagnon, 2024); and lower possibility of unemployment (Pew Research Center, 2016). Other advantages were forwarded by various authors (Brooks, 2024; Gagnon, 2024) as follows: expand career opportunities; prepare for the future in terms of time management strategies; build relationships which can be a great way to start a professional network and make lasting connections; achieve one's personal goals, e.g., getting a degree; make a difference in society, which many universities are encouraging their students to do. A survey conducted by Pew Research Center (2016) also showed that "those without a college degree can find their upward mobility in the job market limited by a lack of educational credentials".

The 5.0 discourse, which consists of Industry 5.0, Work 5.0, and Education 5.0, argues that Industry 5.0 workplaces will require not only advanced technical skills but also "transversal skills like problem-solving, creativity, adaptability, and collaborative competencies sometimes called "21st-century skills" which Education 5.0 seeks to cultivate" (Chigbu & Makapela, 2025; Shahidi Hamedani et al., 2024; Tiron-Tudor et al., 2025), which at the very least would require a bachelor's degree (Puri, 2026).

There was also data which suggest that a college diploma still matters. While job postings do not specify formal education requirements, the expectation that applicants have a college diploma remains embedded in hiring practices, suggesting a gap between policy and practice (Fuller, 2025; Puri, 2026).

From a macro perspective, and a possible reason for many governments' high investments, "higher education is considered one of the key factors driving economic growth and competitiveness for every country" (Maneejuk & Yamaka, 2021). Higher education institutions are likely to produce graduates with the potential to invent and develop new technology, and can help transform a country into a knowledge-based economy (Maneejuk & Yamaka, 2021). The authors also articulated the possible

explanation for the correlation between higher education and economic growth in terms of increased production efficiency and improved quality of outputs as a result of competencies acquired in higher education.

8.4 On-Demand Learning

On-demand learning refers to "how a learner accesses knowledge" (Wiseman, 2022), emphasizing immediate, flexible access to information and learning resources tailored to the learner's needs and context. In an on-demand learning environment, learners can decide what, when, and how to access learning resources based on their needs. Moreover, it is characterized by its flexibility and ubiquity in the learning process, and is supported by digital platforms and delivered through diverse formats such as videos, podcasts, games, blog posts, e-learning modules, job aids, and more.

The mode of delivery is key, thereby reducing, if not eliminating, potential barriers to learning such as time, location, and formal enrollment requirements, allowing seamless access to learning resources.

While on-demand learning, in its various forms, can strategically respond to learners' needs for flexibility and immediacy needs of the learners, providing proof of the knowledge and skills acquired, especially in informal learning settings, presents a challenge for both employees and employers.

8.5 The Need for on-Demand Learning

The labor market continues to face challenges and disruptions. The abrupt disruption, for instance, during the COVID-19 pandemic, necessitated the immediate acquisition of knowledge and skills that had previously been relegated to the backshelves in many workplaces. In the education sector, for instance, teachers needed to learn how to teach online, which required IT and digital literacy beyond the basic level.

While other disruptions are not as abrupt, industry trends and requirements impact on the knowledge and skills of the labor pool. The rapid advancement in science and technology continuously yields technologies and processes that deliver better products and services. From a simple fast-food experience where orders were taken by a person, now transformed into digital kiosks connected to the kitchen and digital payment facilities, to medical equipment, facilities, and services, we are seeing the impact of technology on our lives. The backend of these experiences, however, is people with the relevant knowledge and skills who use the technology and apply improved processes to deliver a better frontend experience.

The increasing level of AI integration is one concrete example of the current digital technology disruption impacting work processes. One side of AI integration is the "complementation of human capacities" (Bone et al., 2025), which can result in improved productivity, efficiency, and, in some cases, quality, but others see AI

as having the "potential to replace humans, by completing tasks autonomously" (Acemoglu & Restrepo, 2019; Bone et al., 2025). Both perspectives, however, imply the need to know and possess the relevant knowledge and skills to use AI in the workplace.

Another disruption is the transition to the Green Economy, which requires industries to adopt green practices across their technologies and workplace processes. While the practice of Corporate Social Responsibility, which foregrounds the Green Economy, has been in existence for quite some time, more concrete measures and indicators anchored on the Environmental, Social, and Governance (ESG) Framework are now pushing companies to take the direction of the Green Economy.

Unfortunately, "the workforce is not meeting the needs of the economy and that the demand for talent is far outreaching skills supply, particularly in novel domains" (Bone et al., 2025). Some studies also show that "in the absence of skilled workers, businesses struggle to implement and develop new technologies, innovate and compete" (Bone et al., 2025; Strietska-Ilina, 2007).

The traditional framework is for industries to rely on academic institutions to produce the labor force for the industry, as a result of the instruction function of the universities. It could be deduced, however, that the same institutions, the universities, have triggered the current disruptions in the labor market through their R&D function, which propelled the rapid advancements in technologies. Unfortunately, there is a lag in education's adaption of technological advancements, which can probably be a result of the disconnect between academia and industry (Bone et al., 2025; Dwivedi et al., 2024; UNESCO, 2022). For instance, a UNESCO survey conducted in 2022 found that across 190 countries, only 15 were developing AI curricula, resulting in misalignment with industry needs (Bone et al., 2025).

These disruptions and shifts in the labor market require employers to be "present-ready" and ensure the sustainability of operations by having a labor force with "future-ready" knowledge and skills. Unfortunately, the conventional form of learning is no longer practical. Learning what you need to know now and at the time you need it, or on-demand learning, is the way to go.

8.6 Microcredentialing as a Form of on-Demand Learning: A Proposed Framework to Ease the Tension

The Future of Jobs Report 2023, released by the World Economic Forum, projected that "six in ten workers will require upskilling or reskilling by 2027" (World Economic Forum, 2020). With only half of the workers having access to adequate training facilities, a stronger collaboration between the academe and the industry, supported by a conducive policy environment, is seen as a possible mechanism to bridge the gap between education and the future of work (Chigbu & Makapela, 2025). Microcredentialing is seen as having strong potential to address current skills needs and enable a sustainability model for both industry and educational institutions.

Microcredentialing "recognizes a skill or competency that has been acquired through an organized learning process and validated through an assessment" (OECD, 2021).

Various authors provided detailed articulations of microcredentials as follows:

- records of the learning outcomes that a learner has acquired following a small volume of learning, focused on one topic of study or skill (European Commission, 2022, as cited in Bozkurt & Brown, 2022; OECD, 2021; UNICEF, 2024),
- assessed against transparent and clearly defined criteria (European Commission, 2022, as cited in Bozkurt & Brown, 2022; OECD, 2021),
- digital proofs of meeting defined learning outcomes that are assessed, quality-assured, and verified by a trusted body (Bozkurt & Brown, 2022; OECD, 2021),
- employer/industry involvement in program design and/or approval and validation of assessment instruments (OECD, 2021),
- expected to provide metadata transparently showing the learner's identity, awarding body, date of issue, study hours needed to achieve the learning outcomes (including credit value and level if applicable), type of assessment, and form of participation,
- can be stackable (Bozkurt & Brown, 2022; OECD, 2021) or combinable with other verified qualifications or used on their own as evidence of learning,
- are often designed to be more flexible in their delivery, compared to traditional degree programs (OECD, 2021; Stand Together, n.d.)

Aside from being a form of lifelong learning or continuing education, microcredentials offer several advantages from the perspectives of learners, industry, government, and policymakers.

1. Provide the proof, in digital form, of the competencies acquired by the learners, which can easily be validated and confirmed.
2. Address the need for on-time short-term learning engagements that would provide specific competencies the industry needs for the labor force, and immediate certification of learning.
3. Can be designed with flexibility and ubiquity that suit the various types of learners, especially those who are working or cannot participate in the conventional mode of education.
4. Lower cost.
5. Provide bridges and pathways to earning academic degrees.
6. Facilitate access and inclusion to learning opportunities.

On the side of the academe, the microcredentialing framework offers the following possibilities:

1. Increased viability and reputation of the institution (Kato et al., 2020; OECD, 2021).
2. Integration of microcredentialing into the curriculum "allows for small-scale experimentation of new pedagogies and technologies, including innovations in teaching and learning and more flexible delivery modes" (OECD, 2021).

3. A marketing strategy for a university's degree programs (tapping into the high value that many cultures still place on education) or a larger potential pool of learners, leading to recruitment efficiencies (Hollands & Tirthali, 2014; OECD, 2021).
4. A sustainability model or cost savings associated with the reuse of course materials (OECD, 2021).
5. A business model for financial sustainability with short learning programs providing Higher Education Institutions with an additional revenue stream (Kato et al., 2020; OECD, 2021) that is less regulated by governments (OECD, 2021).
6. A mechanism for the university to perform its Social Responsibility mandate, since microcredentialing is also recognized by governments as a potential means to support improved access to higher education, including for learners from underserved groups (OECD, 2021).
7. Delivered online or at least 80% digitalization of the learning processes, microcredentialing can greatly decrease the carbon impact of student and staff travel (Versteijlen et al., 2017).

Microcredentialing has attributes that can address the fast-changing competency requirements of the industry, provide a possible sustainability model for universities, enable governments to propel economic growth, progress, and development, and ease the tension between the value of the college diploma and companies' skills-based hiring preferences. It is, however, necessary to develop a coherent microcredential framework that could provide a means of organizing, orienting, and integrating non-formal education programs with formal education (OECD, 2021) in an ecosystem comprised of the various stakeholders.

What makes microcredentials distinct from other forms of common or usual lifelong learning engagements, especially the informal ones, is its attributes of having a credit-unit equivalent anchored on a transparent credit-assigning mechanism usually used by universities, which can be stacked toward a macrocredential, possibly a college diploma and a defined qualifications level anchored on a standard and transparent qualifications framework (e.g., Philippine Qualifications Framework) to facilitate credit recognition and transfer. These attributes enable microcredentialing to occupy that unique space or the gap not addressed by the usual four-year degree programs and training/on-demand courses to address the need for immediate reskilling or upskilling.

For microcredentials to fulfill this unique role, the following essentials must be present in the microcredentialing ecosystem.

1. A QA Framework to facilitate credit recognition, transfer, and stacking. Some of the important pillars of quality include the credibility of the institution offering the microcredentials, the microcredential development process, qualifications of the teaching staff, and assessment/validation of the learning process.
2. Industry-Government-Academe working together to recognize emerging occupations and anticipate employers' needs (Bone et al., 2025).
3. Academic policies to support quality integration in the development and offering of microcredentials and in credit recognition and transfer.

4. Flexibility/ubiquity in learning modality.

8.7 The Microcredentialing Models at the University of the Philippines Open University (UPOU)

UPOU (www.upou.edu.ph) is one of the constituent units of the University of the Philippines (www.up.edu.ph), the only national university in the Philippines. Established in 1995, it was mandated to democratize access to quality higher education through the distance mode of instructional delivery. In 2001, the university started integrating the online component into its teaching and learning process. The whole teaching and learning ecosystem became fully online in 2007. In 2014, Republic Act 10650 was enacted, which tasked the university to provide leadership in the development and offering of open distance e-learning courses and programs, as well as in the development of learning models appropriate for this mode of instructional delivery.

In 2023, the university began reviewing its learning programs to determine how it can better respond to the lifelong learning needs of the labor force, while balancing its traditional roles and social responsibility of a university. Microcredentialing provides an ideal framework.

Figure 8.1 presents the enhanced, sustainable lifelong learning framework, which integrates microcredentialing into the university's teaching and learning ecosystem of the university. In the framework, the unique attributes of credit-equivalent and qualifications level, which enable it to be stacked toward a macrocredential, set it apart from other learning programs offered by the university. Its duration and skill-specific nature, on the other hand, differentiate it from the university's degree programs of the university, the duration of completion of which ranges from 2 to 6 years.

UPOU's microcredentials are offered as standalone courses. Depending on how the learners see it fit, they can be used as is or can be stacked toward a macrocredential, which is the added value of this form of learning engagement. Stacking toward a macrocredential can be done at UPOU or at other HEIs in the country that have adopted the microcredentialing framework. The adoption of microcredentialing by other academic institutions was enabled by the Commission on Higher Education (CHED) Memorandum Order No. 1 Series of 2025 (https://www.scribd.com/document/912784888/CMO-No-1-s-2025).

At UPOU, the identification and development of microcredentials follow three models:

1. Co-development/Recognition of microcredentials developed and offered by partner institutions in collaboration with the university and stacking them toward a macrocredential. An example of this is the microcredentials designed for social workers. The Department of Social Welfare and Development Academy (DSWD Academy) has developed and is offering training programs for professional social workers in collaboration with UPOU. These training programs have

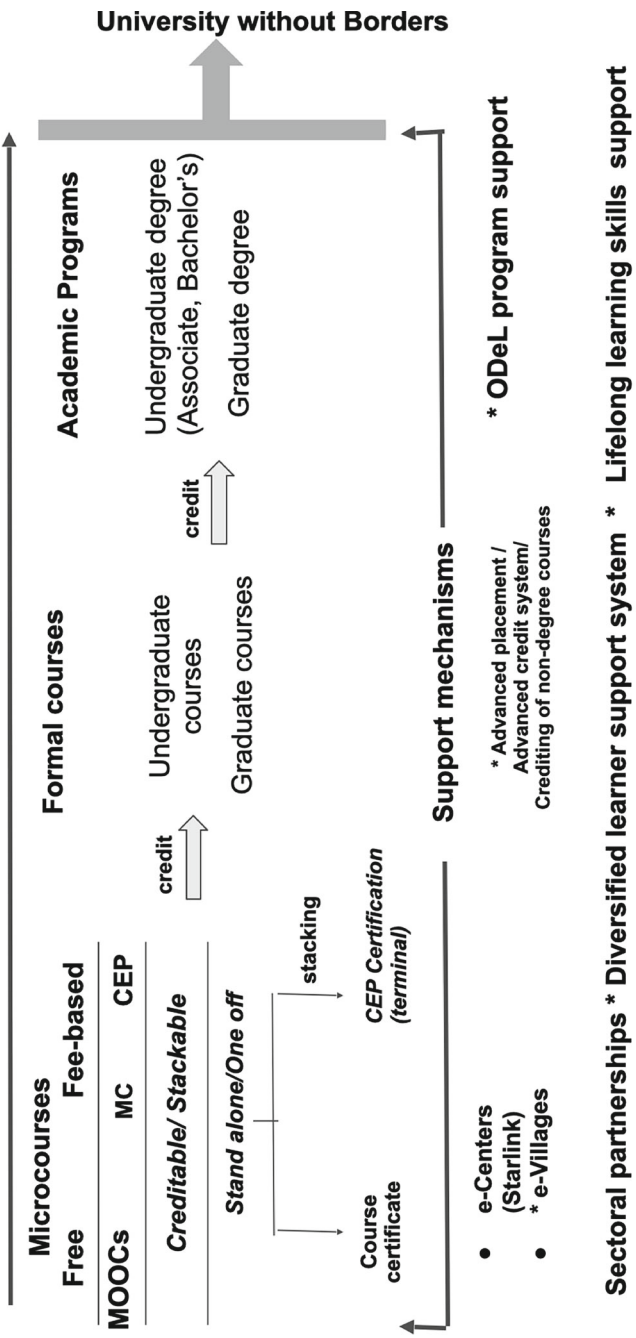


Fig. 8.1 The enhanced and sustainable Lifelong Learning Framework of UPOU (Workshop-generated) (UPOU, 2023)

been converted to microcredentials and have been mapped to the existing degree programs of the university (Diploma/Master's in Social Work), and thus the credits earned can be stacked toward these degrees (https://fmds.upou.edu.ph/archives/news-and-events/9414/).
2. Development and offering of microcredentials in partnership with the industry partners. Under this model, the current and projected competency needs of the major industries serve as the basis for identifying relevant microcredentials to develop and offer. A concrete example is the set of Web Development microcredentials (https://fics.upou.edu.ph/news/upou-fics-introduce-front-end-development-microcredentialing-courses-in-fics-launching-event/).
3. Unbundling of credit courses, usually courses with 3-credit units, into smaller chunks addressing the specific competencies required by the industry. Specific examples are the courses under the Master of Nursing Education program (https://www.facebook.com/UPOUOfficial/posts/the-upou-faculty-of-management-development-studies-in-collaboration-with-the-up-/934084928761550/) and the Massive Open Online Course on Fundamentals of Resilience, which have equivalent credits and can be stacked toward the Master's in Climate and Disaster Resilience to be offered by the university (https://www.preventionweb.net/event/fundamentals-resilience-mooc-series-free-online-courses-climate-and-disaster-resilience).

The crediting and stacking of microcredentials, on the other hand, can take the following forms:

1. Integration into the Degree Program. Under this model, microcredentials are stacked toward a 3-unit course, which can be an elective or a substitute course in a university degree program. This model can reduce the length of time to complete the requirements of a degree program since microcredentials can be taken alongside the other courses in the degree program where the student is enrolled. The stacked microcredentials can partially fulfill the requirements of the degree program.
2. Degree Enhancement. In cases where the stacked microcredentials cannot be used as substitutes or electives of a degree program, they can be considered degree enhancements, that is, supplements to the competencies acquired by the individual from the degree program, thus enhancing his/her credentials.
3. It should be noted that while formal education continues to serve as employment currency, the possession of specific, relevant skills, as in the case of AI and jobs anchored in the green economy, may distinguish one candidate from another (Bone et al., 2025).
4. Rebundling of the unbundled courses. Under this model, the microcredentials resulting from the unbundling of credit courses can be rebundled and credited within the degree program of which they originally were part of. Examples of this are the microcredentials from the courses under the Master of Nursing Education. Upon admission to the program, those who have completed the microcredentials applied for the stacking and credit recognition of the credits earned.

With its attributes, microcredentialing can be the Framework that can serve as a concrete representation of the 5.0 discourse as proposed by Chigbu and Makapela (2025): Industry 5.0, Work 5.0, and Education 5.0. It is fluid enough to accommodate the futures of work configurations.

8.8 Conclusion

Microcredentialing can be a strategic framework to ease the tensions between the value-attached aspiration of having a college degree and the increasing trend of skills-based hiring. Given its features of responding to on-demand learning and carrying equivalent course credits for the learning engagements, it creates pathways and bridges toward the value-laden academic degrees. Under the microcredentialing framework, universities can stay relevant in their ascribed role of academic degree conferment. The adoption of microcredentialing, as a form of on-demand learning, can also enable universities to update their curricular programs and align them with industry requirements. This requires a transformative shift by universities from the traditional way of identifying and developing academic program offerings to a more future-ready perspective, which integrates the pillars of sustainability.

This transformative shift aligns with the framework proposed by Chigbu and Makapela (2025), the two pillars of which are skills development pathways that bridge education, industry, and labor, and sustainability as a unifying normative anchor across ecological, social, and economic dimensions. The implications of this transformation include "aligning innovation policy, curriculum reform, and labour protections under SDG-coherent strategies, and piloting metrics that capture well-being, equity, and productivity" (Chigbu & Makapela, 2025).

The critical role of the universities in microcredentialing was further articulated by Council of the European Union (2022) in terms of making "possible the targeted, flexible acquisition of knowledge, skills, and competencies to meet new and emerging needs in society and the labor market and make it possible for individuals to fill the skill gaps they need to succeed in a fast-changing environment, while not replacing traditional qualifications". This was further supported by OECD (2021) in their report that "Learners who avail of micro-credential programmes provided by higher education institutions tend to be more educated, more skilled and have greater levels of financial and social support from employers".

Stand Together (n.d.) looks at microcredential as the one shaping the future of work. It isn't "just a tool for individual advancement; it's a strategy for building a future workforce that is skilled, adaptable, and ready to meet the challenges of tomorrow. As more organizations embrace these programs, microcredentials pave the way for a dynamic labor market where skills and mutual benefit take precedence over outdated credentials".

References

Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labor. *Journal of Economic Perspectives, 33*(2), 3–30. https://doi.org/10.1257/jep.33.2.3

Alekseeva, L., Azar, J., Giné, M., Samila, S. P., & Taska, B. (2021). The demand for AI skills in the labor market. *Labour Economics, 71*, 102002. https://doi.org/10.1016/j.labeco.2021.102002

Amponsah, M. N., & Haidar, E. H. (2023, March 31). Harvard College accepts 3.41% of applicants to Class of 2027. *The Harvard Crimson*. https://www.thecrimson.com/article/2023/3/31/admissions-decisions-2027/

Bone, M., Ehlinger, E., & Stephany, F. (2025). Skills or degree? The rise of skill-based hiring for AI and green jobs. *Technological Forecasting and Social Change, 214*, 124042. https://doi.org/10.1016/j.techfore.2025.124042

Bozkurt, A., & Brown, M. (2022). Microcredentials: Stackable, combinable, or transferable qualifications. In *EdTechnica: The open encyclopedia of educational technology* (pp. 155–161). EdTech Books. https://doi.org/10.59668/371.8264

Brooks, E. D., II. (2024). Why a college degree is still a great return on investment. *University Business*. https://universitybusiness.com/why-a-college-degree-is-still-a-great-return-on-investment/

Chigbu, B., & Makapela, S. (2025). AI in education, sustainability, and the future of work: An integrative review of industry 5.0, education 5.0, and work 5.0. *Journal of Open Innovation: Technology, Market, and Complexity, 11*(4), 100645. https://doi.org/10.1016/j.joitmc.2025.100645

Commission on Higher Education. (2025). *CHED Memorandum Order (CMO) No. 1, Series of 2025: Guidelines for the development, approval, and recognition of micro-credentials in Philippine higher education*. https://www.scribd.com/document/912784888/CMO-No-1-s-2025

Dwivedi, Y. K., Jeyaraj, A., Hughes, L., Davies, G. H., Ahuja, M., Albashrawi, M. A., Al-Busaidi, A. S., et al. (2024). "Real impact": Challenges and opportunities in bridging the gap between research and practice—Making a difference in industry, policy, and society. *International Journal of Information Management, 75*, 102750. https://doi.org/10.1016/j.ijinfomgt.2023.102750

European Commission. (2021). *Industry 5.0: Towards a more sustainable, resilient and human-centric industry*. Directorate-General for Research and Innovation. https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/industry-50-towards-more-sustainable-resilient-and-human-centric-industry-2021-01-07_en

Fuller, J. (2025). Harvard research: Fewer than 1 in 700 get hired without a college degree. *Harvard Business School Institute for Business in Global Society.* https://www.hbs.edu/bigs/joseph-fuller-college-degree-gap

Gagnon, D. (2024). *Top 7 reasons why college is important*. Southern New Hampshire University. https://www.snhu.edu/about-us/newsroom/education/why-is-college-important

Green, A., & Phan, H. (2025). Culture, context, and East Asian high-performing education systems. *Research Papers in Education, 1–23.* https://doi.org/10.1080/02671522.2025.2567396.

Grego, G., Nenna, F., & Gamberini, L. (2024). XR-based digital twin for Industry 5.0: A usability and user experience evaluation. In *Proceedings of the International Conference on Extended Reality (XR)* (pp. 387–403). Springer.

Grybauskas, A., & Cárdenas-Rubio, J. (2024). Unlocking employer insights: Using large language models to explore human-centric aspects in the context of industry 5.0. *Technological Forecasting and Social Change, 208*, 123719. https://doi.org/10.1016/j.techfore.2024.123719

Hollands, F. M., & Tirthali, D. (2014). Why do institutions offer MOOCs? *Online Learning, 18*(3). https://doi.org/10.24059/olj.v18i3.464

Hua, R., & Dizon, C. S. (2025). Addressing skills mismatch between STEM education and manufacturing industry needs: A literature review. *International Journal of Education and Social Development, 2*(2), 116–118. https://doi.org/10.54097/4pg52849

Jiang, S., & Guo, Y. (2022). Reasons for college major-job mismatch and labor market outcomes: Evidence from China. *China Economic Review, 74*, 101822. https://doi.org/10.1016/j.chieco.2022.101822

Kato, S., Galán-Muros, V., & Weko, T. (2020). *The emergence of alternative credentials* (OECD Education Working Papers, No. 216). OECD Publishing. https://doi.org/10.1787/b741f39e-en.

Khakina, P. (2025). Factors contributing to mismatch between professional training and actual work done among college and university graduates in Kenya. *Iconic and Research Engineering Journals, 8*(9), 258–266. https://www.irejournals.com/formatedpaper/1707423.pdf

Lee, J., Goyette, K., Song, X., & Xie, Y. (2024). Presumed competent: The strategic adaptation of Asian Americans in education and the labor market. *Annual Review of Sociology, 50*, 455–474. https://doi.org/10.1146/annurev-soc-090523-051614

Liu, A., & Xie, Y. (2016). Why do Asian Americans academically outperform whites? The cultural explanation revisited. *Social Science Research, 58*, 210–226. https://doi.org/10.1016/j.ssresearch.2016.03.004

Lutz, W., Reiter, C., Özdemir, C., Yildiz, D., Guimaraes, R., & Goujon, A. (2021). Skills-adjusted human capital shows rising global gap. *Proceedings of the National Academy of Sciences, 118*(7), e2015826118. https://doi.org/10.1073/pnas.2015826118

Maneejuk, P., & Yamaka, W. (2021). The impact of higher education on economic growth in ASEAN-5 countries. *Sustainability, 13*(2), 520. https://doi.org/10.3390/su13020520

OECD. (2021). *Micro-credential innovations in higher education: Who, what and why?* OECD Publishing. https://doi.org/10.1787/f14ef041-en

Pew Research Center. (2016). *The value of college education.* https://www.pewresearch.org/social-trends/2016/10/06/5-the-value-of-a-college-education/

Philippine Qualifications Framework. (2023). *Philippine Qualifications Framework*. https://pqf.gov.ph/Home/Details/7

Pong, C. (2024). 90% of companies make better hires based on skills over degrees. *Forbes.* https://www.forbes.com/sites/cynthiapong/2024/12/26/90-of-companies-make-better-hires-based-on-skills-over-degrees/

Puri, S. (2026, January 28). Where do college degrees still matter in a "skills-first" job market? *LinkedIn Hiring Lab.* https://www.hiringlab.org/2026/01/28/where-do-college-degrees-still-matter-in-a-skills-first-job-market/

Republic of the Philippines. (2014). *Republic Act No. 10650: An Act Expanding Access to Educational Services by Institutionalizing Open Distance Learning in Levels of Tertiary Education.* https://lawphil.net/statutes/repacts/ra2014/ra_10650_2014.html

Sanvictores, B. (2024). *Filling the gap of jobs-skills mismatch.* UPD.edu.ph. https://upd.edu.ph/filling-the-gap-of-jobs-skills-mismatch/

Shahidi Hamedani, S., Aslam, S., Oraibi, B. A. M., Wah, Y. B., & Hamedani, S. S. (2024). Transitioning towards tomorrow's workforce: Education 5.0 in the landscape of society 5.0. *Education Sciences, 14*(10), 1041.. https://doi.org/10.3390/educsci14101041

Stand Together. (n.d.). *Microcredentialing and the role it will play in the future of work*. https://standtogether.org/stories/future-of-work/microcredentialing-and-the-role-it-will-play-in-the-future-of-work

Strietska-Ilina, O. (2007). *Skills shortages: Building a European VET*. Cedefop. https://www.cedefop.europa.eu/files/04-Strietska.pdf

The Adecco Group. (2020). Are skills becoming more important than university degrees? https://www.adeccogroup.com/our-thinking/articles-and-editorials/are-skills-becoming-more-important-than-university-degrees

Tiron-Tudor, A., Labaditis (Cordos), A., & Deliu, D. (2025). Future-ready digital skills in the AI era: Bridging market demands and student expectations in the accounting profession. *Technological Forecasting and Social Change, 215*, 124105. https://doi.org/10.1016/j.techfore.2025.124105.

UNESCO. (2022). *K-12 AI curricula: A mapping of government-endorsed AI curricula*. https://unesdoc.unesco.org/ark:/48223/pf0000380602

UNICEF. (2024). *The innovation of micro-credentials*. https://www.unicef.org/esa/media/15246/file/The-Innovation-of-Micro-Credentials-2024.pdf

University of the Philippines Open University. (2023). *Equipping Filipino professionals through lifelong learning: Roadmap for UPOU microcredentials*. https://www.upou.edu.ph

Uzair-ul-Hassan, M., & Noreen, Z. (2013). Educational mismatch between graduates' skills and market demands in Pakistan. *International Education Studies, 6*(11), 122–130. https://doi.org/10.5539/ies.v6n11p122

Versteijlen, M., Perez Salgado, F., Groesbeek, M., & Counotte, A. (2017). Pros and cons of online education as a measure to reduce carbon emissions in higher education in The Netherlands. *Current Opinion in Environmental Sustainability, 28*, 80–89. https://doi.org/10.1016/j.cosust.2017.09.004

Wiseman, M. (2022). *On-demand learning: What it is and why your organization needs it*. Big Think.https://bigthink.com/plus/on-demand-learning/

World Economic Forum. (2020). *Jobs of tomorrow: Mapping opportunity in the new economy*. https://www.weforum.org/publications/jobs-of-tomorrow-mapping-opportunity-in-the-new-economy/

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Chapter 9
On-Demand Learning as a Catalyst for Inclusive, Scalable, and Sustainable Transformation in AI-Driven Education Policy and Practice

Ebba Ossiannilsson

Abstract The accelerating integration of artificial intelligence (AI), particularly GenAI, into education, alongside rapid changes in labour markets, has heightened the need for learning paradigms that are flexible, equitable, and aligned with the skills required for the labour market and active citizenship. On-demand learning has emerged as a pivotal model, enabling learners to access knowledge and develop competencies in real time in response to personal, professional, and societal needs. This chapter examines on-demand learning as a catalyst for inclusive, scalable, and sustainable transformation, addressing its ethical, pedagogical, and policy dimensions. Drawing on frameworks from UNESCO, OECD, World Bank, WEF, and the European Commission, it analyses how modular learning, heutagogy, micro-credentials, and AI-enabled personalisation can empower learners while safeguarding equity, inclusion, quality, and human agency. The chapter's contribution is primarily conceptual, normative, and position-based, rather than empirically grounded. Through a conceptual and policy-oriented lens, the chapter explores leadership and governance strategies necessary to implement on-demand learning at scale, highlighting the triadic model of care, curiosity, and challenge as foundational for ethical and sustainable transformation. The discussion positions on-demand learning not merely as a response to technological change but as a strategic instrument for global educational policy and practice, enabling lifelong, human-centred learning pathways that align with contemporary workforce and societal needs. On-demand learning must be governed as public educational infrastructure, not as a market convenience.

Keywords Inclusion · Leadership · On-demand learning · Scalability · Sustainability

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9.1 Introduction

This chapter, which is conceptual, normative, and position-based rather than empirically grounded, situates on-demand learning within the context of global transitions towards AI-driven, skill-centric, learner-centred systems. It highlights its potential to deliver inclusive, scalable, and sustainable outcomes. The chapter examines on-demand learning as a transformative approach to education and workforce development. On-demand learning is not merely a flexible delivery mode enabled by AI; it is a strategic policy tool for advancing inclusive, scalable, and sustainable education systems amid rapid technological, labour market, and societal change. On-demand learning should be governed as public educational infrastructure rather than as a market convenience. The editors of this volume, Liu et al. (2025), argue that the world is undergoing an unprecedented transformation in how knowledge is produced, shared, and legitimised. They note that global education systems face intense pressure from AI, automation, and shifting labour markets, which require adaptable, just-in-time learning solutions. This shift responds to rapidly changing workplaces, accelerated technological innovation (including GenAI), and demands for flexible, modular, skill-aligned pathways. They contend that on-demand learning has emerged as a critical paradigm—moving beyond convenience to fundamentally reorganise relationships among knowledge, learners, and work.

Aligned with the United Nations UNESCO Agenda 2030 and the Sustainable Development Goals (SDG) (UNESCO, 2016), particularly SDG 4 on education, which underpins the achievement of all other goals, governments, international bodies such as the European Commission (2022, 2024), UNESCO (2021a, 2021b, 2021c, 2021d, 2023, 2024a, 2024b), the World Economic Forum (2023, 2025), and the World Bank (Rajasekaran et al., 2024), as well as businesses, industries, and entrepreneurs, now prioritise lifelong learning for competitiveness and inclusion and advocate flexible, equitable education. Rapid technological change, climate uncertainty, demographical transitions, and labour-market volatility have exposed the limitations of linear, degree-centred, time-bound, institution-centred education models. These models are increasingly misaligned with complex workforce requirements, rapid skills obsolescence, and the growing demand for lifelong learning. Originally designed for stable economies and predictable career paths, they struggle to meet the needs of learners who must continuously adapt to new competencies, transition between sectors, and pursue ongoing reskilling. Significant competence gaps in the labour market are critical for learning societies; thus, upskilling, reskilling, and unskilling are essential. The rapid advancement of technology, such as the launch of GenAI in 2023, is also blurring the boundaries between human and machine learning and between formal and informal knowledge. These technologies are redefining agency and exposing ethical tensions in on-demand education. Additionally, uncertainties such as the COVID-19 pandemic, wars, and climate change—including floods, tsunamis, and other disasters—further intensify this urgency (Ossiannilsson, 2025a, 2025b). In this context, on-demand learning has

emerged as a critical paradigm, enabling flexible, responsive, learner-centred education pathways that provide access to education when and where competencies are needed. Other responses include learning on the go, learning within communities, peer learning, seamless learning, micro-credentials, and modular pathways, all of which provide accessible upskilling opportunities. This situation requires proactivity, leadership, and agency at all levels—macro, meso, micro, and nano—internationally, nationally, regionally, locally, and individually. The highest priority is to build trust, involvement, inclusion, well-being, and care, since change is made by people and for people.

This chapter responds directly to the call for contributions to this volume, which aims to critically reimagine on-demand learning as a flexible and equitable paradigm for sustainable educational futures amid rapid technological and socioeconomic change. It argues that on-demand learning should be recognised as a strategic policy instrument embedded within AI-driven education systems that prioritise equity, quality, inclusion, and human agency—principles that are non-negotiable—and that promote human flourishing. The chapter examines the conceptual foundations, ethical tensions, and governance conditions necessary for on-demand learning to realise its transformative potential, focusing on leadership, policy frameworks, and equitable implementation. The analysis engages with international frameworks from UNESCO, the OECD, the European Commission, and the World Economic Forum, highlighting the policy levers required to integrate on-demand learning into coherent education systems. It critically examines on-demand learning as a transformative approach to education and workforce development. The chapter contends that on-demand learning is not emergency remote education, platform-driven short courses, or isolated micro-credentials. Rather, it is a learner-driven, AI-enabled system of modular, recognised, and quality-assured learning opportunities accessible whenever and wherever capability development is needed. By connecting global education policy debates, leadership, and conceptual frameworks, the chapter demonstrates how this paradigm can highlight and address inequities, ethical tensions, and structural barriers while promoting lifelong, human-centred learning pathways across diverse regional and socioeconomic contexts. This chapter advances understanding of on-demand learning as a policy mechanism for inclusive, scalable, and sustainable AI-driven education. It presents a human-centred ethical framework, identifies leadership and governance requirements, examines implications for micro-credentials and personalised learning, and contributes to global discussions on lifelong learning, social justice, and workforce readiness.

This chapter is organised as follows. After this introduction, which contextualises on-demand learning in AI-driven global education (Sect. 9.1), there is a brief description of the addressed questions (Sect. 9.2) and the methodology (Sect. 9.3). Section 9.4 presents the findings, with subsections on human flourishing (Sect. 9.4.1); the shift from convenience to transformation, conceptual evolution, and relevance to policy (Sect. 9.4.2); and AI, ethics, human agency, and ethical, pedagogical, and governance considerations (Sect. 9.4.3). Section 9.4.4 covers modular and micro-credential pathways, including opportunities, risks, equity implications, and human flourishing. Section 9.4.5 discusses leadership through uncertainty, presenting a

framework on cultures of care, curiosity, and challenge for inclusive, scalable, and sustainable implementation. In Sect. 9.4.6, policy and institutional readiness are examined, with attention to accreditation, quality assurance, and equitable access. Section 9.5 presents the conclusions, including pathways for sustainable, inclusive, and human-centred educational futures.

9.2 The Addressed Questions and Focus Points

AI-driven transformation and volatile labour markets have revealed the limitations of time-bound, institution-centred, and degree-focused education systems. On-demand learning marks a conceptual shift, moving from access to agency and from standardised provision to adaptive, learner-centred pathways. Ethical considerations include human-centred governance, as AI-enabled on-demand learning may reinforce inequality, surveillance, and credential fragmentation. When based on ethical AI, capability expansion, and strong leadership, on-demand learning can function as a scalable public good. Thus, leadership and sustainable implementation require cultures of care, curiosity, and challenge, supported by coherent policy, quality assurance, and micro-credential ecosystems. The chapter is organised around the following questions:

- How does on-demand learning support inclusive, scalable, and sustainable educational transformation in AI-enhanced contexts?
- What ethical and pedagogical principles should guide the implementation of AI-driven on-demand learning?
- How can policy and leadership frameworks support equitable access, quality assurance, and learner agency?
- What are the implications of micro-credentials, modular pathways, and AI personalisation for traditional and non-traditional learners?
- Under what conditions can on-demand learning promote social justice, workforce adaptability, and sustainable development goals?

9.3 Methodology and Conceptual Approach

This chapter adopts a conceptual and policy-oriented approach, integrating international frameworks and scholarly synthesis. It draws on reviews of relevant grey literature, foundational works, and selected scientific, theoretical, and conceptual complementary frameworks (McCombes, 2025) that position on-demand learning as a catalyst for inclusive, scalable, and sustainable transformation in AI-driven education policy and practice. The chapter defines and explores the core ideas, themes, and theoretical foundations to ensure clarity and context (Johannessen & Olsen, 2023). Key elements include definitions of the main concepts, contextualisation through theoretical and thematic frameworks, structured organisation of complex subjects

and abstract theories for easier understanding, and a focus on function, serving as a foundational element that connects abstract thought with practical application or analysis. The main sources were selected based on the author's previous research on topics related to the addressed questions and the shift from providing education to fostering learner agency and on-demand learning in the pursuit of inclusive, scalable, and sustainable education. The sources also reflect the author's current research on leadership through uncertainty, based on the International Council for Open and Distance Education Strategic Plan 2025–2028 (ICDE, 2025). This plan focuses on innovation for quality, aiming to shape inclusive, scalable, and sustainable education through open, flexible, and distance learning. It emphasises global collaboration, digital transformation, AI integration, and advocacy to achieve UN Sustainable Development Goal 4. The examples from the Global South and Global North, as well as from different regions, are general and based on overviews and analyses from the referenced reports (ref. list) by UNESCO, OECD, and the World Bank (2023–2025). Specific references are not provided for each example, as this is beyond the scope of this chapter. The chapter uses a conceptual and policy-oriented methodology (Johannessen & Olsen, 2023) that combines several complementary international frameworks and scholarly synthesis. This integrative approach bridges theory, policy, and practice, ensuring relevance for scholars, policymakers, and institutional leaders. The included frameworks are: (i) Global policy frameworks, which include Human-Centred Digital Transformation, emphasising lifelong learning, micro-credentials, AI in education, learner agency, and ethical AI use (European Commission, 2024; UNESCO, 2021a, 2021b, 2021c, 2021d, 2023, 2024a, 2024b); Learning Compass 2030 and Education for Human Flourishing (OECD, 2021, 2024, 2025a); The World Bank (Rajasekaran et al., 2024); the World Economic Forum (2023, 2025); and the European Commission's European Approach to Micro-Credentials (2022). (ii) Critical literature synthesis and reviews of scholarly discourse on on-demand learning, ethical AI, and workforce-aligned skills development. Theoretical foundations include capability approaches, which frame on-demand learning as the expansion of human freedoms and competencies (Nussbaum, 2011; Sen, 1999); connectivism and networked learning, which view knowledge as co-constructed within distributed digital ecosystems (Downes, 2012; Siemens, 2005); and AI, ethics, and education, as well as AI ethics and knowledge ecologies, which address epistemic transparency, trust, and human–machine collaboration (Floridi, 2023; Luckin, 2024; Williamson & Eynon, 2020). Leadership and quality are also considered (Ossiannilsson, 2025a, 2025b; Stratton-Maher et al., 2026), and (iii) Comparative case insights: examples from international implementations of on-demand learning and modular credentialling systems.

9.4 Findings

9.4.1 Education for Human Flourishing

There is a growing consensus among global policy-making bodies that the purpose of education in the twenty-first century must extend beyond narrow preparation for employment, economic productivity, or limited human capital formation. Recent global policy discussions increasingly emphasise that education should promote human flourishing, not merely economic productivity. The Organisation for Economic Co-operation and Development (OECD, 2025b, 2025c) has recently presented the Education for Human Flourishing framework. This framework redefines the purpose of education beyond economic productivity by focusing on enabling individuals to develop the capabilities needed to live meaningful, ethical, and socially responsible lives in complex and uncertain futures (OECD, 2025a). It calls for a reconceptualisation of education's purpose as human flourishing and argues that education systems should enable learners to lead meaningful, ethical, and socially responsible lives in an uncertain world. This perspective challenges narrow human capital approaches and aligns education with broader goals such as agency, well-being, civic participation, and sustainability, arguing that systems should cultivate capabilities enabling learners to lead meaningful, purposeful, and ethically grounded lives. This framework shifts the focus from traditional human capital models, which have long dominated policy discourse, towards a vision in which education supports adaptive problem-solving, ethical competence, agency, appreciation of the world, and the capacity to act within it. Human flourishing is defined as the development of learner agency, ethical competence, adaptive problem-solving, and the ability to engage constructively with others and the wider world. The framework emphasises that education systems should foster adaptive problem-solving, ethical competence, agency, and reflective capacities in learners (a, 2025). It identifies human flourishing as the outcome of education systems that support learners' agency, ethical competence, adaptive problem-solving, and appreciation of the world and others. This vision of human flourishing aligns with the capability approach, viewing education as essential for expanding human freedoms, not solely for economic participation. It challenges instrumental perspectives that limit educational value to economic productivity or short-term skills alignment. Instead, it presents education as a lifelong pursuit that enables individuals to navigate uncertainty, contribute to collective well-being, and act with purpose and responsibility.

The OECD (2025a) asserts that future education systems must balance cognitive achievement with human meaning, relational well-being, and moral insight—outcomes not easily reducible to standard metrics such as test scores or labour market alignment. Embedding this vision of human flourishing into on-demand learning systems has significant implications for policy and governance. These perspectives support this chapter's argument that on-demand learning must be grounded in holistic human development, not merely technological responsiveness or

service to the labour market. The competencies outlined in the OECD framework—especially ethical competence and adaptive capacities—align with the capability approach and strengthen the case for education as a lifelong process of expanding human freedoms. This suggests that modular credentials, AI-enabled personalisation, and flexible learning pathways should be designed not only to meet market needs but also to enhance human agency, relational capacities, and ethical action. In this sense, human flourishing offers a normative framework to help policymakers, educators, and institutional leaders assess whether on-demand learning contributes to meaningful lives and resilient societies, rather than reinforcing narrow, instrumental models of learning. In leadership terms, the focus on human flourishing highlights the need for values-driven governance, where cultures of care, curiosity, and challenge are created not only to improve access or efficiency but also to nurture the whole learner—intellectually, ethically, and socially. By prioritising human flourishing alongside inclusion and scalability, policymakers can ensure that on-demand learning supports education systems that adapt to the demands of AI and global change while enriching human lives with purpose, dignity, and connectedness.

This vision from the OECD is highly relevant to the governance of AI-enabled on-demand learning. While AI technologies offer unprecedented flexibility, personalisation, and scalability, their value depends on the purposes they serve. When aligned with a human flourishing framework, on-demand learning can be evaluated not only in terms of efficiency or employability outcomes, but also by its contribution to learners' autonomy, ethical judgement, relational capacities, and sense of meaning. In this way, human flourishing serves as a normative guide for policymakers and institutional leaders seeking to balance innovation with inclusion and technological responsiveness with human dignity. This perspective provides a crucial normative anchor for AI-enabled on-demand learning. Although these systems offer flexibility, personalisation, and scalability, their legitimacy depends on whether they enhance human autonomy, dignity, and purpose, rather than merely accelerating skills delivery. Aligned with a vision of human flourishing, on-demand learning can be evaluated not only by efficiency or employability outcomes, but also by its contribution to lifelong capability development, social inclusion, and education as a public good.

9.4.2 From Convenience to Systemic Transformation and Relevance to Policy

Early implementations of on-demand learning emphasised flexibility and immediacy, allowing learners to access content asynchronously and at their own pace. While this flexibility addressed temporal and geographical barriers, it did not fundamentally challenge dominant educational structures. On-demand learning should be distinguished from emergency remote learning and platform-based upskilling.

The purpose of on-demand learning must be reframed, with the key shift being the evolution from just-in-time training to learner-driven knowledge ecosystems.

A comparative analysis of UNESCO, OECD, and World Bank reports (2023–2025) shows that on-demand learning is not a universal construct but a context-sensitive paradigm shaped by differing socioeconomic logics, governance capacities, and epistemological traditions across the Global North and South. It serves as an instrument of inclusion in the Global South and of optimisation in the Global North. The shift from convenience to transformation depends on whether on-demand learning is integrated into recognised learning pathways, quality assurance systems, and public policy frameworks. In the European Union, for example, policy initiatives on micro-credentials aim to incorporate modular learning into formal qualification frameworks, enabling stackability and recognition across institutions and borders. In many Global South contexts, by contrast, on-demand learning has emerged as a response to capacity constraints in formal education systems, offering alternative routes to skills development and social mobility. The most important—and often overlooked—finding is that Global South reports describe on-demand learning as lifeline infrastructure, while Global North reports describe it as optimisation infrastructure. This distinction is subtle but significant. In the South, learning enables participation in the economy; in the North, learning enhances performance within the economy. Both regions emphasise AI, digital platforms, and online and modular learning. However, the meaning differs: the Global South views technology as an access enabler, focusing on mobile learning, low-cost delivery, and inclusion. The Global North focuses more on technology as an engine for efficiency and personalisation, emphasising AI-driven learning pathways, data analytics, and platform ecosystems. Across regions, the transformative potential of on-demand learning lies in its ability to decouple learning from rigid institutional timelines, support individual, capability-oriented pathways, enable responsiveness to local and global workforce needs, and extend learning opportunities to marginalised and non-traditional learners. These benefits, however, depend on effective governance. Without policy coherence, on-demand learning risks becoming a parallel system lacking legitimacy, recognition, and sustainability.

9.4.3 Human-Centred AI, Ethics, and Human Flourishing

Education systems are undergoing profound transformation as artificial intelligence (AI), digital technologies, and global socioeconomic shifts reshape how knowledge is produced, accessed, and valued. AI is transforming education systems worldwide, increasing demand for flexible, personalised, and lifelong learning pathways aligned with current labour markets and social needs. In response, on-demand learning has emerged as a flexible approach and strategic policy tool capable of driving inclusive,

scalable, and sustainable transformation within education and workforce ecosystems. The accelerating integration of AI into education and work has fundamentally changed the temporal, spatial, and institutional assumptions underlying education systems. Rapid technological change, demographical transitions, climate uncertainty, and evolving labour markets have revealed the limitations of traditional, linear, institution-centred education models. These models, designed for stable economies and predictable career paths, struggle to meet the needs of learners who must continuously adapt to new competencies, transition between sectors, and engage in lifelong reskilling. The rapid expansion of AI-enabled learning platforms also raises critical questions about equity, quality, governance, and human agency. Without deliberate policy intervention, on-demand learning risks becoming fragmented, market-driven, and exclusionary, reinforcing existing inequalities rather than addressing them.

In the context of education for human flourishing, the significance of on-demand learning extends beyond flexibility and efficiency. On-demand learning has become a leading paradigm, offering responsive, learner-driven access to education at the point of need. While often associated with convenience or efficiency, this chapter argues that on-demand learning is far more consequential: it serves as a strategic policy tool that can enable inclusive, scalable, and sustainable transformation in AI-driven education systems. When ethically governed, integrated, and supported by coherent leadership and policy frameworks, on-demand learning can foster lifelong capability development, enhance learner agency, and promote education as a public good aligned with social justice, workforce adaptability, and sustainable development. Without deliberate governance, ethical grounding, and leadership, on-demand learning risks becoming a fragmented, market-driven response to technological change rather than a catalyst for inclusive and sustainable transformation, and may become misaligned with the deeper societal purposes of education.

By situating on-demand learning within global policy agendas, including the SDGs, and synthesising conceptual frameworks from human-centred transformation, capability theory, and ethical AI, this chapter argues that on-demand learning can enable human-centred, digitally mediated policy intervention learning ecosystems that prioritise equity, agency, and public value. Without deliberate governance and ethical grounding, on-demand learning risks becoming fragmented, market-driven, and exclusionary, reinforcing existing inequalities rather than addressing them. This chapter therefore places on-demand learning within global education policy debates, emphasising the conditions under which it can support lifelong, human-centred learning pathways across diverse regional and socioeconomic contexts. Contemporary on-demand learning operates within AI-enabled ecosystems that support personalisation, modularity, and real-time feedback, creating opportunities for deeper systemic change. On-demand learning emerges at the intersection of AI as a systemic, rather than purely technological, driver, where AI is linked to skills volatility, lifelong learning imperatives, and social justice—requiring responsiveness to be balanced with equity and quality. Equity should be treated as a design principle, a governance requirement, and a quality indicator. On-demand learning becomes transformative only when embedded in modular, stackable, and recognised pathways aligned with

public policy goals. It is a policy-relevant response, not merely a market convenience. Policy implications should therefore enhance ethical AI impact assessments, Universal Design for Learning (UDL), data justice, and learner data sovereignty.

International policy frameworks increasingly emphasise that AI in education should be guided by human-centred principles, prioritising learner agency (Blaschke, 2012), transparency, and accountability. Human-centred digital transformation, as described in global education policy discourse, positions technology as a tool to support human development rather than as an autonomous driver of change. AI must augment human agency, not replace pedagogical or professional responsibility. In this context, AI should enhance pedagogical judgement, enable reflective practice, and empower learners to navigate their own learning paths. The OECD's Education for Human Flourishing framework supports this perspective by identifying learner agency, ethical competence, adaptive problem-solving, and relational capacities as central educational outcomes (OECD, 2025a). Integrating a human flourishing perspective into on-demand learning has significant governance implications.

Artificial intelligence, particularly GenAI, plays a central role in enabling on-demand learning by supporting adaptive learning systems, adaptive content delivery, adaptive learning environments, real-time analytics, personalised pathways, predictive analytics, and automated feedback mechanisms. AI-enabled systems must be transparent, explainable, and accountable, ensuring that learners understand how algorithmic decisions shape their learning opportunities. Ethical AI governance is essential for trust and legitimacy, particularly in on-demand environments where data-intensive systems influence access, progression, and recognition (Williamson & Eynon, 2020). From a flourishing perspective, AI should support reflection, autonomy, and ethical action—not surveillance, automation of judgement, or behavioural manipulation. These outcomes cannot be reduced to employability metrics or short-term skills alignment. However, the ethical implications of AI in education are particularly significant in on-demand contexts, where decisions about access, progression, and assessment may be partially automated (Floridi, 2023; Luckin, 2024). These capabilities have greatly enhanced the responsiveness of education systems, allowing learning opportunities to be tailored to individual needs, contexts, and goals, but they also raise ethical concerns related to power, transparency, and inequality. Human-centred digital transformation frameworks emphasise that AI must augment human judgement and agency rather than replace pedagogical responsibility or learner autonomy. Yet, the integration of AI into on-demand learning environments also intensifies long-standing ethical concerns related to power, control, and inequality in education. The capability approach provides a strong normative foundation for evaluating AI-enabled on-demand learning. From this perspective, education is not merely about acquiring skills but about expanding individuals' real opportunities to pursue lives they value.

Ethical risks are particularly significant in on-demand contexts, where AI systems can affect access to learning opportunities, credential recognition, and progression pathways. Algorithmic bias may disadvantage learners from marginalised backgrounds, while opaque analytics reduce transparency and contestability. Data-intensive learning environments also raise concerns about surveillance, consent,

and data ownership. These challenges are especially acute in regions with limited regulatory capacity, where learners may lack protection from exploitative practices. Key ethical risks include algorithmic bias affecting access and progression, opaque decision-making systems, surveillance-oriented data practices, and unequal access to AI-enabled learning infrastructure. Policy frameworks should therefore require transparency, explainability, and accountability in AI-enabled learning systems, while ensuring learner data sovereignty and privacy protection. Addressing these issues requires making ethical AI governance a core policy concern rather than an afterthought. Public authorities and institutions must establish clear standards for transparency, explainability, and accountability in AI-enabled learning systems. Learners must be informed participants, able to understand how AI systems shape their learning experiences and exercise agency over their personal data. Ethical governance is therefore a precondition for trust, legitimacy, and sustainability in on-demand learning systems (Floridi, 2023; Williamson & Eynon, 2020). On-demand learning can enhance capabilities by providing flexible, context-sensitive access to education. However, this potential is realised only when learners retain meaningful control over learning goals, pathways, and data. Algorithmic systems that restrict choice, obscure decision-making processes, or prioritise efficiency over equity risk undermining the very freedoms that on-demand learning is intended to support.

Examples of the adoption of the human flourishing framework from international regions include the following: In Global South contexts, a human flourishing perspective emphasises the importance of on-demand learning systems that expand agency and dignity, rather than merely compensating for capacity gaps through low-cost or narrowly instrumental provision. Within the European Union, the human flourishing framework complements existing rights-based and quality assurance approaches, reinforcing the view that micro-credentials and AI-enabled learning should support lifelong personal development as well as employability. In Asian skills ecosystems, education for human flourishing provides a counterbalance to efficiency-driven models, highlighting the need to align large-scale reskilling initiatives with ethical judgement, learner autonomy, and social responsibility. In South America, where education often mediates between formal and informal labour markets, a human-flourishing lens strengthens the case for on-demand learning pathways that support meaningful social participation and long-term mobility, not just short-term employment. In regions with limited regulatory capacity or digital infrastructure, particularly in parts of the Global South and South America, ethical AI governance must be treated as a structural requirement, rather than an optional safeguard.

9.4.4 Modular Learning, Micro-Credentials, and Human Flourishing

Modular learning and micro-credentials have gained global prominence as mechanisms to align education with rapidly changing skills demands (European Commission, 2022). Equity, recognition, and systemic coherence are crucial. Enhancing global opportunities and mitigating risks is essential. Micro-credentials support equity only when governed by transparent standards, quality assurance, and clear pathways into further learning.

Without coherent frameworks, micro-credentials risk reproducing inequality through fragmented credentialism. Modular learning and micro-credentials are essential for implementing on-demand learning at scale, offering flexible, targeted pathways for skills development and lifelong learning. While they provide flexibility and responsiveness, their contribution to human flourishing depends on how they are governed and integrated within education systems. If designed narrowly around labour market signalling, micro-credentials risk fragmenting learning and reinforcing inequality. However, when embedded within coherent qualification frameworks, they can support lifelong capability development and learner agency. This approach recognises that modular learning should complement, not undermine, existing education systems. By enabling stackability and recognition across institutions and borders, micro-credentials can support learner mobility and lifelong learning while maintaining trust in public education. These initiatives have shown potential to expand access and relevance, especially for young people and adult learners excluded from traditional education pathways. However, they also reveal risks related to fragmented credential landscapes, uneven recognition, and reliance on market-driven provision. Equity considerations are central to this discussion. Learners with greater social, economic, and cultural capital are better positioned to navigate complex credential ecosystems and translate micro-credentials into tangible opportunities. Without deliberate policy intervention, modular systems risk perpetuating existing inequalities rather than reducing them.

From a policy perspective, modular learning and micro-credentials should be considered infrastructure for lifelong learning, not isolated products. Public governance must ensure that micro-credentials are integrated into clear progression pathways, aligned with national qualifications frameworks, and supported by robust quality assurance mechanisms. This requires coordination across education, labour, and social policy domains, as well as sustained investment in institutional capacity and professional development. Despite their potential, micro-credentials also present significant risks. Without shared standards and public oversight, they may fragment learning pathways, undermine trust in qualifications, and favour learners with greater social and economic capital. For marginalised learners, especially in low-income contexts, the value of micro-credentials depends on recognition by employers, institutions, and professional bodies. Policy intervention is essential to ensure that modular credentials promote equity rather than stratification. This includes alignment with

national qualifications frameworks, quality assurance mechanisms, and pathways to further education.

The human flourishing perspective reframes micro-credentials not as isolated products but as pathways that contribute to meaningful learning trajectories. From this perspective, the value of modular learning lies in its ability to support adaptive problem-solving, ethical reasoning, and personal purpose throughout life. Micro-credentials can serve as instruments of inclusion, so public policies must ensure stackability, portability, public recognition, and quality assurance, enabling learners to accumulate learning in ways that enhance social mobility and personal development. This framing is especially important in diverse regional contexts. Across regions, these approaches have been adopted in response to rapid labour market changes and increasing demand for reskilling and upskilling. However, their contribution to inclusion and sustainability fundamentally depends on governance, recognition, and system integration. In the European Union (European Commission, 2022), micro-credentials are increasingly positioned as tools for lifelong learning, workforce mobility, and inclusion, complementing rights-based and quality assurance approaches. Policy initiatives aim to integrate micro-credentials into coherent qualification frameworks, emphasising transparency, quality assurance, and portability. In Asia, micro-credentials provide a counterbalance to efficiency-driven skills strategies by reaffirming education's ethical and civic dimensions. In countries such as Singapore and South Korea, government-led initiatives integrate micro-credentials into national skills strategies. In many Global South and South American contexts, micro-credentials have emerged through partnerships among universities, industry, and international organisations as pragmatic responses to capacity constraints and skills mismatches. In South America, micro-credentials are often implemented through partnerships among universities, industry, and international organisations to address youth unemployment and informal labour markets. In the Global South and South America, where modular learning often bridges formal and informal labour markets, a human flourishing perspective strengthens the case for public oversight and recognition.

9.4.5 Leadership Through Uncertainty: Cultures of Care, Curiosity, and Challenge

The governance and implementation of on-demand learning in AI-driven education systems take place amid significant technological, ethical, and societal uncertainty. Technological advancements outpace regulatory frameworks, labour market demands shift unpredictably, and societal expectations for education continue to rise. In this context, leadership is not merely operational management or technological adoption; it must be understood as ethical and strategic stewardship of complex sociotechnical systems. Leadership cannot rely on linear planning or be limited to operational management or technological adoption; instead, it requires ethical

and strategic stewardship of complex sociotechnical systems. Scalable on-demand learning depends less on technology than on values-driven leadership cultures.

The Leadership through Uncertainty framework (Ossiannilsson, 2025a, 2025b; Stratton-Maher et al., 2026) emphasises ethical stewardship amid uncertainty and highlights three interdependent cultural orientations: care, curiosity, and challenge. Central to this model is a triadic framework: care includes inclusion, accessibility, and learner well-being; curiosity includes innovation, experimentation, and AI literacy; and challenge includes standards, accountability, and criticality. A culture of care prioritises inclusion, accessibility, and learner well-being as essential foundations of on-demand learning, addressing diverse needs and contexts. AI-enabled personalisation and flexibility can support diverse learners only if systems are designed with a clear commitment to equity. This requires addressing barriers related to disability, language, digital access, and socioeconomic disadvantage. Care-oriented leadership challenges narratives that present efficiency or scalability as sufficient indicators of success, insisting that learner dignity and agency remain central. A culture of curiosity fosters innovation, experimentation, continuous learning, and reflective practice among educators, leaders, and policymakers. On-demand learning systems depend on institutions' capacity to engage critically with AI technologies, adapt pedagogical models, and learn from implementation experiences. Curiosity-oriented leadership supports innovation while recognising that learning from failure is an essential component of responsible transformation. A culture of challenge ensures that flexibility and personalisation do not erode academic standards, integrity, critical inquiry, or institutional accountability, nor compromise quality. This framework connects AI ethics, pedagogy, policy coherence, and institutional cultures. The concept of leadership through uncertainty provides a framework for understanding how institutions and systems can navigate challenges while preserving public value. Rather than seeking to eliminate uncertainty, this leadership approach recognises it as a structural condition of contemporary education and emphasises building institutional cultures that respond responsibly and adaptively. Leaders must challenge both technological determinism and market-driven narratives, maintaining education's public mission. These cultural foundations enable institutions and systems to navigate uncertainty while upholding ethical and pedagogical standards. On-demand learning environments may be vulnerable to pressures for rapid credential production, market alignment, or automated assessment. Leaders must therefore challenge both technological determinism and market-driven logics that prioritise short-term outcomes over long-term educational purposes. This includes safeguarding academic integrity, ensuring transparency in AI-mediated decisions, and maintaining robust quality assurance processes.

Human flourishing serves as a normative anchor for leadership decisions, helping leaders assess whether on-demand learning initiatives genuinely enhance learner agency and purpose or merely optimise delivery efficiency. Leadership amid uncertainty is central to governing AI-enabled learning ecosystems in inclusive, sustainable, and ethically grounded ways. The three cultures care, curiosity, and challenge form a leadership framework that sustains ethical, inclusive, high-quality on-demand learning. This framework enables institutions to navigate uncertainty

while maintaining education's public mission at scale. Leadership amid uncertainty thus becomes a central enabling condition for transformation, aligning institutional practice with broader societal and policy goals.

In Global South and South American contexts, where learners may encounter intersecting barriers such as poverty, limited connectivity, language differences, and disability, compounded vulnerabilities necessitate public investment in infrastructure, learner support services, and inclusive design practices. In Asia and the EU, institutional investments in AI literacy and professional development have been essential for enabling responsible innovation and have allowed educators to move beyond passive adoption towards informed, ethical use of AI-enabled tools.

9.4.6 Policy and Institutional Readiness: Aligning On-Demand Learning with SDG 4

To achieve institutional readiness, nations and institutions must adopt, contextualise, and adapt frameworks from UNESCO, the OECD, the World Economic Forum, and the European Commission as policy foundations. On-demand learning should be considered public infrastructure for lifelong learning, not a peripheral innovation. Responses to global policy agendas are crucial for sustainability. These agendas include SDG 4 (inclusive, equitable quality education, and lifelong learning), skills agendas (reskilling, upskilling, workforce transitions), digital sovereignty, and ethical AI governance. There are also urgent needs to address accreditation, quality assurance, funding, and data governance. Policy coherence is essential for institutional readiness across multiple domains. Institutional readiness depends on leadership capacity and organisational culture. Institutional capacity and professional development are central to this readiness, including accreditation, funding, and data governance. Educators and leaders must be prepared to design, facilitate, and govern on-demand learning environments, which require competencies in digital pedagogy, assessment design, AI literacy, and ethical decision-making. Without sustained investment in human capacity, technological infrastructure alone cannot achieve transformation.

For on-demand learning to serve as a catalyst for inclusive and sustainable transformation, it must be integrated into coherent policy ecosystems that address governance, quality assurance, funding, and institutional capacity. Fragmented or ad hoc approaches risk undermining trust, increasing inequality, and limiting scalability. Framing on-demand learning through the lens of human flourishing strengthens its alignment with SDG 4, particularly targets related to equitable access, quality education, and lifelong learning opportunities. By prioritising learner agency, ethical competence, and adaptive capabilities, on-demand learning enables education systems to respond to labour market changes and foster personal development,

civic participation, and social cohesion. When governed as public educational infrastructure, AI-enabled on-demand learning can provide meaningful learning opportunities throughout the life course, especially for learners historically excluded from formal education pathways, and support workforce adaptability, civic participation, and social cohesion. A flourishing-oriented approach emphasises long-term human development over short-term optimisation, reinforcing education's role as a public good. On-demand learning supports human flourishing only when AI, policy, and leadership are aligned with human agency, equity, and sustainability (see Table 9.1).

Figure 9.1 illustrates how AI-enabled on-demand learning supports human flourishing. At the centre is the learner, whose agency, ethical competence, adaptive capacities, meaning, and purpose are enhanced through learning design, modular learning pathways, micro-credentials, on-demand access, and personalised support. The foundational base, comprising SDG 4 and human-centred digital transformation, is crucial, as are governance, ethical leadership, and quality assurance mechanisms. All four perspectives interact within an ecosystem and through a holistic approach. The surrounding governance structures also ensure that scalability and flexibility align with equity, sustainability, and education as a public good.

Educators need support to design and facilitate on-demand learning, while institutions must invest in inclusive technologies and ethical governance structures. Accreditation, quality assurance, data governance, funding models, and professional development should be aligned to ensure that flexibility does not undermine trust or equity. Accreditation and quality assurance pose fundamental policy challenges.

Table 9.1. Aligning on-demand learning with the OECD Education for Human Flourishing framework

Dimension of human flourishing (OECD)	Implications for on-demand learning design	Policy and governance considerations
Agency	Learners exercise choice over learning goals, pace, and pathways	Ensure transparency, learner data sovereignty, and informed consent
Adaptive problem-solving	Modular, flexible learning responds to changing personal and societal needs	Support stackable credentials and lifelong learning pathways
Ethical competence	AI systems augment, rather than replace, human judgement	Mandate ethical AI governance, explainability, and accountability
Relational and social capacities	Learning supports collaboration, civic engagement, and social inclusion	Promote inclusive design and equitable access
Meaning and purpose	Learning connects personal aspirations with societal contribution	Align education policy with SDG 4 and public good objectives

Source: Adapted from OECD (2025a)

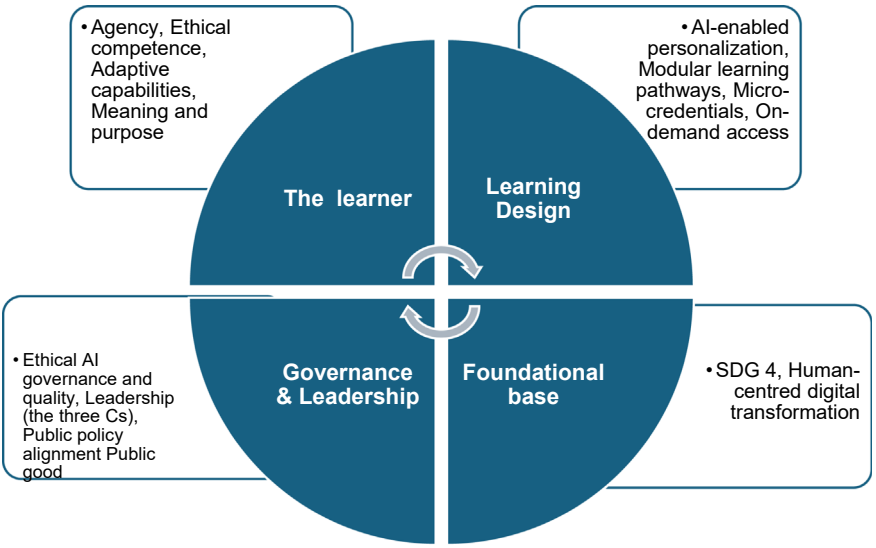


Fig. 9.1. On-demand learning for human flourishing in AI-driven education (author)

Traditional quality assurance mechanisms are often unsuitable for modular, non-linear learning pathways. Policymakers must adapt regulatory frameworks to recognise diverse forms of learning while maintaining rigorous standards. This includes developing criteria for evaluating AI-enabled personalisation, modular assessment, and the coherence of micro-credentials. Without such frameworks, learners may face uncertainty about the legitimacy and portability of their achievements. Data governance and ethical AI regulation are equally critical. On-demand learning systems rely on data-intensive processes that raise concerns about privacy, consent, and algorithmic decision-making. Policy frameworks should ensure that learner data are protected, AI systems are transparent and accountable, and learners retain meaningful control over personal information. These considerations are especially important in cross-border learning environments, where data may be processed across jurisdictions with different regulatory standards. Funding models also require rethinking. Sustainable on-demand learning cannot rely solely on short-term project funding or market-based provision. Public investment is necessary to support digital infrastructure, professional development, and learner support services. Funding mechanisms should incentivise inclusion, collaboration, and long-term capacity building rather than competition and fragmentation.

Across regions, policy coherence relies on alignment among education, labour, and social policy domains. On-demand learning systems disconnected from employment frameworks risk becoming irrelevant, while those driven too strongly by labour market demands risk narrowing educational purposes. Balanced governance recognises education's dual role in supporting economic participation and fostering democratic, social, and personal development. In Global South contexts, international

cooperation and development partnerships are often crucial for supporting equitable implementation. In the EU, coordinated policy efforts have focused on harmonising micro-credential frameworks and quality assurance. In Asia, state-led skills initiatives demonstrate the potential of integrated education–employment ecosystems. In the Global South and South America, challenges related to infrastructure, digital divides, and regulatory capacity persist, highlighting the need for international cooperation and capacity building.

9.5 Conclusion

Education systems are struggling to address accelerating AI-driven change, skills volatility, and widening inequalities. Traditional degree-focused models lack the flexibility and responsiveness needed for lifelong learning, while unregulated market-based on-demand solutions risk fragmentation, inequity, and loss of public trust. Human flourishing offers a vital normative framework for evaluating AI-enabled education, shifting the focus from efficiency and productivity to meaning, dignity, and collective well-being. The challenge for policymakers and leaders is not whether to adopt on-demand learning, but how to govern it intentionally so that it enriches human lives in an uncertain world. On-demand learning is most effective when regarded not as a delivery innovation, but as public educational infrastructure governed by ethical AI, quality assurance, and inclusive leadership. The future of on-demand learning will be determined by policy choices. If governed responsibly, it can contribute to resilient, inclusive, human-centred education systems. If left to fragmented or market-driven dynamics, it risks deepening existing divides. Coherent policy development must balance flexibility with equity, innovation with accountability, and AI with human agency.

This chapter argues that on-demand learning is a strategic public good essential for sustainable futures. It synthesises and highlights key global developments to demonstrate that on-demand learning acts as a catalyst for achieving the SDGs, workforce adaptability, and social justice, and calls for integrated leadership, policy coherence, and ethical AI governance. The chapter contends that on-demand learning should not be seen merely as a technological convenience or minor innovation, but as a strategic public policy tool capable of supporting inclusive, scalable, and sustainable transformation for human flourishing and human-centred futures in AI-driven education systems. When embedded in ethical governance, supported by coherent policy frameworks, and guided by cultures of care, curiosity, and challenge, on-demand learning can expand learner agency, promote inclusion, and support sustainable lifelong learning across diverse contexts. Central to these arguments is the recognition that AI-enabled flexibility alone does not ensure equity or quality. Transformation depends on human-centred governance, leadership capable of navigating uncertainty, and sustained public investment. Modular learning and micro-credentials can promote inclusion only when integrated into recognised pathways and supported by

robust quality assurance. Ethical AI governance must be treated as a foundational requirement, safeguarding trust, transparency, and learner rights.

Rather than treating sustainability as a concluding aspiration, the chapter integrates SDG 4 (inclusive and equitable quality education and lifelong learning for all) as a structural lens throughout the argument. Sustainability is conceptualised across three interrelated dimensions. Social sustainability is addressed through equity-oriented design, universal access, and learner agency. Institutional sustainability is considered through scalable governance models, quality assurance, and professional capacity building. Systemic sustainability is linked to the alignment of education with labour market transformation, democratic participation, and social cohesion. In this framework, AI-enabled on-demand learning becomes sustainable only when governed as part of public educational infrastructure, rather than as an ad hoc or market-driven solution. On-demand learning is presented as a mechanism for advancing SDG 4 targets related to access, relevance, quality, and lifelong learning, particularly for learners historically excluded from formal education pathways. On-demand learning should be governed as public educational infrastructure, not as a market convenience. By foregrounding cultures of care, curiosity, and challenge, the chapter presents leadership as a critical lever for aligning technological innovation with educational values and societal goals. On-demand learning thus becomes a means to advance SDG 4, support workforce adaptability, and strengthen education as a public good in an uncertain world. The chapter also aims to inform policymakers, senior institutional leaders, and international organisations about how on-demand learning can be governed as a public good in AI-driven education systems.

Policymakers, institutional leaders, and educators must not simply adopt on-demand learning, but shape it deliberately, ethically, and collectively. AI-enabled on-demand learning presents significant opportunities to enhance access, inclusion, and learner agency, provided it is embedded within supportive public policy frameworks. Realising this potential requires recognised and quality-assured micro-credentials, robust ethical AI governance, and strong leadership capacity. Policy efforts should focus on integrating on-demand learning into lifelong learning strategies, strengthening qualification and recognition frameworks, investing in leadership and educator development, ensuring human-centred and transparent AI governance, and fostering international collaboration, particularly to support the Global South.

Closing arguments: On-demand learning, when human-centred and ethically governed, enables lifelong, inclusive, and sustainable learning pathways suited to AI-driven societies. The question is not whether education will become on-demand—it already has. The question is whether we will govern it with purpose, care, and responsibility.

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References

Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *The International Review of Research in Open and Distributed Learning, 13*(1), 56–71. https://doi.org/10.19173/irrodl.v13i1.1076

Downes, S. (2012). *Connectivism and connective knowledge: Essays on meaning and learning networks*. National Research Council Canada.

European Commission. (2022). *A European approach to micro-credentials*. Publications Office of the European Union. https://education.ec.europa.eu/education-levels/higher-education/micro-credentials

European Commission. (2024). *AI Act. (Artificial Intelligence Act)*. https://digitalstrategy.ec.europa.eu/en/policies/regulatory-framework-ai

Floridi, L. (2023). *The ethics of artificial intelligence*. Oxford University Press.

ICDE. (2025). *ICDE strategic plan*. https://www.icde.org/wp-content/uploads/2024/12/ICDE-Strategic-Plan-2025-2028.pdf

Johannessen, J. A., & Olsen, B. (2023). *How to write conceptual papers in the social sciences*. Routledge. https://doi.org/10.4324/9781003457091

Liu, D., Prinsloo, P., Kanwar, A., Kalim, U., & Zhang, Y. (2025). *On-demand learning in a changing world: Philosophical, technological, and practical perspectives on workforce and vocational education*. http://iasle.net/concept-note

Luckin, R. (2024). Exploring the future of learning and the relationship between human intelligence and AI: An interview with professor Rose Luckin. *Journal of Applied Learning & Teaching, 7*(1), 346–363.

McCombes, S. (2025, January 22). *How to write a literature review | Guide, examples, & templates*. Scibbre. https://www.scribbr.com/dissertation/literature-review/. Retreived 28 April 2026.

Nussbaum, M. (2011). *Creating capabilities: The human development approach*. Harvard University Press.

OECD. (2021). *OECD future of education and skills 2030: OECD learning compass 2030. A series of concept notes*. https://www.oecd.org/content/dam/oecd/en/about/projects/edu/education-2040/1-1-learning-compass/OECD_Learning_Compass_2030_Concept_Note_Series.pdf

OECD. (2024). *Policies, data and analysis for trustworthy artificial intelligence*. https://oecd.ai/en/

OECD. (2025a). *Education for human flourishing: A conceptual framework*. OECD Publishing. https://www.oecd.org/en/publications/education-for-human-flourishing_73d7cb96-en.html

OECD. (2025b). *Trends shaping education 2025*. OECD Publishing. https://www.oecd.org/en/publications/trends-shaping-education-2025_ee6587fd-en.html

OECD. (2025c). *Education policy outlook 2025*. OECD Publishing. https://www.oecd.org/en/publications/education-policy-outlook-2025_c3f402ba-en.html

Ossiannilsson, E. (2025a). *Leadership, openness, ethics, and AI: Navigating uncertainty in education*. IntechOpen. https://doi.org/10.5772/intechopen.1014075

Ossiannilsson, E. (2025b, February). Navigating the nexus: Ethical leadership and human resources in the artificial intelligence. *Education@ETMA , 4*(1), 2583–3928.

Rajasekaran, S., Adam, T., & Tilmes, K. (2024). *Digital pathways for education: Enabling greater impact for all*. World Bank. https://hdl.handle.net/10986/42386

Sen, A. (1999). *Development as freedom*. Oxford University Press.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1), 3–10.

Stratton-Maher, D., Ossiannilsson, E., Manousou, E., & Arumugam, P. (2026). Leading through uncertainty: The three Cs approach to inclusive, scalable and sustainable leadership in higher education. In A. Cossham, B. Carr & C. Goode (Eds.), *30th ICDE World Conference 10 to 13 November 2025, Wellington, New Zealand*: Full papers (pp. 742–763). International Council for Open and Distance Education.

UNESCO. (2016). *The sustainable development goals report 2016*. https://unesdoc.unesco.org/ark:/48223/pf0000246526

UNESCO. (2021a). *Reimagining our futures together: A new social contract for education.* UNESCO. https://doi.org/10.54675/ASRB4722
UNESCO. (2021b). *Ethics of artificial intelligence: The recommendation.* UNESCO. https://www.unesco.org/en/artificial-intelligence/recommendation-ethics
UNESCO. (2021c). *Global AI ethics and governance observatory.* UNESCO. https://www.unesco.org/ethics-ai/es
UNESCO. (2021d). *AI and education: Guidance for policy-makers.* UNESCO. https://www.unesco.org/en/articles/ai-and-education-guidance-policy-makers
UNESCO. (2023). *Technology in education: A tool on whose terms?* UNESCO. https://www.unesco.org/gem-report/en/publication/technology
UNESCO. (2024a). *AI competency framework for teachers.* UNESCO. https://www.unesco.org/en/articles/ai-competency-framework-teachers
UNESCO. (2024b). *AI competency framework for students.* UNESCO. https://doi.org/10.54675/JKJB9835
UNESCO, International Labour Organization, World Bank. (2023). *Transforming technical and vocational education and training for successful and just transitions.* UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000383360
Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology, 45*(3), 223–235. https://doi.org/10.1080/17439884.2020.1798995
World Bank. (2025). *Digital progress and trends report 2025.* World Bank. https://www.worldbank.org/en/publication/dptr2025-ai-foundations
World Economic Forum. (2025). *AI, tech and the intelligent age at Davos 2025: What to know.* https://www.weforum.org/stories/2025/01/industries-in-the-intelligent-age-ai-tech-theme-davos-2025/

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Part III
Equity, Access, and Inclusion

ODL in Resource-Constrained or Marginalized Contexts, Barriers/Enablers, Social Justice, Workforce Participation

Chapter 10
On-demand Learning to Address Gender Disparities in the Drone Economy—A Case from South Africa



Annemarie Davis, Tapiwa Muzata, and Raphael T. Mpofu

Abstract This chapter offers a case study in which on-demand learning is applied in a marginalized context. Situated in the Global South, in a middle-income country, the student entrepreneurship center at the largest single-mode distance learning institution in South Africa has developed a program to open opportunities for women in the male-dominated aviation sector, specifically the drone industry. The case study demonstrates how on-demand learning, through the Drone Divas Programme creates opportunities outside formal, degree-based university programs. At the same time, the case study illustrates the efforts made to address graduate unemployment and to open up opportunities for women in STEAM (Science, Technology, Engineering, Arts and Mathematics) fields. It explores the barriers experienced by women participating in on-demand training programs while offering nuanced accounts of the lived experiences of three participants. This chapter links the on-demand training to entrepreneurship development interventions within a learning ecosystem that combines efforts of an accredited training center, a student entrepreneurship office, qualified business mentors and coaches, and government funding. Using qualitative approaches to engage women drone pilots not only offers insight into their life stories, but also contributes to a deeper understanding of their lived realities, which can inform policy and further on-demand learning interventions.

Keywords On-demand learning · Resource-constrained contexts · Case study · Gender disparities · Drone economy · Global South

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10.1 Introduction

The rich historical background of South Africa, driven by political aspirations that brought about separation and division, as well as deliberate efforts toward equality and redress, makes the South African context worthy of exploration. In South Africa, and most likely elsewhere in the Global South, the aviation industry has historically been dominated by men, representing another instance of marginalization of women. In aviation, many roles traditionally assigned to women were lower paid and linked to activities such as hosting passengers, operating ticket desks, and handling public relations. This marginalization can be attributed to numerous factors, including traditional gender roles, lack of access to education and training opportunities, limited access to capital and resources, and discriminatory practices within industries. As the aviation industry evolves, there is a growing recognition that diversity and inclusion are not just moral imperatives but also strategic advantages. Kiliç and Yanikoğlu (2023) confirm that embracing such diversity can lead to more productive and dynamic workplaces in the aviation sector. By fostering diversity, particularly gender diversity, and cultivating an inclusive environment, the aviation industry can unlock innovation, drive stronger collaborations, and ensure a more sustainable future.

Despite these lofty goals, women continue to face significant challenges. A snapshot of young (15–34 years), Black African women in South Africa today shows that women account for approximately 51.3% of South Africa's population and 42.1% of households are female-headed. Within the South African context, the official unemployment rate for Black African Women is 38% (Statistics South Africa, 2024). Recognizing the realities of unemployment also requires acknowledging that women disproportionately shoulder unpaid caregiving work and remain overrepresented in lower-paid, care-based industries while being underrepresented in Science, Technology, Engineering, and Mathematics (STEM) fields.

Furthermore, women's entrepreneurship in South Africa has been hindered by a pervasive culture of risk aversion, particularly among women. In a study exploring the experiences of Black African women entrepreneurs in South Africa's male-dominated entrepreneurial environment, Diale and Carrim (2022) found that women experience slow entry due to patriarchy, cultural blockages, and the need to continuously upskill. Many women are hesitant to take entrepreneurial risks due to various socio-economic factors, including limited financial resources, lack of access to business networks and mentorship, and cultural barriers.

The aviation industry offers significant growth potential. By aligning this growth potential with deliberate efforts to dismantle existing barriers, the Inhlanyelo Hub NPC seeks to offer entrepreneurial development programs for women. For this chapter, the case study focuses specifically on the Inhlanyelo Hub Drone Divas Programme, which was conceptualized as an on-demand training program. The Drone Divas Programme offers comprehensive training in drone piloting, technology development (including coding), industry optimization, and manufacturing. However, the program's aim is not merely to train women as drone pilots, but to empower them to establish and operate their own small businesses within the industry.

This approach is significant because it addresses the gender imbalance in aviation from a holistic perspective—empowering women not only as skilled professionals, but also as entrepreneurs and industry leaders. This initiative exemplifies how on-demand training programs can do more than simply equip individuals with technical skills; they can also empower them to become industry leaders, entrepreneurs, and change-makers. By breaking down gender barriers and fostering the creation of women-owned businesses, programmes such as the Drone Divas Programme can contribute to a more diverse and inclusive aviation industry.

Traditionally, the value of a qualification has been situated within the physical certificate issued and the listing of the qualification on the curriculum vitae or résumé. While some schools of thought prioritize the physical certificate route, another argues for the value of knowledge, expertise, and skills over the formal qualification itself. In environments where prestige is linked to formal qualifications, particularly where such a certificate is issued for the first time in the history of a family, the perceived value is increased even further.

In a country like South Africa, where racial discrimination historically acted as a barrier to entry into formal post-school education, the value of the certificate, and the associated prestige, carries significant weight and is often viewed as an end in itself. At the same time, there is a prevailing belief that the certificate will open doors to employment opportunities and income security.

While recognizing the value of formal qualifications, it is also necessary to acknowledge the limitations of formal learning programs, which are often offered, and completed, over extended periods. Critiques relating to outdated content or irrelevant curricula are voiced globally. Graduate unemployment remains a persistent reality, and concerns are often raised about the inability of universities to train students for the jobs of the future. The extended duration required to complete a formal qualification can also be a hindrance. While part-time study allows individuals to work while studying, it can place significant stress on people attempting to balance work, study, and take care of a household and family.

While South Africa is considered among the continental leaders in terms of income, digital access,[1] and ICT infrastructure, it is also regarded as one of the most constrained in terms of employment, equality, and skills. On-demand learning may present a potential solution by building on existing digital access and ICT infrastructure; however, the deep structural inequality persists. While on-demand learning is often presented as an inclusive solution, the realities of inequality may hinder those most in need of such learning, resulting in continued exclusion. When developing an on-demand learning program, there is therefore a real need to consider who benefits and who remains excluded—and then to explicitly address these exclusions. Exclusion may take various forms, including caregiving responsibilities, single parenthood, household chores, or limited access to appropriate digital devices for learning.

One also needs to be cautious when considering the cost of participation. These costs may not only be direct monetary costs, but may also include securing alternative

[1] https://www.ecofinagency.com/telecom/1607-45735-ict-development-index-2024-ranking-of-african-countries.

caregiving for children or elderly dependants while attending class, the burden of transport costs, or the sacrifice involved in spending money on data when basic household needs, such as infant nutrition, must also be met.

On-demand learning presents itself as a training option that provides flexible, modular, and learner-centered pathways, enabling individuals to develop knowledge and skills when and where they are most required, in direct response to particular situations, objectives, and professional needs (Ahsan et al., 2023; Peterson & Cox, 2025). On-demand learning can support growth and advancement, particularly when learning is offered in manageable chunks. But, for on-demand learning to be of real value, it must extend beyond flexibility. While the full implications of this are not yet fully understood, from our experience it includes things like transport support, flexible hours, block-release-in-person engagements, peer support, and entrepreneurial development and business start-up support, such as mentoring and coaching. What can be confirmed is that the Drone Divas Programme should not be a standalone intervention, but part of a broader learning ecosystem.

10.2 Examining the Drone Divas Programme Through On-demand Learning, Intersectionality, and Entrepreneurial Ecosystems

On-demand learning is presented as an alternative to the formal, time-specific learning offered by universities. Often, it takes the form of just-in-time skills acquisition. Some of the characteristics include flexibility, micro-credentials, job-specific skills acquisition, and are often in response to market demands. The Inhlanyelo Hub NPC Drone Divas Programme is in response to the growing drone economy linked to job-specific skills (such as the acquisition of a drone pilot license) as well as providing opportunities for stand-alone interventions to enhance opportunities.

As the authors of this chapter we do not claim that all women continue to experience inequality. In fact, from the empirical data gathered, the participants were found to be very positive, and notions of any "victim-mentality" were absent. We recognize that there may be patterns of patriarchy and power, and we also acknowledge that not all men are in privileged positions. The Drone Divas Programme was designed for those women who are marginalized. We recognize that women are concentrated among the less-educated and poor, and that their unpaid and unvalued reproductive and domestic functions, along with their lower levels of education mean they are overrepresented among those who are often excluded from formal learning programs.

We learned that we cannot attempt to present on-demand learning in an unequal, developing country context without considering the realities of those exposed to these inequalities. Additionally, this chapter reports on a program initiated for women only, aiming to create opportunities in male-dominated industries. Naturally, adopting an intersectional lens to interpret the lived experiences of the women in the programme

seems appropriate. Intersectionality is widely recognized as one of the most significant contributions to feminist scholarship. According to Crenshaw (2013), intersectionality highlights how systems of oppression—such as gender, race, class or geography—interact to preclude differentiated and compounding experiences of marginalization and privilege.

Given the realities of the history of oppression in South Africa, the effort to minimize marginalization and offer inclusivity as a foundation for the Drone Divas Programme, is not only called for but also a priority. Embedding inclusivity translates into a critical review of the program by giving voice to the participants, to determine how access to the on-demand learning program is evenly distributed. For example, gender-based exclusion in STEM fields cannot be understood without attention to how gender intersects with race, socio-economic status, spatial marginalization, caregiving responsibilities, and differential access to digital infrastructure and professional networks.

A woman's ability to participate fully in programmes aimed at inclusion is shaped by her location, income, race, and the time she must spend on caregiving. This chapter does not use intersectionality as a descriptor of the participants. Rather, the lens of intersectionality is used as a starting point for us to critically inquire into the lived realities of young women, thereby assisting with program design and participation. The outcome of such critical inquiry may inform institutional arrangements and program design to shape women's opportunities within the drone economy. We believe that using intersectional theory as a framework for critically inquiry enables us to move beyond individual success narratives and shift attention to enablers and constraints. The intersectional approach also reminds us that the experiences of the women participants are not the same—their experiences of the Drone Divas Programme are not homogenous. We recognize this heterogeneity through specific forms of inquiry, and we adopted the life-story methodology to gather input in the hope of not inadvertently privileging those already closest to the opportunity.

The Inhlanyelo Hub NPC Drone Divas Programme is an example of a program for inclusive pathways. The "on-demand" nature of the program does not imply that anyone can join program whenever it suits them. Rather, the on-demand nature finds expression in being a non-formal qualification aimed at employability and entrepreneurship. Within the South African context, graduate unemployment and underemployment are harsh realities. Skills development is often proposed as a solution to unemployment—which implies that learners are responsible for maintaining their own employability through continuous upskilling. However, harsh realities linked to graduate unemployment prove that unemployment is not easily addressed through training alone.

As an alternative to seeing employment as the goal, the Inhlanyelo Hub NPC devised programmes that are entrepreneurship oriented and work toward economic participation and the establishment of small businesses. Given the importance of SMEs in growing economies, the alignment between on-demand training in growing industries aimed at new venture creation, while addressing gender disparities may be a magic formula to bring about real change.

The rationale informing entrepreneurship-oriented programmes, such as the Drone Divas Programme, is that it can open alternative pathways. When offered in accordance to on-demand learning principles, the opportunities can be further enhanced. Yet, the structural barriers limiting access to capital, or recognition and admittance to established business networks, may prevent those already operating on the margins from moving forward. This implies that the Drone Divas Programme design should not only cater to technical training for obtaining an unmanned aerial vehicle license, but also offer support through an entrepreneurial ecosystem. Elements within an entrepreneurial ecosystem include (Stam & Van de Ven, 2021) formal institutions, culture, networks, physical infrastructure, finance, leadership, talent, knowledge, demand, intermediate services, and productive entrepreneurship. The case organization, Inhlanyelo Hub NPC, is not in control of these elements—there may be influence, there may be opportunity—but taken as a whole, the ecosystem is a living system that needs nurturing, reinvestment, remodeling, strengthening, and growth. Also, when the on-demand training program includes skills on how to solve problems, find solutions, and drive opportunities for growth, with business coaching and support, the barriers may be reduced. Knowledge on barriers and challenges for entrepreneurs is readily available in academic research and general interest linked to reviews of intervention programs by government, local communities, and service providers. Additionally, interest in the lived realities of women entrepreneurs is growing. Using a systematic literature review of the available literature from 2013 to 2023, Utete and Mkhwanazi (2025) identified 75 studies that scrutinize the challenges associated with women entrepreneurship. Their review of the literature indicated several substantial constraints encountered by entrepreneurs in South Africa, often tracing the contours of gender (page 716).

Following is a description of the methods employed to critically inquire about the experiences of the beneficiaries of the Drone Divas Programme, followed by a presentation of socio-demographic realities that shape participation and experience. The theoretical perspectives of on-demand learning, intersectionality, and entrepreneurial ecosystems combined serve as an analytical tool to analyze the Drone Divas Programme as an attempt to offer on-demand learning that is responsive to lived realities, pays attention to structural inequality, and embedded in an entrepreneurial ecosystem.

10.3 Methodology

In the context of aviation, research has a critical role in informing industry practices, setting agendas, and addressing challenges such as gender inclusivity. To address these challenges, researchers must go beyond surface-level observations and delve into the lived experiences of women in the industry. The authors of this chapter adopted a sensemaking lens, combined with a life-story technique (Lewis-Beck et al., 2024), to explore the experiences of some of the women who participated in the Drone Divas Programme.

The authors adopted a qualitative interpretivist approach to give voices to three of the women who participated in the program. Sensemaking is particularly useful in understanding the complex and often messy realities of women seeking to breakthrough and working in male-dominated fields such as aviation. Sensemaking is a social, retrospective process grounded in identity and narrative. The life-story technique captures the narrative essence of a person's experience, bringing order and meaning to the life being told (Lewis-Beck et al., 2024). Narrative inquiry is qualitative research that seeks to understand how individuals make meaning of their lives and the world around them by studying their stories and experiences. Kevill et al., (2015) confirms that the use of narrative research in the field of entrepreneurship requires one to move away from the dominant mode of thinking regarding entrepreneurship, which involves focusing on the more relational and emergent aspects of entrepreneurial practice. This implies deliberate efforts to construct meaning of what it means to be an entrepreneur, linked to social relationships that exist between people in any given context. The benefit of this approach is that these narrative accounts enable us to gain insight into the social and relational ways in which entrepreneurs realize innovative practice or activity. Atkinson (2002, p. 123) explains that "life story interviewing is a qualitative research method for gathering information on the subjective essence of one person's entire life that is transferable across disciplines."

The inclusion criteria required participants who have participated in the Drone Divas Programme from inception in 2023 up to cohort 4 in 2025. Any participant who did not complete the program was excluded. Ethical clearance and gatekeeper permission were granted through the ethics committee (certificate #11403) of the institution to which the researchers are affiliated and where the case organization is situated. All participants received a participant information sheet and consented in writing to participate in the research.

For contextual richness, we engaged all participants in collecting socio-demographic data, which provided insight into, for example, their life-circumstances, responsibilities, and backgrounds. Socio-demographic data were gathered through a brief online information form. The form covered items such as language, age, qualification, employment status, financial responsibilities, caregiving responsibilities, number of dependents, technical training, challenges experienced with training and primary device used for online training.

The project leader for the Drone Divas Programme was assigned the role of interviewer, and the rapport established with the participants through the program, contributed to ease of conversation. Despite the rapport, the possibility of interviewer bias and social desirability bias could have influenced the responses. This may have led to participants shaping their life stories to align with the perceived expectations of gratitude dynamics (Berger, 2015). To mitigate this, the interview questions were open-ended and non-leading. The interviews were transcribed verbatim and during the analysis process, the research team made efforts to bracket prior assumptions (Sinfield et al., 2023).

The interviews were audio-recorded and transcribed. The transcripts were read and re-read after revisiting the focus of this chapter. Relevant sections, based on the focus of the chapter, were then analyzed and presented below as the life stories of

three candidates, focusing on their entry into the programme and their experiences with the training. The life-story interview schedule allowed reflection on when their story began, how it moved through the programme, covered future plans, and ended with suggestions to future learners.

This chapter offers a case study on the Drone Divas Programme as a form of on-demand learning to address societal and gender challenges. The chapter also offers a high-level description of the life stories of three women drone pilots.

10.4 The Case Organization

Inhlanyelo Hub NPC (The Hub) is a university-based entrepreneurship hub for innovation and entrepreneurship development that promotes inclusive economic participation through structured training, incubation, and enterprise support. The Hub operates at the intersection of education, innovation, and social impact, and functions as an ecosystem builder focused on expanding opportunities for historically marginalized groups, consistent with development theory that emphasizes that equitable access to knowledge, resources, and networks underpins inclusive growth (Nussbaum, 2007; Sen, 1999).

The Hub's model is grounded in a systems view of entrepreneurship as embedded within social, institutional, and economic environments rather than as an isolated individual activity (Ahl & Marlow, 2012; Mpofu, 2024). The Hub's programmes therefore address structural barriers affecting youth, women, and rural communities and aim not only to build skills but also to transform participation pathways by strengthening access, confidence, and exposure to business opportunities. This multidimensional approach aligns with ecosystem research showing that enterprise outcomes depend as much on enabling environments as on individual capability (Isenberg & Onyemah, 2016).

To this end, a core institutional feature is the integration of experiential learning into programme design and governance. Research on university-based entrepreneurship centers indicates that leadership effectiveness improves when reflective practice, regulatory awareness, and experimentation are embedded in training systems (Mpofu, 2024), consistent with Kolb's (2014) iterative learning model of experience, reflection, conceptualization, and experimentation.

The Hub operates through partnerships across academia, industry, government, and civil society, reflecting a quadruple-helix innovation framework that supports legitimacy, resource mobilization, and scalability (Carayannis & Campbell, 2009). Inclusive innovation theory further informs the strategy, showing that grassroots innovation emerges when stakeholders reduce structural barriers and intentionally develop enabling ecosystems (Heeks et al., 2014). This approach integrates gender-responsive pedagogy, flexible delivery, mentorship, and psycho-social support to recognize women's differentiated constraints. Participants receive sequenced support

across ideation, compliance, branding, market access, and investment readiness—an integrated incubation approach associated with improved venture sustainability (Hackett & Dilts, 2004).

The integrated approach reflects feminist institutional theory, showing that gender-neutral interventions often reproduce inequality unless structural barriers are directly addressed (Acker, 2006). The Hub's design also incorporates ecological systems perspectives, which demonstrate how interacting environmental layers, including institutional culture, norms, regulation, and networks, shape entrepreneurial participation and necessitate multi-level interventions (Mpofu, 2024). The Drone Divas Programme illustrates how the practical application of this integrated institutional approach functions within an emerging technology sector.

10.4.1 The Drone Divas Programme

The Drone Divas Programme is a targeted capacity-building initiative designed to increase women's participation in drone and aviation technology by addressing persistent gender disparities in STEM and related sectors. UNESCO (2017) and the World Bank (2020) widely link these disparities to unequal access to training, restrictive socio-cultural norms, and institutional bias that limits women's entry into high-growth technical fields. The programme is grounded in the premise that exclusion from emerging technological economies rarely reflects a lack of interest or ability; rather, it results from structural constraints such as financial cost, geographic distance, social expectations, and institutional gatekeeping. Intersectionality theory helps explain these dynamics by showing how overlapping systems of inequality create compounded disadvantage for women positioned across multiple social and economic margins (Acker, 2006). Applicant data confirm this multidimensional pattern: cost, distance, gender bias, caregiving demands, and regulatory complexity often co-occur, indicating that inequality operates through interlocking structural systems rather than isolated barriers (Elam et al., 2019; Kabeer, 1999).

To address these constraints, the program uses a blended learning model that combines on-demand digital instruction, face-to-face class sessions and practical drone flying, with structured supports such as mentorship, guided practice, and progress monitoring. Flexible delivery expands participation for women balancing employment, caregiving, and mobility limitations (Means et al., 2014), while relational support networks help strengthen persistence in male-dominated technical fields (Al-Dajani & Marlow, 2013). Its pedagogy is informed by experiential learning research showing that iterative cycles of practice, reflection, conceptualization, and experimentation enhance problem-solving and adaptability under conditions of uncertainty (Mpofu, 2024). This approach is particularly well suited to rapidly evolving technological sectors such as drone operations.

Training environments are intentionally gender-responsive, fostering belonging, peer support, and professional identity formation—factors strongly associated with retention and success in non-traditional career pathways (Dasgupta, 2011). The

programme also addresses institutional barriers by guiding participants through certification processes and regulatory requirements, thereby supporting entry into formal economic participation (De Soto, 2000). Beyond technical skills, participants frequently report increased confidence, stronger aspirations, and greater willingness to pursue previously unattainable opportunities, outcomes consistent with capability-based theories that define empowerment as expanded agency and choice (Nussbaum, 2007; Sen, 1999).

The Drone Divas Programme commenced in 2023, and there have been four cohorts to date: three cohorts in Gauteng Province, and one cohort in the Western-Cape Province. The Drone Divas Programme is grounded in the principles of on-demand learning. Specifically, it offers career-oriented and skill-based opportunities that align educational experiences with industry requirements. The drone industry is growing, with opportunities for drone applications in commercial, recreational, and military settings. Drones are used to deliver medical supplies by air, provide real-time data on farms, inspect infrastructure, and contribute to public safety, among other applications. Yet, the costs associated with remote pilot licensing exceed R35000 (roughly $2200). The Drone Divas Programme not only covers the costs of remote pilot license training, but also provides for the required Class 3 medical consultation, which is an entry requirement (governed by civil aviation law) radio examinations, and practical training, as well as a travel stipend to ensure full participation. The programme is offered over three months and is treated as a grant to successful applicants. Applicants must be registered students at the University of South Africa in Science, Technology, Engineering, Arts, and Mathematics fields, aged between 20 and 40. Preference is given to unemployed candidates.

Selection occurs through a rigorous process. A group of 30 candidates is selected to participate in a selection workshop focused on entrepreneurial ideation content. At the end of the workshop, candidates present a pitch for their business idea in the drone industry, after which the final group is selected for the Class 3 medical tests. Those who meet the Class 3 medical requirements are then selected to be part of the new cohort. All participants sign a learner agreement that holds them accountable for participation and completion.

For the first three cohorts, the first two weeks involved an immersion component, during which the 20 women were accommodated at a central facility for the first phase of the training. During this immersion period, the candidates were matched with a roommate for mutual support and accountability. In addition, the immersion ensured that the candidates could give undivided attention to theory and tests, relieved from daily commuting, household chores, and caregiving responsibilities.

Phase 1 training includes a one-day session in a field where the candidates are given the opportunity to fly a drone—albeit at a limited height and distance. Phase 1 training covers content that introduces participants to the drone industry, including legislation, industry dynamics and trends, and drone mechanics. It also includes Tello drone flight training and applications such as using drones for cinematography and photography. Provision is also made to cover coding basics and drone design, with exposure to CAD and 3D modeling. The drone fieldwork covers cinematic drone work and video editing, with practical demonstrations of footage captured

by participants. At the end of the two weeks, candidates are issued a certificate of competency.

Phase 2 training is scheduled over 10 weeks, but progress across all four cohorts has been delayed due to the need for some candidates to repeat the radio examinations. Under the assessment rules, the pass mark is 75%, and if a candidate fails the exam, she needs to wait two weeks before attempting it again. Upon qualifying as drone pilots, as determined by official Civil Aviation Authority trainers, the pilots have the option to enroll in advanced training: Beyond Visual Line of Sight (BVLOS) training, which is also offered as a fully funded one-month grant.

After completing the BVLOS training, pilots are invited to sign up for the Business Model Canvas bootcamp to develop their business idea and gain access to business mentoring and coaching. The first cohort of Drone Divas was launched in 2023, with the fifth cohort planned for 2026. To date, 53 women drone pilots have entered the drone economy through this programme.

The following section offers the results of the brief online information form that was used to gather data on the socio-demographic realities among those who have participated in the Drone Divas Programme since inception. A total of 26 Drone Diva participants responded. Exploring the socio-demographic factors provides insight into the personal circumstances of the participants.

10.4.2 Socio-Demographics

The socio-demographic profile of the respondents reflects a terrain of bundled barriers comprising financial constraints (100% of respondents), geographic distance (71.4% of respondents), gender bias/discrimination (42.9% of respondents), and time constraints (related to household chores and caregiving responsibilities (38.1% of respondents). To corroborate this pattern, the multi-select options in the questionnaire reflect the most common co-occurring barriers, including cost and geographic distance (70%), cost and gender discrimination (45%), and cost and time constraints (35%). Table 10.1 depicts patterns of barrier co-occurrence.

The co-occurrences suggest that women encounter a combination of factors that constrain their participation in meaningful economic activities and/or sectors that require financial and time investments. Cost barriers seem to be core to the paired barriers. In addition to cost barriers, gender discrimination may indicate that some sectors are ring-fenced by men through "old boys" networks, which raise entry barriers for women. The responding women also felt excluded based on their socio-economic backgrounds (71.4%), gender (71.4%), and race or ethnicity (42.9%). The responses highlight the contextual and lived realities encountered by women. Respondents highlighted that factors likely to significantly reduce their participation in the Drone Divas Programme include financial support (100%) and flexible or online training options (85.7%).

Further analysis warrants the classification of these barriers, including those that are less dominant. Table 10.2 provides a summary of the classification of the barriers.

Table 10.1 Co-occurrence barriers from multi-select responses

Barrier A	Barrier B	Co-occur count	Co-occur % of respondents
Cost	Geographic distance	14	70.0
Cost	Gender bias/ discrimination	9	45.0
Cost	Time constraints	7	35.0
Cost	Regulatory complexity	6	30.0
Gender bias/ discrimination	Geographic distance	5	25.0
Geographic distance	Time constraints	4	20.0
Gender bias/ discrimination	Regulatory complexity	3	15.0
Geographic distance	Regulatory complexity	3	15.0
Cost	Lack of information	2	10.0
Geographic distance	Lack of information	2	10.0
Cost	Safety concerns	1	5.0
Cost	Work	1	5.0
Gender bias/ discrimination	Time constraints	1	5.0
Safety concerns	Time constraints	1	5.0
Time constraints	Work	1	5.0

Table 10.2 Classification of barriers

Barrier class	Identified barrier
Resource barriers	• Cost • Lack of information
Delivery barriers	• Geographic distance • Time constraints
Social barriers	• Gender bias/discrimination • Safety concerns • Gatekeeping
Compliance barriers	Regulatory complexity

The barriers can be classified into resource-based barriers, delivery barriers, social barriers, and compliance barriers. It is worth noting that while the on-demand offering alleviates barriers, it does not solve all barriers on its own. For instance, resource-based barriers such as cost and lack of information will not be solved solely by the on-demand offering. While the on-demand offering is cheaper, women may still lack resources needed to acquire devices, secure reliable internet access, or obtain relevant information.

Social barriers may not be fully addressed because they are embedded in women's socio-economic context. An on-demand offering alone may not mitigate these barriers unless it is supported by additional interventions for women. For example, in contexts where women experience gender-based abuse (e.g., emotional, financial, or physical), enrollment in an on-demand learning program may unintentionally escalate the risk of abuse. An abuser may interpret a woman's participation in skills development and professional advancement as a threat to existing power dynamics. This is particularly true where increased employability and income-generation opportunities could reduce economic dependence and expand pathways to exit the relationship or oppressive social environment. As such, the on-demand offering may appear to be a low-barrier educational opportunity, but for some participants it may intensify abuse-related scrutiny, intimidation, and/or retaliation.

Additionally, the on-demand learning program may unintentionally escalate gender gatekeeping in some niche professional fields—such as the drone economy in this case. It may attract additional barriers designed to keep women out, particularly in the South African context, where women's empowerment initiatives and policies are sometimes perceived as disadvantaging men.

Compliance barriers were also highlighted in the responses. Some respondents felt excluded because of Civil Aviation Authority (CAA) and other regulatory requirements. For example, the Drone Divas Programme requires prospective participants to pass a Class 3 medical examination. From our experience, some potential participants passed the interview but failed the medical examination (for example, being pregnant at the time, which meant no x-ray could be done, or not meeting eyesight requirements), which resulted in them not being enrolled in the program. It should be highlighted that the on-demand offering does not address this barrier, as it lies beyond its scope.

10.4.3 Three Life Stories

Building on the barriers highlighted in the previous section, the following section offers a nuanced narrative of three participants in the programme. The aim of the life stories was to present the lived realities of three participants—their stories cannot be generalized. Rather, these stories provide contextually grounded insights into the participants' lived experiences. Through conversations guided by a semi-structured interview guide, participants shared parts of their life stories. The interview guide invited participants to describe how their journey as drone pilots began. This was followed by questions on their experiences of the training and some reflections on the gendered realities in the aviation sector. Finally, participants were asked to reflect on the process and share advice for future participants in the Drone Divas Programme, or similar on-demand training aimed at women in male-dominated sectors.

Each of the participants started from a very different place. Participant A, a 26-year-old drone pilot, explained how she never had an interest in drones. Her dream was to become a commercial pilot and begin training, but she was unable to fulfill

her dream due to the high costs. She completed her degree in humanities and was unemployed, having to move back to her parents' home and was very negative about her future. A cousin brought the Drone Divas recruitment to her attention, and she applied. In preparing for the selection interview, she conducted research on drones and was surprised by the possibilities. Participant A was also one of the top-performing candidates and was absorbed into the working environment immediately after obtaining her drone pilot license. She admits that: *"I didn't even see myself getting employment so soon… I felt like I was one of the lucky ones to get employed."*

She explained how, on starting the new job, she had to move to another province and, on her first day, was given a car, a drone, and GPS coordinates. She had no experience in the field but was trusted to go out and do the work. She found it daunting but described how she remained calm. She confirmed the value of gaining on-the-job training through her employment. While recognizing her future intention of owning her own business in the drone industry—specifically in security applications—she described herself as too inexperienced and too young to pursue this in the near future.

> I want to open a security business. That's my main goal because I can see that this drone industry is growing each and every day and you really can be someone in the future. But, you also need to stand up for yourself and create opportunities for other people. So that's my main goal.

As a young child, Participant B dreamed of flying and explained her love for superhero movies where the hero can fly—she even shared a picture of herself in a Superman outfit standing on the roof of a house. She joined the Drone Divas Programme as a graduate in industrial psychology. While meeting the age criteria, she joined as a 39-year-old with an interest in aviation but no theoretical knowledge or experience. Participant B struggled with mastering the theory linked to the aviation licensing requirements. She also explained that she struggled with English as it is not her first language. *"The terminology was unknown to me…and even when I did my studies at Unisa, the street language and the academic language have a huge difference."* She relied heavily on support from fellow Drone Divas and successfully completed the program. She is permanently employed, but drone piloting is not part of her job specification. She dreams of getting involved in search-and-rescue efforts using drones. When asked about her entrepreneurial intentions, she explained that the cost of acquiring a drone while setting up a business is prohibitive and confirmed her fear of the unknown.

Participant C described the strong women who surrounded her while growing up. She described how she learned, from an early age, not to rely on others—and was especially wary of men.

> I was born and bred in a township, raised by a single woman, surrounded by women in the family, and only had a few uncles. So my interaction with the males has been quite limited.

Her mother, grandmother, and aunts warned her against men who would only help a woman in return for a favor. Ironically, Participant C now finds herself in the drone sector, focusing on defense systems and security. She described how her interest in

drones started when she was tasked with a university assignment that required content on drone applications. Soon after, she saw the Drone Divas Programme recruitment and applied—not knowing that within two years she would be the founder of a drone business aiming to make a mark in anti-drones and defensive drones. She specifically mentioned her attempts to "… *get into a boardroom full of decision makers who are male*" and asked: *"Why is it that we must prove our roles as women because women have always had the power within them to multitask?"*

Participant C has not only registered a business, but also drives collaboration within the industry while working part-time in an established drone training business as a marketing specialist. While this part-time employment may take time away from developing her own business, she confirmed that she is a single mother and cannot afford to forgo a regular income.

While their life stories as drone pilots began from diverse backgrounds and realities, there was a clear message regarding the positive power of peer support and being part of a women-only program. None of the participants presented themselves as victims or as resentful individuals who felt excluded in the past. Rather, they expressed appreciation and positive attitudes toward the potential that the aviation industry offers. All confirmed the supportive nature of the facilitators and trainers—irrespective of gender.

With any life-story, there is a beginning and an end. Yet, for the three stories shared above, the ending remains unwritten, as their lives as drone pilots are only beginning. The life-story section above confirms that the entry points and starting positions of candidates for an on-demand learning programme are diverse—and so too are the exit points and what follows. Understanding these entry points may be useful in program design and support during the programme delivery.

10.4.4 Contributors to Success of the Drone Divas Programme

Through the semi-structured interviews, and the responses to the online background information form, the following factors were identified that contribute to the success of the programme:

Fostering a supportive environment is key to success. Findings from the interviews confirm the importance of creating a collaborative atmosphere in which participants support one another. All participants testified to the benefit of the two-week immersion at the beginning of the programme. They explained how partnering with a roommate made it possible to support each other and work together to master the theory.

Experienced instructors were also highlighted—not only should instructors be knowledgeable, but they should also adapt to the needs of individuals within the group. Participants noted that the instructors were calm and dedicated, which contributed to a positive learning experience.

Incorporating practical applications early on was also identified as a key success factor for the training program. Participants described, with excitement, their first opportunity to fly a drone in an open field. This took place within the first week of the training and provided motivation to prepare for the theoretical examinations. In addition, sharing details early in the program on how drones are applied across various industries contributed to a much stronger understanding of drone technology and its uses.

Celebrating achievements was also noted as a key to successful engagement and motivation. The programme includes several theoretical components followed by examinations administered through Civil Aviation Authority instructors. Having units that build on others, requiring progress at each stage, helped keep participants motivated, while team cohesion also served as a motivator.

The participants were very positive about the programme and about taking part in a cohort composed exclusively of women, frequently referring to a sense of community, solidarity, and "sisterhood." As a result, the benefits of offering the programme in a mixed-gender format could not be assessed. From the vantage point of programme managers, the authors of this chapter observed a consistently positive atmosphere and high levels of cohesion across all four cohorts—dynamics that may, or may not, be attributable to the single-gender composition of the groups.

10.5 Recommendations

Sharing the case study of the conceptualization and delivery of a drone training program, developed in response to growing demand and designed to address multiple gender, economic, and social challenges, is likely to equip policymakers and educators with tools to assist in the development of on-demand learning programmes. In addition, this case study offers insights into ongoing developmental interventions that not only translate learning into practice but also offer sustainable solutions for job creation. What started as an on-demand learning initiative has resulted in the establishment of several new businesses. It offers insight into the learning ecosystem established through an accredited training center, a student entrepreneurship office, qualified business mentors and coaches, and government funding mechanisms, all situated within a Global South reality.

Recommendations for future research could include applying an intersectionality lens to interrogate how intersecting identities, such as gender, race, ethnicity, socioeconomic background, age, caregiving responsibilities, and disability status, collectively influence participants' engagement with the programme and their perceived value of it. Given the growth in the population of qualified drone pilots who participated in the Drone Divas Programme, it may also be useful to explore intra-group differences, recognizing that "women" and "female identifying participants" are not a homogenous category. Intersectionality can be used to reveal different experiences that might otherwise be overlooked by focusing on gender alone.

In terms of programme design, the authors of this chapter confirm the contributors to successful programme delivery offered by the participants. For future cohorts, the immersion component should be prioritized to ensure the best possible start to the programme. While the theoretical component can be covered in four weeks, the extended nature of the program offering allows for flexibility in time commitments through self-study weeks, in-person class sessions, and practical sessions. The mixture of delivery modes (self-study, in-person class attendance, and practical sessions in the field) appears to be a valuable attribute in the design. However, none of the cohorts finished within the 12-week period due to the need for rewriting of some assessments and the required waiting period before a rewrite attempt.

Collaboration with industry is an important component and should be encouraged—not only for programme design, but also for absorbing drone pilots into employment and on-the-job training. From the first cohort, several drone pilots were immediately absorbed into one of the national logistics provides in South Africa, which is indicative of the available opportunities. The ongoing entrepreneurial support and engagement with the entrepreneurial ecosystem should be promoted. Drone pilots who have completed the advanced BVLOS rating participate in another immersive five-day workshop for ideation and use the business model canvas methodology to develop business ideas. From there, support is offered through training on financing, business registration, business marketing and media, as well as a dedicated business mentor or coach to assist with pre-incubation of businesses.

Tracking of the program graduates is equally important, with a need to build in a feedback loop—not only to track progress, but to build a database of case studies that can be useful for others or to revisit on-demand learning programme design.

The Inhlanyelo Hub NPC Drone Divas Programme is a funded initiative that ensures full participation of young women, despite their household, caregiving, and other responsibilities. Continued funding is necessary to strengthen the pipeline of drone pilots and drone applications in the growing industry. Recommendations to funding agencies include not only funding the training itself but also providing a related stipend to cover some participation costs, which should be part of any funding arrangement. In a country where public transport is not free, and where the cost of transport is linked to distance traveled, fuel prices, and connections between different modes of transport, at least a travel stipend should be offered. Undoubtedly, providing a meal on in-person training days is necessary, as it may be the only meal of the day, or even week, for some participants. For the on-demand programme to be effective in lowering the barriers encountered by women, it needs to be supported by other interventions such as stipends for data and devices, psycho-social counseling, check-in tutorials, and monitoring and evaluation to ensure that self-pacing does not evolve into stagnation. A suite of support structures will need to be provided to enhance the success of the on-demand programme.

Although the on-demand offering will lower several barriers, there are some nuanced implied assumptions in the intervention. For example, we assume that participants will be able to pace their own learning and have access to devices and stable internet connectivity. The on-demand programme should not be "content only" but must balance affordability, provide reliable internet access (ideally zero-rated or low

data consumption), offer gender-sensitive support, and meet civil aviation regulatory complexities. Additional interventions may be needed to address these assumptions and ensure they do not limit the on-demand programme's effectiveness.

Being aware of factors that exclude those from marginalized communities should be at the forefront of program design. Factors pertaining to traditional gender roles, lack of access to education and training opportunities, limited access to capital and resources, and discriminatory practices within industries should be discussed openly and used to test the inclusivity of any on-demand learning programme.

10.6 Conclusion

This chapter offered insight into the ways in which the industry can break down boundaries and reduce the challenges that lead to stress, burnout, and attrition among women in the industry. By exposing the social aspect of entrepreneurial practice, emphasis is placed on relational sets of coordinated activities and the role of human agency, enabling a deeper appreciation of the complexities of enacted entrepreneurial practice. Understanding the personal complexities faced by women entrepreneurs who have participated in structured programmes designed to address multiple gender, economic, and social challenges, is likely to equip policymakers and educators with tools to assist in the development of on-demand learning programmes. Further, the findings from this research could inform the design and delivery of entrepreneurial programmes that may benefit accredited training centers, student entrepreneurship offices, qualified business mentors and coaches, and government developmental programmes.

References

Acker, J. (2006). Inequality regimes: Gender, class, and race in organizations. *Gender & Society, 20*(4), 441–464. https://doi.org/10.1177/0891243206289499

Ahl, H., & Marlow, S. (2012). Exploring the dynamics of gender, feminism and entrepreneurship: Advancing debate to escape a dead end? *Organization, 19*(5), 543–562. https://doi.org/10.1177/1350508412448695

Al-Dajani, H., & Marlow, S. (2013). Empowerment and entrepreneurship: A theoretical framework. *International Journal of Entrepreneurial Behaviour & Research, 19*(5), 503–524. https://doi.org/10.1108/IJEBR-10-2011-0138

Ahsan, K., Akbar, S., Kam, B., & Abdulrahman, M. D. A. (2023). Implementation of micro-credentials in higher education: A systematic literature review. *Education and Information Technologies, 28*(10), 13505–13540.

Atkinson, R. (2002). The life story interview. In J. F. Gubrium, J. F. & J. A Holstein (Eds.), *Handbook of interview research: Context & method* (pp. 121–140). Sage Publications.

Berger, R. (2015). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. *Qualitative Research, 15*(2), 219–234. https://doi.org/10.1177/1468794112468475

Carayannis, E. G., & Campbell, D. F. J. (2009). "Mode 3" and quadruple helix innovation systems: Toward a 21st-century fractal innovation ecosystem. *International Journal of Technology Management, 46*(3–4), 201–234. https://doi.org/10.1504/IJTM.2009.023374

Crenshaw, K. (2013). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. In *Feminist legal theories* (pp. 23–51). Routledge.

Dasgupta, N. (2011). Ingroup experts and peers as social vaccines who inoculate the self-concept: The stereotype inoculation model. *Social Psychological and Personality Science, 2*(3), 231–238. https://doi.org/10.1080/1047840X.2011.607313

De Soto, H. (2000). *The mystery of capital*. Bantam Press.

Diale, D., & Carrim, N. M. (2022). Experiences of black African women entrepreneurs in the South African male-dominated entrepreneurial environments. *Journal of Psychology in Africa, 32*(3), 216–223. https://doi.org/10.1080/14330237.2021.2018109

Elam, A., Brush, C., Greene, P., Baumer, B., Dean, M., & Heavlow, R. (2019). *Global entrepreneurship monitor 2018/2019 women's entrepreneurship report*. Global Entrepreneurship Research Association. https://www.gemconsortium.org/report/gem-20182019-womens-entrepreneurship-report

Hackett, S. M., & Dilts, D. M. (2004). A systematic review of business incubation research. *The Journal of Technology Transfer, 29*(1), 55–82. https://doi.org/10.1023/B:JOTT.0000011181.11952.0f

Heeks, R., Foster, C., & Nugroho, Y. (2014). New models of inclusive innovation for development. *Innovation and Development, 4*(2), 175–185. https://doi.org/10.1080/2157930X.2014.928982

Isenberg, D., & Onyemah, V. (2016). Fostering scale up ecosystems for regional economic growth. In *Global entrepreneurship congress* (Vol. 11, No. 1, pp. 71–97). Tagore LLC. https://www.researchgate.net/profile/Daniel-Isenberg/publication/309328841_Fostering_Scaleup_Ecosystems_for_Regional_Economic_Growth_Innovations_Case_Narrative_Manizales-Mas_and_Scale_Up_Milwaukee/links/624432cc57084c718b7644e5/Fostering-Scaleup-Ecosystems-for-Regional-Economic-Growth-Innovations-Case-Narrative-Manizales-Mas-and-Scale-Up-Milwaukee.pdf#page=70

Kabeer, N. (1999). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and Change, 30*(3), 435–464. https://doi.org/10.1111/1467-7660.00125

Kevill, A., Trehan, K., Easterby-Smith, M., & Higgins, D. (2015). Stick or twist? The practice of undertaking life story interviews in-the-moment. *International Journal of Entrepreneurial Behavior & Research, 21*(3), 448–471. https://doi.org/10.1108/IJEBR-08-2014-0143

Kiliç, S., & Yanikoğlu, Ö. P. (2023). Breaking the barriers: An analysis of diversity, equity, and inclusion strategies in the global aviation industry. *Tourism in Southern and Eastern Europe*, *7*, 189–199. https://doi.org/10.20867/tosee.07.13

Kolb, D. A. (2014). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Pearson FT Press.

Lewis-Beck, M.S., Bryman, T., & Liao, F. (2024). Life story interview. In M. S. Lewis-Beck, A. Bryman, & T. Futing Liao (Eds.), *The SAGE encyclopedia of social science research methods* (pp. 567–570). SAGE Publications, Inc. https://doi.org/10.4135/9781412950589.n492

Means, B. Bakia, M., & Murphy, R. (2014). *Learning online: What research tells us about whether, when and how*. Routledge. https://doi.org/10.4324/9780203095959

Mpofu, R. T. (2024). Entrepreneurial growth: Bridging experiential learning, ecological systems analysis and governance of entrepreneurship centre environments. *Journal of Governance & Regulation, 13*(2), 382–394. https://doi.org/10.22495/jgrv13i2siart14

Nussbaum, M. C. (2007). Capabilities as fundamental entitlements: Sen and social justice. In *Capabilities equality* (pp. 54–80). Routledge.

Peterson, P. L., & Cox, C. B. (2025). Adapting to the future: How microcredentials fuel self-directed learning in the evolving workplace. *Industrial and Organizational Psychology, 18*(1), 139–142. https://doi.org/10.1017/iop.2024.72

Sen, A. (2014). Development as freedom (1999). In J. T. Roberts, A. B. Hite, & N. Chorev (Eds.), *The globalization and development reader: Perspectives on development and global change* (2nd ed., pp. 525–548). Wiley-Blackwell.

Sinfield, G., Goldspink, S., & Wilson, C. (2023). Waiting in the wings: The enactment of a descriptive phenomenology study. *International Journal of Qualitative Methods*, *22*, 16094069231207012. https://doi.org/10.1177/16094069231207012

Stam, E., & Van de Ven, A. (2021). Entrepreneurial ecosystem elements. *Small Business Economics, 56*(2), 809–832. https://doi.org/10.1007/s11187-019-00270-6

Statistics South Africa. (2024). *Quarterly Labour Force Survey. Quarter 4: 2024*. https://www.statssa.gov.za/publications/P0211/P02114thQuarter2024.pdf

UNESCO. (2017). *Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM).* UNESCO. https://doi.org/10.54675/QYHK2407

Utete, R., & Mkhwanazi, S. J. (2025). Analysing women entrepreneurial empowerment challenges in South Africa: A systematic literature review. *Edelweiss Applied Science and Technology, 9*(6), 702–719.

Worldbank. (2020). *Overcoming the challenges women face in Technical and Vocational Training in Cote d'Ivoire.* https://documents1.worldbank.org/curated/en/099040325110089682/pdf/P505768-b6f7e0f7-ec55-4774-932a-48bf84fcc264.pdf#:~:text=Women%2C%20in%20particular%2C,distribution%2C%20inadequate%20boarding%20facilities%2C%20and

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Chapter 11
On-Demand Learning in Health: Lifelong Learning for Public Systems in the Global South

Carlos Alberto Pereira de Oliveira, Bruno Miranda Neves, and Marcelo Ubal

Abstract This chapter examines on-demand learning in health as part of broader lifelong learning strategies aimed at strengthening public health systems in the Global South. Moving beyond purely technological interpretations, it argues that technology-mediated lifelong learning should be understood within the institutional, political, and territorial realities that shape health workforce development and public service capacity. Grounded in lifelong learning studies and critical perspectives on the Global South, the chapter develops a theory-informed comparative analysis of four large-scale digital learning initiatives operating at regional, national, and global levels: the PAHO Virtual Campus for Public Health, the Brazilian AVASUS platform, OpenWHO, and the WHO Academy. Through a qualitative and document-based approach, the analysis explores challenges related to workforce shortages, territorial inequalities, scalability, multilingual access, and institutional coordination. The chapter suggests that the effectiveness of on-demand learning depends not only on technological innovation, but also on governance capacity, public policy alignment, and institutional integration. It further argues that, in Global South contexts, lifelong learning in health may contribute to workforce development, knowledge democratization, and the strengthening of public systems.

Keywords On-demand learning in health · Lifelong learning · Public health systems · Global South · Learning health systems · Technology-mediated education

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Summary
This chapter analyzes on-demand learning in health as a key component of lifelong learning systems designed to strengthen public health infrastructures and institutional resilience, particularly in the Global South. It argues that technology-mediated lifelong learning should not be understood merely as a technical response to rapid change, but as a strategic public function embedded in health systems, workforce policies and governance arrangements. The chapter is grounded in adult learning and lifelong learning traditions, combined with critical perspectives on the Global South and the political economy of skills. It recognizes that contemporary health systems depend on a large and unevenly distributed global workforce, facing persistent shortages, territorial disparities, and increasingly complex health challenges. In this context, scalable and flexible learning strategies become essential for maintaining service quality, supporting professional practice, and improving system resilience. This chapter develops a theory-informed and policy-oriented analysis of emerging lifelong learning infrastructures in health systems, drawing on conceptual literature and selected large-scale institutional initiatives. Four institutional cases are analyzed at different governance levels: the Virtual Campus for Public Health of the Pan American Health Organization, the Brazilian AVASUS platform, the OpenWHO global learning platform, and the WHO Academy. These cases represent regional, national, and global initiatives that illustrate how on-demand learning can be integrated into public health systems. The transversal analysis shows that the impact of digital lifelong learning depends less on technological innovation alone and more on governance, institutional alignment, and local adaptation. Across the cases, lifelong learning in health functions as a multi-scalar public infrastructure that supports workforce development, institutional capacity, and equity-oriented health systems. The chapter concludes that on-demand learning in health is most effective when it is integrated into public systems, aligned with territorial realities, and designed as part of long-term strategies for workforce development and health system strengthening. The chapter also frames lifelong learning as a condition for digital sovereignty, knowledge democratization, and institutional strengthening in the Global South.

11.1 Introduction

11.1.1 Philosophical Foundations of Lifelong Learning: Humanism, Confucianism, and the Global South

Contemporary debates on lifelong learning cannot be reduced to technical or instrumental perspectives. At a moment of global transformation, the central question is not merely how to adapt educational systems to new technologies, but how to articulate educational processes with broader ethical, cultural, and social horizons. From this standpoint, lifelong learning should not be understood as a simple functional response to labor market demands, but as part of a wider cultural and social process.

Education, in this sense, corresponds to "the broad processes of cultural circulation that take place through human and social relations, which reproduce the status quo and/or generate new meanings" (Ubal et al., 2011). This definition shifts the analytical focus away from formal schooling alone and toward the broader social dynamics in which learning takes place, including workplaces, communities, and public institutions.

Such an approach resonates with both Western humanist traditions and Confucian philosophy. In Confucian thought, education is inseparable from moral cultivation (xiū shēn), social harmony, and responsible governance, reinforcing the ethical dimension of lifelong learning which is not a utilitarian activity aimed at power or wealth, but a lifelong path of ethical self-cultivation. Knowledge, practice, and moral development are inseparable, and education is oriented toward the formation of individuals capable of acting with responsibility within society. This understanding aligns with humanist perspectives in which knowledge is not merely instrumental, but intrinsically linked to ethical formation and social commitment.

In contemporary technological societies, however, this humanist understanding of learning is under pressure, particularly from performative, market-driven, and hypercompetitive logics that redefine learning primarily as an instrument of productivity. The expansion of lifelong learning discourses often occurs within performance-oriented environments, where education is reduced to continuous skill updating. In such contexts, learning risks becoming a mechanism of self-optimization rather than a path toward human development. Critical perspectives emerging from the Global South emphasize that lifelong learning must be situated within the historical, social, and economic conditions that shape public systems. Educational processes are embedded in relations of power, in the organization of work, and in the distribution of opportunities across societies marked by inequality.

Within these contexts, lifelong learning must also be understood as a cultural and political process. As Ubal and colleagues argue, educational experiences that extend throughout the life course should promote encounters with difference, since "we should promote exchanges among subjects throughout their lives […] as a concrete way of learning to live with the different, to relate to other cultures and diversities" (Ubal et al., 2023). This perspective places intercultural dialogue, social coexistence, and ethical formation at the center of lifelong learning, rather than viewing it merely as a mechanism for technical updating.

These philosophical perspectives converge in a view of lifelong learning as a process of human formation embedded in social realities. Rather than a purely technical or economic function, lifelong learning emerges as a cultural, ethical, and political practice that unfolds across the life course. When situated within the context of the Global South, this understanding becomes inseparable from broader struggles for equity, social rights, and the strengthening of public systems. Lifelong learning in health, therefore, must be understood not only as a technological or pedagogical innovation, but also as part of a broader project of social transformation and collective well-being.

To avoid treating lifelong learning in health as merely a pragmatic response to change, this chapter is theoretically anchored in adult learning and lifelong learning

traditions. Adult learning is understood as a practice-oriented process in which learners mobilize experience, autonomy, and relevance to real-life problems—an orientation consistently highlighted across foundational adult education scholarship (Jarvis, 2004; Knowles et al., 2015; Merriam & Bierema, 2014). In this sense, on-demand learning in health is not simply faster training, but a mode of learning triggered by practice needs, shaped by professional judgment, and oriented toward immediate applicability in service settings.

Lifelong learning itself, however, is not a neutral concept. It has been discussed through foundational models and critiques that illuminate underlying assumptions about individual responsibility, governance, and the political economy of skills (Regmi, 2015). This critical lens is particularly relevant in the Global South, where learning opportunities intersect with structural constraints, inequities, and uneven access to resources. In parallel, Freire's view of education as an ethical and emancipatory practice—grounded in autonomy, responsibility, and situated agency—helps frame lifelong learning in health as more than technical updating, emphasizing its public, dialogical, and civic dimensions (Freire, 1996).

Within this broader perspective, this chapter examines how technology-mediated, on-demand learning in health has been configured as a public and institutional infrastructure to support health workforce development and system resilience, particularly in the Global South.

11.1.2 Lifelong Learning, Public Systems, and the Global South

The contemporary expansion of lifelong learning discourses must be understood within the broader political and economic transformations that shape public systems, particularly in the Global South. Lifelong learning is often presented as a neutral and universally beneficial educational strategy (Regmi, 2015). However, in societies marked by historical inequalities, colonial legacies, and asymmetric economic development, the meanings and functions of lifelong learning cannot be detached from their socio-political contexts.

Critical perspectives emerging from Latin America, Africa, and parts of Asia emphasize that the Global South is not merely a geographic designation, but a political, historical, and epistemic condition. As Theotônio dos Santos argues, the Global South cannot be understood only through its peripheral position in the international system, but through "a subordinated insertion in the international division of labor and knowledge" (Santos, 2020). These asymmetries have historically shaped unequal flows of technology, scientific authority, and policy models, including in the field of digital education and health governance. In this sense, the Global South should be interpreted not as a simple geographic category, but as a cultural, political, and economic condition shaped by dependent capitalism and by the historical processes of colonization and resource extraction.

Within this context, educational models circulating globally are not neutral: they carry implicit assumptions about development, labor markets, and the role of the state, often derived from experiences in the Global North. Lifelong learning policies may therefore assume very different meanings depending on their institutional and political orientation. In some settings, they are mobilized to promote social inclusion, strengthen public services, and expand access to knowledge as a social right. In others, they are framed as instruments for individual employability, competitiveness, and self-responsibilization, often detached from collective guarantees and public provision.

In the Global South, the organization of lifelong learning is closely linked to the capacity of states to sustain public systems under conditions of economic constraint and social inequality. Public health systems, in particular, depend on continuous processes of professional education to maintain service quality, respond to emerging health challenges, and reduce territorial disparities. Yet the availability of resources for training and professional development is often uneven, especially in peripheral or underserved regions.

Technology-mediated learning environments have emerged as a strategic response to these structural constraints (Nieder et al., 2022). By enabling large-scale access to educational resources, digital platforms can support workforce development even in contexts marked by geographic dispersion and limited institutional infrastructure. However, the expansion of these technologies also raises critical questions. Digital learning initiatives may either reinforce existing inequalities—by privileging regions with better connectivity and resources—or contribute to more equitable systems, depending on how they are designed, governed, and integrated into public policies.

From a Global South perspective, the key issue is not the mere adoption of technological solutions, but the political and institutional frameworks in which they operate. Lifelong learning initiatives must be aligned with inclusive development projects, the strengthening of public systems, and the recognition of health workers as subjects embedded in social, territorial, and institutional contexts. When detached from these dimensions, learning technologies risk reproducing the same patterns of dependency that have historically shaped peripheral economies and knowledge systems.

In this sense, lifelong learning in health becomes part of a broader struggle over the future of public systems. It is connected to debates about universal access, state responsibility, professional valorization, and the democratization of knowledge. When conceived as a public good rather than a private commodity, lifelong learning can contribute to reducing inequalities and strengthening collective capacities. At the same time, the Global South must also be understood as a site of epistemic innovation, institutional creativity, and South–South cooperation, rather than exclusively through narratives of deficit or dependency.

These socio-political considerations provide the contextual foundation for the analysis developed in this chapter. The following sections examine how technology-mediated, on-demand learning initiatives have been institutionalized at regional, national, and global levels, and how they interact with the challenges faced by public health systems in the Global South.

11.1.3 Lifelong Learning in Health: Public Systems, Equity, and Technological Mediation

The organization of health systems in contemporary societies demands professionals capable of learning continuously and adapting rapidly to complex and diverse territorial realities. Accelerated scientific, technological, epidemiological, and organizational transformations are reshaping how care is delivered, managed, and governed. These transformations impose unprecedented challenges on public health systems and require health professionals who are able not only to acquire new knowledge, but also to do so continuously, throughout their professional trajectories. This requirement is particularly evident in the Global South, where health systems operate under conditions of resource constraints, social inequality, and marked territorial heterogeneity.

Traditional models of professional education—largely structured around sequential curricula, rigid institutional pathways, and time-bound training cycles—are increasingly misaligned with these realities. In many contexts, they fail to respond to the urgency, diversity, and unpredictability of situations encountered by frontline health workers. Scarcity of resources, heterogeneous population profiles, and persistent social inequalities further amplify these limitations. In such environments, the ability to access reliable, context-sensitive knowledge at the right moment becomes a strategic factor for clinical decision-making, community well-being, and overall public health outcomes. Learning, therefore, can no longer be understood as a finite stage preceding professional practice, but must be recognized as a permanent, systemic, and practice-embedded process.

According to consolidated data from the World Health Organization (WHO), the global health workforce comprises more than 65 million professionals, including approximately 30 million nursing and midwifery personnel and around 13 million medical doctors, in addition to millions of pharmacists, dentists, community health workers, and other health-related occupations, representing one of the largest professional workforces worldwide and a foundational pillar of social protection systems (WHO, 2023). Yet the WHO projects a shortfall of approximately 10 million health workers by 2030, with the most severe deficits concentrated in low- and middle-income countries (WHO, 2016). This imbalance in workforce availability reflects structural inequalities and poses a direct challenge to the sustainability and effectiveness of health systems.

Regions such as Europe and the Western Pacific concentrate large absolute numbers of health professionals, yet face growing pressures related to population ageing, the rising burden of chronic conditions, and the continuous reorganization of care systems. The South-East Asia region mobilizes very large workforces in absolute terms, associated with population size, but must address challenges of scale, heterogeneity, and uneven training capacity. In contrast, the African and Eastern Mediterranean regions continue to experience chronic shortages, low workforce density, and fragile institutional infrastructures for education and professional development, despite high and growing health needs.

In the Region of the Americas, the Pan American Health Organization reports marked heterogeneity in workforce density, both between and within countries. While some countries exceed the global benchmark of health worker density, others—particularly those with extensive rural or underserved territories—face persistent shortages and maldistribution of professionals (Organización Panamericana de la Salud [PAHO], 2021). These regional disparities reinforce the need for differentiated and context-sensitive strategies for workforce development and continuing education.

Across all regions, the combination of large workforce volumes, uneven distribution, and evolving epidemiological profiles exposes the structural limits of traditional, centralized training models and reinforces the need for lifelong learning in health strategies that are adaptable to diverse system contexts.

At this scale, exclusively face-to-face, centralized, and episodic training models are impractical as primary strategies for professional qualification. Scalable, flexible, and technology-mediated learning infrastructures thus become indispensable to sustain lifelong learning in health at a level compatible with real-world system demands.

This need is particularly evident in the health sector, where workforce development must respond to rapidly evolving demands and large-scale system challenges. In this context, international frameworks have emphasized the importance of continuous and flexible learning approaches to support health professionals, especially in dynamic and resource-constrained environments (World Health Organization, 2016). Within this broader movement, on-demand learning in health has gained prominence as a mode of knowledge provision oriented toward immediacy, contextual relevance, and practical application in service settings.

These transformations are not only reflected in the organization of health systems but are also explicitly articulated in international policy frameworks advanced by multilateral organizations within the United Nations system. The 2030 Agenda for Sustainable Development highlights the interdependence between health systems, lifelong learning, and decent work, particularly through SDG 3, SDG 4, and SDG 8 (United Nations, 2015). In this context, UNESCO has emphasized the need for flexible and inclusive learning systems across the life course, while the UNESCO Institute for Lifelong Learning has advanced lifelong learning as a structural principle for education systems (UNESCO, 2021; UNESCO Institute for Lifelong Learning, 2022). In parallel, the World Health Organization has highlighted the importance of continuous and scalable learning approaches for strengthening health workforce capacities (World Health Organization, 2016, 2022), and the International Labour Organization has stressed the growing need for reskilling and upskilling in response to transformations in the world of work (International Labour Organization, 2022).

In this context, on-demand learning in health is understood as a mode of knowledge provision characterized by immediacy, contextual relevance, and responsiveness to practice-based needs. It involves the capacity of learning systems to deliver validated, accessible, and actionable knowledge at the moment it is required, supporting decision-making and professional practice in real-world settings. This definition serves as the analytical lens through which the institutional cases examined in the

following sections are interpreted, in dialogue with recent evidence on digital education in health professions and the need for scalable, evidence-informed learning models (Car et al., 2019).

The COVID-19 pandemic offered a paradigmatic illustration of the strategic role of lifelong learning in health, as digital technologies became central to pandemic planning, health system response, and the rapid circulation of knowledge (Whitelaw et al., 2020). Faced with a novel virus and rapidly evolving scientific evidence, health systems depended on continuous learning processes to update clinical protocols, reorganize services, and protect health workers and populations. In this context, rapid and large-scale learning initiatives were mobilized as part of the health system response itself, reinforcing the understanding that timely access to validated knowledge constitutes a life-preserving intervention, effectively transforming knowledge dissemination into a public health intervention (World Health Organization, 2020).

At the same time, the everyday functioning of health systems increasingly demands on-demand learning responses to high-impact challenges, including climate-related events, communicable diseases, non-communicable conditions, mental health needs, and health surveillance activities. From this broader perspective, emergencies do not constitute exceptions, but rather intensified manifestations of a permanent learning demand inherent to the governance and operation of contemporary health systems.

This chapter examines how lifelong learning in health, mediated by digital technologies, has been operationalized through institutional learning ecosystems at different scales. Through the analysis of four interconnected experiences—the Virtual Campus of Public Health of the Pan American Health Organization (CVSP/PAHO), the Brazilian AVASUS platform, OpenWHO, and the WHO Academy—the chapter explores how localization, equity, and public governance shape on-demand learning infrastructures and contribute to strengthening public health systems in the Global South.

To avoid treating lifelong learning in health merely as a pragmatic or instrumental response to accelerated change, this chapter is theoretically anchored in adult education and lifelong learning traditions. Adult learning is understood as a practice-oriented process in which learners mobilize experience, autonomy, and relevance to real-life problems (Jarvis, 2004; Knowles et al., 2015; Merriam & Bierema, 2014). Lifelong learning is also examined critically, as a concept embedded in governance arrangements, institutional responsibilities, and equity assumptions (Regmi, 2015). Freire's conception of education as an ethical and emancipatory practice frames lifelong learning in health as a public, dialogical, and civic endeavor (Freire, 1996).

Finally, drawing on an infrastructural perspective, digital learning environments are analyzed as socio-technical systems whose effectiveness depends on alignment between design, governance, access, and local practices (Star & Ruhleder, 1996). Within accelerated societies (Rosa, 2013), lifelong learning in health emerges as a strategic public infrastructure aligned with health system resilience and global policy commitments, including the WHO Global Strategy on Digital Health 2020–2025 (WHO, 2020).

This perspective aligns directly with the 2030 Agenda for Sustainable Development, particularly with Sustainable Development Goal (SDG) 3 (Good Health and Well-being) and SDG 4 (Quality Education), emphasizing the interdependence between strong health systems and inclusive, equitable, and lifelong learning opportunities. In this sense, learning functions not only as an educational process, but also as a strategic lever for equity, institutional capacity, and sustainable development.

Taken together, these elements suggest that on-demand learning in health is most transformative when it operates as an ethical, collaborative, and system-oriented infrastructure, reinforcing public health systems, respecting territorial and cultural diversity, and enabling health workers to act with competence and confidence in complex real-world contexts.

11.2 Methodological and Analytical Approach

The analysis developed in this chapter takes shape through the articulation between conceptual literature and emerging models of lifelong learning in health systems. Rather than separating empirical reference from theoretical reflection, the argument unfolds through their continuous interplay, allowing these initiatives to be interpreted in relation to broader transformations in how knowledge is produced, organized, and applied within health systems.

This chapter adopts a qualitative, theory-informed analytical approach based on the examination of selected institutional cases of technology-mediated lifelong learning in health. Rather than aiming at statistical generalization, the analysis seeks to identify patterns, divergences, and structural features across different learning systems, with particular attention to their institutional design, governance arrangements, and capacity to respond to real-world demands.

The use of case-based analysis follows established methodological traditions in qualitative research, particularly in the study of complex social and institutional phenomena, where contextual depth and analytical interpretation are central (Flyvbjerg, 2006; Yin, 2018).

The initiatives considered—such as the Pan American Health Organization's Virtual Campus for Public Health (CVSP), Brazil's AVASUS, the World Health Organization's OpenWHO platform, and the WHO Academy—are approached as part of the emerging ecosystem of lifelong learning infrastructures discussed throughout the chapter. They are not treated as bounded cases, but as situated arrangements through which these transformations become visible across different institutional and territorial contexts.

The selection of cases was guided by their relevance in the global landscape of lifelong learning in health, their diversity in institutional configuration, and their documented role in supporting large-scale workforce development. Together, these cases represent different models of organizing on-demand learning systems, allowing for a comparative analysis across distinct geopolitical and institutional contexts.

This comparative perspective enables the identification of patterns and variations across cases, in line with approaches that emphasize the analytical value of systematic comparison in understanding complex systems (Ragin, 2014).

To structure this analytical reading, the analysis follows a set of interrelated dimensions grounded in the literature on lifelong learning, infrastructures, and learning health systems. These include the organization of learning across scales, the governance structures that sustain it, the degree to which learning is embedded within health systems, and the modalities through which knowledge is made available—particularly in on-demand formats characterized by immediacy, flexibility, and contextual relevance. At the same time, attention is given to how these arrangements respond to heterogeneous conditions, especially in contexts marked by structural asymmetries and uneven infrastructural capacities.

This framing allows for a transversal reading across the initiatives, bringing into focus both recurring patterns and the tensions that shape their development. What emerges is not an exhaustive mapping, but an identification of broader configurations that characterize the current reconfiguration of lifelong learning in health. In this sense, learning appears not only as an educational activity, but as an infrastructural dimension of health systems, embedded in their modes of coordination, adaptation, and continuous transformation.

The argument develops through a process of synthesis in which literature and documented experiences are brought into relation to clarify key concepts, establish connections, and bring into view the underlying logics of these initiatives, particularly in relation to global–local dynamics. Particular attention is given to the global–local dynamics that permeate these processes, especially in contexts where access to infrastructures, institutional capacity, and knowledge production remains uneven.

The analysis focuses on three main dimensions: (i) the organizational and governance structures of the learning systems, (ii) the modalities of knowledge production and dissemination, and (iii) their capacity to support timely, context-responsive learning processes. These dimensions are examined in light of the theoretical framework discussed in the introduction, particularly the relationship between lifelong learning, public systems, and the evolving demands of health workforce development.

Within this analytical framing, on-demand learning can be understood as part of a broader transformation in the organization of knowledge in health systems, extending beyond technological provision to encompass evolving forms of temporal, spatial, and institutional coordination, as discussed in the preceding sections.

11.3 Institutional Cases of On-Demand Learning in Health

The following section examines selected institutional cases of technology-mediated lifelong learning in health systems across different scales and geopolitical contexts. These cases illustrate how on-demand learning has been operationalized within public systems and how it contributes to addressing structural challenges related to workforce development, equity, and access to knowledge.

11.3.1 The Virtual Campus of Public Health: A Regional and Foundational Experience in Lifelong Learning in Health

The Virtual Campus of Public Health (CVSP) of the Pan American Health Organization represents one of the earliest and most sustained regional experiences of technology-mediated lifelong learning in health. Launched in 2003, the CVSP was conceived as a strategic instrument of technical cooperation, designed to strengthen health workforce capacity across the Americas through continuous, collaborative, and context-sensitive learning (Listovsky et al., 2022). Long before the widespread adoption of MOOCs and global learning platforms, the CVSP articulated digital education with public health priorities, institutional development, and regional integration.

This case can be analytically understood through three interrelated dimensions: its governance structure, the ways in which knowledge is produced and disseminated, and its capacity to support timely and context-sensitive learning processes.

Unlike centralized training models, the CVSP operates through a network-based governance structure, organized around national and subregional nodes embedded within ministries of health, public institutions, and academic partners. This decentralized architecture enables countries to adapt learning offers to local epidemiological profiles, linguistic diversity, and health system needs, while maintaining alignment with PAHO's technical guidelines and strategic objectives (Listovsky et al., 2022). In this sense, the CVSP exemplifies an early model of localized lifelong learning in health, combining regional coordination with national ownership.

Empirical evidence highlights the scale and continuity of the CVSP's educational activities. Between 2007 and 2021, the platform delivered more than 200 tutored courses and over 200 self-learning courses, addressing priority themes such as primary health care, epidemiological surveillance, health promotion, noncommunicable diseases, and health system strengthening (Listovsky et al., 2022). Participation expanded significantly during the COVID-19 pandemic, when the CVSP rapidly adapted its learning offers to support countries in responding to evolving public health demands. This trajectory demonstrates the platform's capacity to function not only as an educational environment, but as a regional learning infrastructure responsive to both routine and extraordinary health challenges.

Beyond quantitative indicators, studies evaluating specific CVSP courses report high levels of learner satisfaction, particularly with respect to pedagogical design, tutor support, and relevance to professional practice. Evaluations conducted in different national contexts indicate that participants value the integration of theory and practice, collaborative learning dynamics, and the direct applicability of course content to their work environments (Evaluación de satisfacción, 2020). These findings reinforce the role of the CVSP as a platform that supports practice-oriented and learner-centered professional development.

The CVSP has also been analyzed as an institutional communication and knowledge-sharing ecosystem, rather than merely a learning management system.

Research on its communication strategies highlights how the platform contributes to disseminating public health priorities, strengthening institutional visibility, and fostering regional knowledge exchange among health professionals and organizations (Cunha, 2024). This dimension is particularly relevant in a region characterized by social, cultural, and linguistic diversity, where effective communication is integral to capacity building and policy implementation.

From a policy perspective, the CVSP aligns closely with the 2030 Agenda for Sustainable Development, particularly SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education), by promoting equitable access to continuous professional education in health. Its cooperative and network-based model also resonates with SDG 17 (Partnerships for the Goals), reflecting PAHO's long-standing mandate to foster regional collaboration and shared learning. By embedding lifelong learning within public institutions and regional cooperation frameworks, the CVSP contributes to strengthening health systems as learning systems.

Taken together, the Virtual Campus of Public Health of PAHO constitutes a foundational regional experience in lifelong learning in health. Its historical depth, decentralized governance, and sustained integration with public health priorities distinguish it as a precursor to later national and global initiatives. In the architecture developed in this chapter, the CVSP provides the regional grounding upon which subsequent experiences—such as national platforms like AVASUS and global initiatives like OpenWHO and the WHO Academy—can be analytically situated.

11.3.2 AVASUS: Lifelong Learning in Health at National Scale

The AVASUS (Virtual Learning Environment of the Brazilian Unified Health System) represents one of the most consolidated national experiences of technology-mediated lifelong learning in health within a large, universal public health system. AVASUS was created through an institutional partnership between the Brazilian Ministry of Health and the Federal University of Rio Grande do Norte (UFRN), coordinated by the Laboratory of Technological Innovation in Health (LAIS). Conceived within this public–academic collaboration, AVASUS operates not merely as a repository of courses, but as a public learning infrastructure designed to support continuing education, workforce qualification, and system responsiveness across a territorially extensive and socially diverse country.

From an analytical standpoint, this experience illustrates how governance arrangements, knowledge infrastructures, and responsiveness to real-world demands interact in the organization of on-demand learning in health.

Empirical evaluations demonstrate the scale and reach of the platform. A national assessment published in Frontiers in Medicine reports that AVASUS surpassed 800,000 users, more than 2 million enrollments, and over 300 courses, reaching health professionals from all Brazilian regions. Importantly, this scale is not an end

in itself.[1] As highlighted by the authors, "the massive, open, flexible, and digitally mediated learning strategies designed in AVASUS contribute to the Sustainable Development Goals (SDGs) set forth by the UN in the 2030 Agenda, specifically SDG 3 and SDG 4" (Valentim et al., 2022). These findings situate AVASUS not only as an educational initiative, but as a strategic mechanism for aligning lifelong learning in health with global development agendas.

Crucially, participation indicators are accompanied by evidence of practical relevance for health services. According to the same study, 75.6% of participants reported that AVASUS course contents contributed to improving existing health services in their workplaces, while 24.6% indicated that the courses were essential for implementing new services (Valentim et al., 2022). This relationship between learning and service transformation is directly linked to the pedagogical model adopted. As noted in the literature, "the technological mediation offered by Massive Open Online Courses (MOOCs) in AVASUS has spurred the adoption of innovative technologies in the continuing process of improving the individual and collective capacities of the Brazilian health workforce" (Valentim et al., 2022). Such evidence supports the interpretation of AVASUS as an on-demand learning mechanism, activated by concrete service needs rather than abstract curricular requirements.

Beyond aggregate indicators, the academic literature highlights the methodological robustness of evaluations conducted on AVASUS. Studies combine platform data with national administrative databases—such as the National Registry of Health Care Facilities and the Brazilian Occupation Classification—allowing analyses that link learning trajectories to professional profiles, territorial distribution, and service contexts. In the evaluation of national learning pathways addressing syphilis and other sexually transmitted infections, researchers integrated educational, occupational, and epidemiological data, demonstrating the capacity of AVASUS to function as a knowledge management instrument embedded within the health system, rather than as an isolated educational intervention.

The relevance of AVASUS becomes particularly evident in its application to priority public health problems. Massive open online courses delivered through the platform have been explicitly mobilized as national instruments to address persistent challenges such as congenital syphilis, prison health, and COVID-19, reaching hundreds of thousands of enrollments across all regions of Brazil (Caitano et al., 2022). In this context, AVASUS has been described as "a remarkably efficient and effective tool for promoting public health policies, adding value to health services and strengthening system resilience through massive, open, and technology-mediated education." These findings reinforce the role of lifelong learning in health as a driver of system responsiveness and resilience, particularly in large and decentralized public systems.

[1] According to the official AVASUS Transparency Portal, as of **February 4, 2026**, the platform registered **1,551,245 users**, **4,457,996 course enrollments**, and **2,840,739 certifications issued**, with **499 active courses**. These figures indicate the continued expansion of AVASUS beyond the period analyzed by Valentim et al. (2022) and are publicly available and updated in real time.

Importantly, AVASUS has also been analyzed from perspectives that go beyond efficiency and scale, incorporating interculturality, equity, and ethical dimensions of technology-mediated learning. Research focusing on interculturality emphasizes that technology-mediated Massive Open Online Courses (MOOCs) have become innovative strategies for health training from an intercultural perspective, enabling professionals to be better equipped to work in culturally diverse contexts (da Cunha et al., 2025). By valuing sociocultural diversity, local knowledge, and territorial specificities, AVASUS contributes to more inclusive and context-sensitive health practices, aligning professional training with the realities of diverse populations served by the Unified Health System.

Taken together, the academic literature positions AVASUS as a paradigmatic case of national-scale lifelong learning in health, combining openness, scalability, methodological rigor, and demonstrable impact on health services. Its experience illustrates how on-demand, technology-mediated learning can be institutionalized as a component of public policy, reinforcing system resilience, advancing the Sustainable Development Goals, and supporting health professionals in responding to both routine demands and heightened systemic pressures (Romão et al., 2023). In this sense, AVASUS exemplifies how learning infrastructures can be designed to operate with and within public health systems, rather than alongside them.

11.3.3 OpenWHO: Global Emergency Learning at Scale

The OpenWHO platform represents one of the most significant global experiences of technology-mediated lifelong learning in health, designed to support health professionals, decision-makers, and frontline workers across diverse epidemiological, institutional, and territorial contexts. Developed and operated by the World Health Organization, OpenWHO was conceived as an open, multilingual, and scalable learning environment capable of delivering rapid, authoritative, and context-sensitive knowledge aligned with WHO norms, guidelines, and technical recommendations. Since its launch in 2017, the platform has evolved in response to operational learning needs in global health, culminating in a major redesign in 2025 that repositioned OpenWHO as a global learning resource hub focused on the rapid dissemination and reuse of learning materials for health emergencies.[2]

Analytically, this initiative highlights the articulation between organizational design, knowledge dissemination mechanisms, and the capacity to deliver rapid and context-responsive learning at scale.

[2] OpenWHO was launched by the World Health Organization in 2017 as an open learning platform to disseminate WHO technical guidance and training resources for public health emergencies. In 2025, the platform was redesigned to prioritize open access to reusable learning materials, discontinuing user registration and certification to reduce barriers and accelerate knowledge dissemination during health crises (World Health Organization, n.d.).

From its inception, OpenWHO was structured to address a central challenge in global health governance: the mismatch between the speed of emerging health threats and the pace of traditional training models. By offering self-paced, freely accessible courses in multiple languages, the platform operationalized a model of on-demand learning in health, enabling professionals to access critical knowledge at the point of need, regardless of geographic location or institutional affiliation. Empirical analyses demonstrate that OpenWHO achieved global reach at unprecedented scale, with extensive participation across all WHO regions, particularly from low- and middle-income countries (Utunen et al., 2020).

The strategic role of OpenWHO became especially visible during the COVID-19 pandemic. As scientific knowledge about a novel virus evolved rapidly, OpenWHO enabled the WHO to translate emerging evidence into structured learning resources and disseminate them in near real time. An early analysis of platform use data shows that a single introductory COVID-19 course reached 232,890 enrollments in just two months, delivered in 13 languages and accessed by learners from all WHO regions (Utunen et al., 2020). This experience reinforced the understanding—widely adopted during the pandemic—that learning saves lives, underscoring how structured, multilingual, and rapidly updated knowledge can operate as an essential protective layer for health systems.

Beyond this initial emergency response, OpenWHO demonstrated sustained growth as a global learning infrastructure. A retrospective analysis of the platform's first seven years of operation indicates that, between 2017 and 2024, OpenWHO delivered 315 courses, offered learning resources in 75 languages, and accumulated more than 9.2 million enrollments worldwide (Utunen et al., 2024). These figures provide concrete evidence of the platform's unprecedented scale and confirm its consolidation as the WHO's primary digital environment for lifelong learning in health, supporting both emergency response and routine public health functions.

A defining feature of OpenWHO is its emphasis on multilingualism and localization as strategies for equitable access. Evidence from platform use data indicates that providing courses in multiple languages was a decisive factor in enabling rapid and equitable access to COVID-19-related knowledge (Utunen et al., 2020). This approach extends beyond translation to encompass cultural, social, and health system adaptation, supporting context-sensitive uptake of technical guidance across diverse settings. Such design principles align with broader analyses of digital learning for health workers in low- and middle-income countries, which highlight the importance of accessibility, openness, and contextual relevance for effective professional development (Nieder et al., 2022).

Analytically, OpenWHO illustrates how on-demand learning operates at a global scale under conditions of urgency, where immediacy and accessibility become central to knowledge provision.

11.3.4 The WHO Academy: Toward a Global Ecosystem for Lifelong Learning in Health

The WHO Academy represents a decisive step in the institutionalization of lifelong learning in health as a core function of global health governance. Officially launched in 2020, with strong political and financial support from the Government of France, the Academy was conceived not merely as a training platform, but as a global policy infrastructure for continuous learning, embedded within the strategic mandate of the WHO (WHO, 2021, 2024). Its creation reflects the recognition that the capacity of health systems to respond to complex, interconnected, and evolving challenges depends fundamentally on the continuous development of human and institutional competencies.

This experience can be interpreted as a more structured expression of the analytical dimensions guiding this chapter, particularly in terms of governance, knowledge production, and system-level responsiveness.

Unlike earlier initiatives primarily focused on content dissemination, the WHO Academy is explicitly grounded in adult learning sciences, competency-based education, and systems thinking, underscoring how structured, multilingual, and rapidly updated knowledge can operate as an essential protective layer for health systems. Its pedagogical model emphasizes personalized learning pathways, modular curricula, and the integration of digital, hybrid, and face-to-face learning modalities, allowing learning to occur across the professional life course and in close connection with real-world practice (WHO, 2023). This approach marks a qualitative shift from episodic training toward structured lifelong learning in health, aligned with WHO norms, standards, and strategic priorities.

The Academy was designed in direct response to structural transformations affecting health systems worldwide. These include demographic transitions, the growing burden of non-communicable diseases, recurrent public health emergencies, accelerating digitalization, climate change, and the proliferation of misinformation and infodemics. Recent analyses highlight that the WHO Academy explicitly incorporates these dimensions into its learning architecture, positioning climate change and health, emergency preparedness, digital health, leadership, and infodemic management as priority domains for competency development (Prats et al., 2023; Rubinelli et al., 2022).

A distinctive feature of the WHO Academy is its emphasis on institutional and collective competencies, rather than solely individual skill acquisition. Learning programs are designed to strengthen not only health professionals, but also ministries of health, regulatory bodies, and health organizations, supporting evidence-informed decision-making, governance capacity, and system resilience (WHO, 2021). This orientation aligns with the concept of learning health systems, in which continuous feedback, knowledge translation, and adaptive learning are integral to system performance.

The WHO Academy also advances a strong equity-oriented and Global South–focused agenda. By prioritizing multilingual delivery, open digital access, and partnerships with countries and regional offices, the Academy seeks to reduce persistent asymmetries in access to high-quality professional education. Rather than replacing national and regional initiatives, it functions as a hub that articulates global standards with local and regional learning ecosystems, building upon experiences such as the Campus Virtual of PAHO, national platforms like AVASUS, and global initiatives such as OpenWHO.

From a policy perspective, the WHO Academy is explicitly aligned with the 2030 Agenda for Sustainable Development, particularly SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals). By embedding lifelong learning within WHO's institutional architecture, the Academy reinforces the understanding that sustainable health systems depend not only on infrastructure and financing, but on the continuous renewal of knowledge, competencies, and leadership across all levels of the system.

Importantly, the WHO Academy does not represent a rupture with previous learning initiatives, but rather their institutional consolidation and strategic expansion. While OpenWHO demonstrated the feasibility and impact of large-scale, on-demand digital learning—particularly during emergencies—the WHO Academy extends this experience by establishing governance structures, quality frameworks, and long-term learning strategies. In doing so, it transforms episodic learning responses into a permanent global learning ecosystem.

Within the analytical architecture of this chapter, the WHO Academy completes a multilevel trajectory of lifelong learning in health. Beginning with regional cooperation models such as the PAHO Virtual Campus, advancing through national-scale public policies like AVASUS, and scaling globally through OpenWHO, the WHO Academy represents the point at which lifelong learning in health becomes an explicit, institutionalized mandate of global health governance. Its emergence signals a paradigm shift: learning is no longer ancillary to health systems, but a foundational condition for their effectiveness, equity, and resilience.

At an analytical level, the WHO Academy represents a more institutionalized configuration of lifelong learning infrastructure, where global governance, standardization, and system integration converge to position learning as a strategic component of health system strengthening.

At the same time, these global initiatives raise important questions regarding their adaptability to contexts marked by infrastructural constraints and unequal access to digital resources, particularly in low- and middle-income settings.

11.4 Transversal analysis: Learning Ecosystems Across Scales

From a transversal perspective, the cases examined in this chapter reveal how learning ecosystems take shape through the interplay between governance arrangements, knowledge infrastructures, and responsiveness to real-world demands.

Across the four cases, the analysis highlights how learning at scale depends less on isolated course offerings and more on the alignment of governance, standards, and feedback loops between practice and knowledge. From a comparative perspective, the cases can be read across shared dimensions such as governance, scale, openness, localization, and integration with health systems. This resonates with the learning health systems literature, which describes continuous cycles in which data and experience from practice are translated into knowledge and then reintegrated into care and organizational routines (Enticott et al., 2021; Kilbourne et al., 2024; Smith et al., 2024). In this sense, on-demand learning ecosystems become part of a broader capacity for rapid system learning, institutionalizing feedback loops between evidence generation, policy adaptation, professional practice, and digital infrastructure, especially when they support localization, multilingual access, and real-time updating features that are decisive for equity and effectiveness in the Global South (Regmi, 2015; Star & Ruhleder, 1996).

The four initiatives can be read comparatively across key axes that structure lifelong learning infrastructures in health systems.

Across scales, the cases illustrate how learning health systems operate from regional coordination (CVSP), to national public policy (AVASUS), to global emergency response (OpenWHO), and finally to institutionalized global governance (WHO Academy). This progression highlights how scale is not merely a matter of reach, but of institutional complexity and coordination capacity.

Across governance arrangements, the cases reveal different modes of institutional anchoring, ranging from decentralized networks embedded in public systems to globally coordinated platforms aligned with multilateral organizations. These differences shape how learning priorities are defined, how resources are allocated, and how knowledge circulates within and across systems.

Across degrees of system integration, the initiatives vary in how deeply learning is embedded within health systems. While some operate as complementary educational platforms, others function as integral components of policy implementation, workforce development, and service organization, reinforcing the interpretation of lifelong learning as a system-level infrastructure.

Across modalities of knowledge provision, all cases demonstrate forms of on-demand learning characterized by immediacy, flexibility, and responsiveness to practice-based needs. However, they differ in how these features are operationalized, particularly in relation to localization, multilingualism, and adaptation to diverse institutional and territorial contexts.

Considered together, these dimensions make it possible to interpret lifelong learning in health not as a set of isolated initiatives, but as an emerging infrastructural ecosystem shaped by governance, scale, and system integration.

11.5 Final Considerations: Lifelong Learning as Public Infrastructure for Health Systems

The analysis developed throughout this chapter points to a broader interpretation of lifelong learning in health as a form of public infrastructure. **Conceptually, this** chapter supports the view that lifelong learning in health should be treated as a public infrastructure: it is shaped by adult learning principles (Knowles et al., 2015; Merriam & Bierema, 2014), by governance and equity constraints embedded in lifelong learning models (Regmi, 2015), and by the infrastructural conditions that enable access and use at scale (Star & Ruhleder, 1996). Accordingly, future research should move beyond descriptive platform accounts and examine how these ecosystems change professional routines, service organization, and institutional decision-making—particularly in low- and middle-income settings. A priority agenda includes: (i) mixed-method evaluations linking learning participation to practice change; (ii) implementation-oriented research on how learning content is adopted and sustained in services; and (iii) equity-sensitive analyses of localization (cultural adaptation, language, connectivity, and institutional readiness) as determinants of impact.

Rather than replacing traditional education, lifelong learning in health complements and extends it, enabling health professionals and institutions to adapt continuously to evolving challenges. When embedded within public and multilateral institutions, such learning ecosystems contribute not only to workforce development, but also to the strengthening of health systems as learning systems.

Overall, the analysis suggests that on-demand learning functions most effectively as a public infrastructure when three interrelated conditions are present: (i) institutional anchoring within health systems and public policies, ensuring alignment with workforce and service needs; (ii) multi-scalar governance arrangements capable of coordinating local adaptation with regional and global knowledge flows; and (iii) modalities of knowledge provision that are responsive to practice, combining immediacy, contextual relevance, and accessibility across diverse settings.

Under these conditions, lifelong learning in health moves beyond the provision of educational resources and becomes embedded in the very functioning of health systems, shaping professional practice, supporting decision-making, and enabling continuous adaptation to evolving challenges.

In a historical moment characterized by digital transformation, geopolitical realignments, climate-related health risks, and intensified global interdependence, lifelong learning in health should no longer be considered a complementary policy instrument. Rather, it emerges as a structural condition for sovereign, resilient, and

equity-oriented public health systems in the Global South, capable of sustaining knowledge production, professional autonomy, and institutional continuity across generations.

In doing so, the chapter contributes to the field by advancing an analytical understanding of on-demand learning as an infrastructural component of health systems, rather than merely as a technological or pedagogical innovation.

11.6 Limitations and Future Research Directions

While advancing an analytical understanding of lifelong learning in health as a system-level infrastructure, this chapter is subject to several limitations. First, it relies primarily on document analysis and published evaluations, rather than on primary empirical research. Second, while the chapter highlights scale, reach, and institutional design, it does not systematically assess the causal impact of learning initiatives on health outcomes or service performance.

These limitations point to important directions for future research. There is a clear need for longitudinal and mixed-methods studies examining how lifelong learning in health influences clinical practices, service organization, and population health outcomes. In the Global South, in particular, research should explore how technology-mediated learning interacts with local health system capacities, resource constraints, and social determinants of health.

Accordingly, future research agendas should move beyond descriptive accounts of digital learning platforms and prioritize analytical approaches that examine how lifelong learning ecosystems influence professional routines, service organization, and institutional decision-making. Priority areas include: (i) mixed-methods evaluations linking learning participation to changes in practice and service delivery; (ii) implementation-oriented studies on how learning content is adopted, adapted, and sustained within health services; and (iii) equity-sensitive analyses of localization processes, including language, cultural adaptation, connectivity, and institutional readiness, particularly in low- and middle-income settings.

These dynamics also point to a broader research agenda. Future studies could further explore how global lifelong learning infrastructures are adapted, translated, and reconfigured in contexts marked by uneven digital capacities, institutional constraints, and diverse health system arrangements, particularly across low- and middle-income settings. Such investigations can deepen our understanding of how on-demand learning operates under conditions of structural asymmetry and how its potential as a public infrastructure can be realized across different contexts.

Additionally, comparative exploration of large-scale Asian health systems—where strong public coordination, digital governance capacity, and long-term state planning play significant roles—may offer complementary insights into how lifelong learning infrastructures can be institutionalized at national scale.

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References

Caitano, A. R., Gusmão, C. M. G., Dias-Trindade, S., Barbalho, I. M. P., Morais, P. S. G., Caldeira-Silva, G. J. P., Romão, M. H., Valentim, J. L. R. S., Dias, A. P., Alcoforado, J. L. M., de Oliveira, C. A. P., Coutinho, K. D., Rêgo, M. C. F. D., & Valentim, R. A. M. (2022). Massive health education through technological mediation: Analyses and impacts on the syphilis epidemic in Brazil. *Frontiers in Public Health, 10*, 944213. https://doi.org/10.3389/fpubh.2022.944213

Car, J., Carlstedt-Duke, J., Tudor Car, L., Posadzki, P., Whiting, P., Zary, N., Atun, R., Majeed, A., Campbell, J., & Digital Health Education Collaboration. (2019). Digital education in health professions: The need for overarching evidence synthesis. *Journal of Medical Internet Research, 21*(2), e12913.

Cunha, Y. H. (2024). *O impacto da comunicação institucional: uma análise propositiva da comunicação digital do Campus Virtual de Saúde Pública da OPAS*. Universidade Federal do Rio Grande do Norte. https://repositorio.ufrn.br/handle/123456789/60769

da Cunha, P. S., Batista, N. A. N., Fernandes, F., Barbalho, I. M. P., Romão, M. H., Coutinho, K. D., Valentim, R. A. M., de Souza Lacerda, J., Dias, A. D. P., Henriques, S., Valentim, R., Alves, F., & Coutinho, K. D. (2025). Interculturality, public health and health education: Data report based on the Virtual Learning Environment of the Brazilian Health System (AVASUS). *Frontiers in Public Health, 13*, 1642452. https://doi.org/10.3389/fpubh.2025.1642452

dos Santos, T. (2020). *Desenvolvimento e civilização: Homenagem a Celso Furtado. EdUERJ.*. https://eduerj.com/produto/desenvolvimento-e-civilizacao-homenagem-a-celso-furtado/.

Enticott, J., Johnson, A., & Teede, H. (2021). Learning health systems using data to drive healthcare improvement and impact: A systematic review. *BMC Health Services Research, 21*(1), 200. https://doi.org/10.1186/s12913-021-06215-8

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219–245. https://doi.org/10.1177/1077800405284363

Freire, P. (1996). *Pedagogia da autonomia: saberes necessários à prática educativa.* Paz e Terra.

International Labour Organization. (2022). *The ILO strategy on skills and lifelong learning for 2022–30*. International Labour Organization.

Jarvis, P. (2004). *Adult education and lifelong learning: Theory and practice* (3rd ed.). Routledge. https://doi.org/10.4324/9780203561560

Kilbourne, A. M., Elwy, A. R., Sales, A. E., & Atkins, D. (2024). The foundational science of learning health systems. *Health Services Research, 59*(6), e14374. https://doi.org/10.1111/1475-6773.14374

Knowles, M. S., Holton, E. F., III, & Swanson, R. A. (2015). *The adult learner: The definitive classic in adult education and human resource development* (8th ed.). Routledge. https://doi.org/10.4324/9780429299612

Listovsky, G., Morales, A., Fernández, A., & Silva, M. (2022). El Campus Virtual de Salud Pública de la OPS como estrategia de cooperación técnica. *Revista Panamericana de Salud Pública, 46*, e83. https://doi.org/10.26633/RPSP.2022.83.

Merriam, S. B., & Bierema, L. L. (2014). *Adult learning: Linking theory and practice*. Jossey-Bass.

Nieder, J., Schwerdtle, P. N., & Vallejo-Torres, L. (2022). MOOCs for health worker education in low- and middle-income countries: A scoping review. *Frontiers in Public Health, 10*, 891987. https://doi.org/10.3389/fpubh.2022.891987

Organización Panamericana de la Salud. (2020). *Evaluación de satisfacción de alumnos de cursos del Campus Virtual de Salud Pública.* PAHO.

Organización Panamericana de la Salud. (2021). *Health workforce in the Americas: Regional profile and key statistics 2018–2021*. PAHO. https://iris.paho.org/handle/10665.2/54680

Prats, E., Neville, T., Nadeau, K., et al. (2023). WHO Academy education: globally oriented, multicultural approaches to climate change and health. *The Lancet Planetary Health, 7*, e10–e11. https://doi.org/10.1016/S2542-5196(22)00252-2

Ragin, C. C. (2014). *The comparative method: Moving beyond qualitative and quantitative strategies*. University of California Press.

Regmi, K. D. (2015). Lifelong learning: Foundational models, underlying assumptions and critiques. *International Review of Education, 61*, 133–151. https://doi.org/10.1007/s11159-015-9480-2

Romão, M. H., Dias, A. P. P., Caitano, A. R., Batista, N. A. N., Oliveira, E. G., & Valentim, R. A. M. (2023). AVASUS' contributions to promoting lifelong learning in health: Toward achieving the Sustainable Development Goals and strengthening global health security. In S. Saxena (Ed.), *One Health approach: Advancing global health security with the Sustainable Development Goals*. IntechOpen. https://doi.org/10.5772/intechopen.113796

Rosa, H. (2013). *Social acceleration: A new theory of modernity*. Columbia University Press.

Rubinelli, S., Purnat, T. D., Wilhelm, E., Traicoff, D., Namageyo-Funa, A., Thomson, A., Wardle, C., & Ball, A. (2022). WHO competency framework for health authorities and institutions to manage infodemics. *Human Resources for Health, 20*, 35. https://doi.org/10.1186/s12960-022-00733-0

Smith, C. L., Fisher, G., Dharmayani, P. N. A., et al. (2024). Progress with the Learning Health System 2.0: A rapid review of Learning Health Systems' responses to pandemics and climate change. *BMC Medicine, 22*, 131. https://doi.org/10.1186/s12916-024-03345-8

Star, S. L., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information Systems Research, 7*(1), 111–134. https://doi.org/10.1287/isre.7.1.111

Ubal, M., Bordoli, E., & Araujo, L. (2023). Modalidades docentes en la ETP como referencia para el análisis de las prácticas y la construcción de una identidad docente en la Educación Superior Tecnológica Profesional. *Revista Pesquisas em Educação Profissional e Tecnológica.* https://www.ufsm.br/app/uploads/sites/511/2023/10/E-book-PPGPT-1-Pesquisas-em-Educacao-Profissional-e-Tecnologica-out-23.pdf

Ubal, M., Varón, X., & Martinis, P. (2011). *Hacia una educación sin apellidos. Aportes al campo de la educación no formal*. Psicolibros-Waslala.

UNESCO. (2021). Reimagining our futures together: A new social contract for education. UNESCO.

UNESCO Institute for Lifelong Learning. (2022). Marrakech framework for action: Harnessing the transformational power of adult learning and education. UNESCO Institute for Lifelong Learning.

United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. United Nations.

Utunen, H., Ndiaye, N., Piroux, C., George, R., Attias, M., & Gamhewage, G. (2020). Global reach of an online COVID-19 course in multiple languages on OpenWHO in the first quarter of 2020: Analysis of platform use data. *Journal of Medical Internet Research, 22*(4), e19076. https://doi.org/10.2196/19076

Utunen, H., Piroux, C., Ndiaye, N., Attias, M., & Gamhewage, G. (2024). OpenWHO after seven years: Scaling multilingual digital learning for global health emergencies and beyond. *Learning Health Systems, 8*(4), e70058. https://doi.org/10.1002/lrh2.70058

Valentim, R. A. M., de Oliveira, C. A. P., Oliveira, E. S. G., Ribeiro, E. L., da Costa, S. M., Morais, I. R. D., Fernandes, F. R. D. S., Caitano, A. R., Gusmão, C. M., Cunha-Oliveira, A., Rêgo, M. C., Coutinho, K. D., Barros, D. M. S., & Ceccim, R. B. (2022). Virtual Learning Environment of the Brazilian Health System (AVASUS): Efficiency of results, impacts, and contributions. *Frontiers in Medicine, 9*, 896208. https://doi.org/10.3389/fmed.2022.896208

Whitelaw, S., Mamas, M. A., Topol, E., & Van Spall, H. G. C. (2020). Applications of digital technology in COVID-19 pandemic planning and response. *The Lancet Digital Health, 2*(8), e435–e440. https://doi.org/10.1016/S2589-7500(20)30142-4

World Health Organization. (n.d.). *OpenWHO: About us.* World Health Organization. Retrieved April 22, 2026, from https://openwho.org/about
World Health Organization. (2016). *Global strategy on human resources for health: Workforce 2030*. https://apps.who.int/iris/handle/10665/250368
World Health Organization. (2020). *Global strategy on digital health 2020–2025*. https://www.who.int/publications/i/item/9789240020924
World Health Organization. (2021). *WHO Academy: Building a global learning hub for health.* World Health Organization. https://www.who.int/about/who-academy
World Health Organization. (2022). *Working for health 2022–2030 action plan.* World Health Organization.
World Health Organization. (2023). *Global health workforce statistics overview*. https://www.who.int/data/gho/data/themes/topics/health-workforce
World Health Organization. (2024). *The WHO Academy Strategy 2024–2026: Leading lifelong learning for a healthier world*. World Health Organization.
Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.

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Chapter 12
A Praxis of Emergence and Intentional Adaptation at Equity Unbound



Maha Bali, Mia Zamora, Nadine Aboulmagd, Yasmine Abulfadl, Yasser Tamer Atef, and Irene Maweu

Abstract This chapter will share several case studies from the praxis of Equity Unbound, a grassroots movement that emphasizes equity-focused, open, connected intercultural learning. Using concrete examples of strategic decisions and projects, we will show how an overarching approach of emergent professional learning (as an approach to responding to educators' evolving needs worldwide), rooted in socially just care, has been needed in the past few years to respond to major uncertainties educators have faced, such as the COVID-19 pandemic, racial injustice in the US, wars in Europe and the Middle East, and the existence of generative AI. We will share the ways in which we were able to support educators through these major shifts through working outside of formal institutions to respond with Intentionally Equitable Hospitality (IEH) using intentional adaptation to their needs, including the projects of: Online Community Building resources, Continuity with Care, and Mid-Year Festival. Moreover, we will show how the facilitation praxis of IEH has been used in this work as an additional form of intentional adaptation at the micro level, while also centering self-determined learning and increasing potential for transformative learning. We will highlight the ways in which our praxis promotes socially just care, and the challenges faced, based on a collaborative autoethnography methodology (between the six authors representing three countries and four stakeholder groups: educators, educational developers, freelance facilitators, and undergraduate students).

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Keywords On-demand learning · Emergence · Self-determined learning · Agency · Equity · Socially just care

12.1 Introduction

This chapter proposes an alternative way of conceptualizing and applying on-demand and self-determined learning, offered from the lens of the international community of Equity Unbound,[1] which offers professional development to educators and education global stakeholders via a praxis we call Intentionally Equitable Hospitality (IEH) (Bali et al., 2016).

We will review literature on the connection between heutagogy, self-determined learning and agency, how on-demand learning can be conceived of as emergent, how transformative learning can be seen through a lens of sustaining community online and via connected learning, and how our praxis of IEH includes phases that cover all of these elements, which were initially proposed as an approach toward equitable and agentic educator professional development by Bali and Caines (2018).

Using collaborative autoethnography, the authors, themselves organizers of Equity Unbound events and offerings, share their reflections on the ways in which a variety of things we have done together embody our values and advanced understandings of what could be done in hybrid and online learning environments. We discuss the origins of IEH praxis in the hybrid praxis of challenging academic gatekeeping via Virtually Connecting to ensure the most marginalized voices had a place at the table at academic conferences; the ways Equity Unbound was an agile community responding to the needs for care and community during the COVID-19 pandemic, and the ways in which the Mid-Year Festival (MYFest) and IEH series envisioned a different approach to professional learning post-pandemic that addressed the needs for coming together in community, healing and joy, while also centering a critical perspective on urgent global issues such as racial injustice and emergent educational challenges such as generative AI.

We will share the ways in which we were able to support educators through these major shifts through working outside of formal institutions to respond with the praxis of IEH, applying intentional adaptation at the macro and micro levels. We will highlight the ways in which our praxis promotes socially just care, and the challenges faced, using collaborative autoethnography from six organizers (an educational developer in Egypt, an educator in the US, an instructional designer in Egypt, a freelance facilitator in Kenya, and two undergraduate students in Egypt) plus data collected in 2024 with global participants in the Mid-Year Festival.

[1] See https://equityunbound.org.

12.2 Literature Review

12.2.1 On-Demand Learning as Emergent Strategy

In the corporate world, we have seen for many years the phenomenon of "companies must be able to depend on their employees' and associates' ability to learn 'on the fly' as they attempt to beat their competitors to markets that remain undefined with solutions they have yet to identify," with emphasis on career progression for those who "can take action amid such uncertainty, as a result of the speed and context in which they acquired knowledge" (Trondsen & Vickery, 1997, p. 169).

The needs of on-demand learning resonate very much with *Emergent Strategy* (brown, 2017). Building on the work of the Movement Generation, Brown considers the analogies of natural shocks and slides to describe instability, uncertainty and disruption in social spaces like education. Shocks like earthquakes or political revolutions are "acute moments of disruption" while slides are slower, like rising sea levels or increasing unemployment (brown, 2017 Kindle loc 1181):

> One of our key roles… must be to harness the shocks and direct the slides -- all towards achieving the systemic, cultural and psychic shifts we need to navigate the changes with the greatest equity, resilience and ecological restoration possible. (brown, 2017, Kindle loc 1191, citing Movement Generation).

The "contemporary university has its place amid a world in total motion" (Barnett, 2023, p. 116) and the challenge is how we "shape a university in the context of a world that lacks stability" (Barnett, 2023, p. 116). Barnett (2023) suggests that universities should more clearly recognize their "entwinement… with large ecosystems of the world" and move away from instrumentality toward "an ethic of collective care for the world" (p. 116). Barnett also emphasizes the importance of the university as not just one that responds but also one that has agency in the world (2023).

In our higher education context, the two most recent ways in which stakeholders have felt their entwinement with global uncertainty, had to learn "on the fly," respond to "instability," and acquire new knowledge very quickly, were the "shocks" of COVID-19 pandemic, where everyone in most countries had to suddenly learn to learn and teach remotely; and the prevalence of Artificial Intelligence (AI) in our lives via Large Language Models (LLMs) such as ChatGPT. A less shocking but slower-changing "slide" effect on higher education comes from burnout among educators, students and educational support personnel, in the process of enduring the pandemic, then the erosion of well-being from moving slowly "back to normal" in a face-to-face context, followed by "moral injury" from ongoing violence and wars in various parts of the world as well as internal systemic process within institutions that go against the values of social justice and care that many in education hold dear.

Two important elements of Emergent Strategy that are particularly relevant to supporting on-demand, agile professional development in higher education are "intentional adaptation," being willing to make changes in the moment, to adapt, while never losing sight of your goals; this will become clear in the particular practices we share in our findings. The other is "less prep, more presence," which allows

for organizers and facilitators of professional development to focus more on being present with people in the room and their evolving needs and interests, rather than remain fixated on what gets prepared in advance.

12.2.2 Heutagogy and Self-Determination as Agency

Self-determined learning is an instructional approach that diverges from traditional teacher-led learning or "pedagogy," to "heutagogy"—an approach that centers learner agency "where learners define what they will learn and how they will learn and assess their learning" (Hase & Kenyon, 2000, 2007; Snowden & Halsall, 2016 as cited by Blaschke). This is normally [by centering principles of] "self-efficacy and capability, reflection and meta-cognition, and nonlinear learning" (Blaschke, 2021) within adult learning spaces.

Self-directed learning and self-regulated learning are narrower concepts that can apply for non-adult learners. Self-directed learning, as defined by Knowles (1975), emphasizes the learner taking initiative, alone or with help, figuring out their own needs and goals, as well as finding resources and selecting appropriate learning strategies. Self-regulated learning occurs when learners become "metacognitively, motivationally, and behaviorally active participants in their own learning process" and can "personally initiate and direct their own efforts to acquire knowledge and skill rather than relying on teachers, parents, or other agents of instruction." (Zimmerman, 1989, p. 329, as cited in Cosenfroy & Carré, 2014).

Heutagogy encompasses self-regulation and self-determination within its two principles of learner agency and reflection and meta-cognition, but also has additional principles of self-efficacy and capability, and a final principle unique to heutagogy in the nonlinearity of learning. According to Blaschke (2021), pedagogy assumes high instructor control, andragogy assumes less instructor control and more student maturity, with more self-determined and self-directed learning, but heutagogy assumes a larger degree of learner control and little to absent instructor control.

The heutagogic approach is rooted in and supported by self-determination theory that posits that when individuals "are autonomously motivated, either by intrinsic motivation or well-internalized (thus autonomous) forms of extrinsic motivation" (Ryan & Deci, 2020, p. 1) they tend to perform more effectively, creatively, and confidently, and persistently, since they are left to direct their focus on the skills and competencies they believe they are best at and interested in.

This approach departs from teacher and subject centered linear modes of learning, to focus more on nurturing lifelong learning skills such as autonomy, flexibility, creativity, critical reasoning, tolerance for ambiguity (Blaschke, 2021).

12.2.3 Transformative Learning

Transformative learning requires critical self-reflection, which includes both questioning one's own assumptions, and "participating fully and freely in dialectical discourse to validate a best reflective judgement" (Mezirow, 2006/2006, p.118). This may be either "epochal," i.e., sudden aha moments, or "cumulative," i.e., progressive over time (Mezirow, 2006/2006). Creating communities that can reflect together in dialog over sustained periods of time can help adult learners develop a metacognitive awareness of the transformations in their own learning, and make connections between their own values, practices and theories. While many institutions offer one-off workshops for professional development that may or may not result in "epochal" learning, open online spaces such as the ones we will describe in our findings offer a more sustained community where "cumulative" learning is also possible and more likely.

Wenger, Trayner, and de Laat's (2011) assess value creation in communities of practice comparing immediate learning versus learning that is later realized as the learner finds value in how past learning influences their practice.

Sustained reflection with a community may offer more opportunities for cumulative transformative learning, as well as opportunities for metacognitive reflection in dialog to assess how one's practice benefits from past learning.

12.2.4 Equitable and Agentic Educator Professional Development (Building on Work of Bali & Caines, 2018)

> Imagination of how things could be otherwise is central to the initiation of the transformative process. (Mezirow, 2006/2006 p. 119)

In 2018, Bali and Caines recommended a framework that advocates for educational development approaches that "encourage heutagogy with outcomes that focus on ownership and agency which can potentially lead to transformative learning" and showed how "open educational practices that use technology" can support such learning "because of the social interaction and open attitudes underlying the practices rather than the particular technologies involved (Bali & Caines, 2018) They recommended a move away from in-house, one-size-fits-all professional development, recognizing that longer-term approaches are needed if we are to achieve transformative learning since this "often entails a process of unlearning assumptions built from years of being the recipient of ineffective pedagogy" (Bali & Caines, 2018).

Online spaces allow for more fluid notions of time and space, which are very important for adult learners with varying needs, but have historically been sometimes narrowly used in very rigid ways such as xMOOCs on platforms like Coursera and

EdX that reflect traditional notions of learning and more lecturing and structure than social, dialogic and liberatory learning.

12.2.5 IEH as a Culmination of Agentic, Equitable, Educator Professional Development

IEH can be understood as

> a critical pedagogical approach [that] centers values rather than measurable predetermined outcomes. [It] is not neutral… it prioritizes the values of social justice while fostering learner/participant agency within the learning space, while never forgetting the ways in which power and oppression work outside of that learning space, and how they influence it ... When we wish to practice IEH, we need to continually renew our intentions to notice oppression and injustice and seek to redress them, to iteratively modify and adapt our practices according to the responses and reactions of participants/learners, particularly those who bring marginalized perspectives. (Bali & Zamora, 2022b, para 5)

This understanding of IEH shows that our ethos toward "on-demand" learning and learning self-determination/agency recognizes macro and micro inequalities and oppressions and seeks to redress them. Evolving mainly as a hybrid (Bali et al., 2016), then a general, facilitation praxis (Bali & Zamora, 2022b, 2023), the thinking behind IEH is that an educator, facilitator, or organizer is not just a host of a learning space, but very intentionally a co-creator and not a gatekeeper moving within a learning community (Bali & Zamora, 2022b) where everyone has a responsibility for the flourishing of others in the space.

IEH grew from our reflections on our own practices and analyzing the ways we aimed toward these goals in a hybrid community called Virtually Connecting, to broader contexts. We eventually broke it down into four iterative phases (Bali & Zamora, 2022b):

1. **Pre-design:** whom do we involve in the design? Whose perspectives influence the design?
2. **Design:** how do we account for equity considerations in design, redressing power dynamics and inequalities while anticipating and redesigning to reduce harm to those furthest from justice
3. **Facilitation:** how do we respond in the moment to new inequalities that arise, how do we practice what adrienne maree brown (2017) calls "intentional adaptation"?
4. **Beyond the moment:** how do we sustain community and grow it in order to build stronger foundations for ongoing learning?

In the context of this paper, we would like to emphasize the ways in which "pre-design" should also mean whose needs are considered when we design "on-demand" learning, and who is involved in the process of designing? How do we center and empower those in the margins to collectively work toward their own liberation in community and design their own learning? How do we design on-demand learning to redress injustice and center self-determination in equitable ways? Are we willing to

"intentionally adapt" in the moment as needed? Can we sustain community in ways that strengthen the potential for transformative learning and invite those furthest from justice to remain in our midst? These are all ideals we strive toward, and in the findings, we will show how we have been trying to achieve them.

12.2.6 On-Demand Learning in This Chapter

In this chapter, we will be viewing on-demand learning as learning which can be done via IEH praxis (see Fig. 12.1):

a. **Pre-design**: Heutagogical principles of centering adult learners' agency, metacogition, self-efficacy, and nonlinearity
b. **Design**: Equity in the processes of learning while enacting all the principles
c. **Facilitation**: Emergent strategy, with tolerance for ambiguity and willingness of designers of learning experiences for "intentional adaptation."

Sustaining Community: Transformative learning via sustained communal reflection over time Overarching all of this is a narrative of care that is not always emphasized explicitly, but will appear in our autoethnographic narratives.

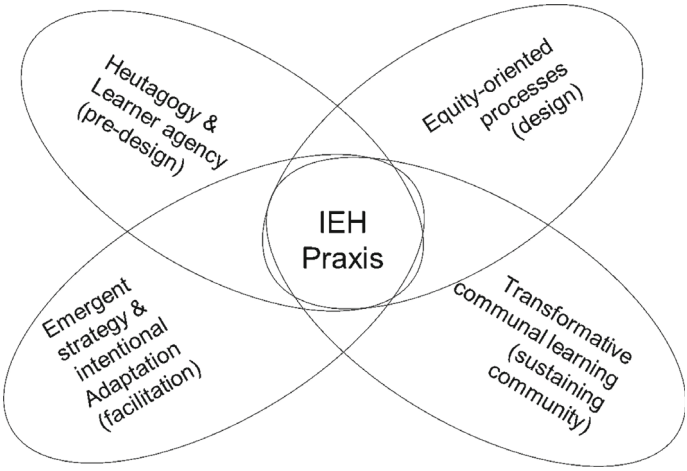


Fig. 12.1 Elements of IEH praxis as on-demand learning

12.3 Methodology

12.3.1 Collaborative Autoethnography

This chapter uses the methodology of digital collaborative autoethnography (CAE). CAE is a participatory research methodology whose goal is to "describe and systematically analyze personal experience in order to understand cultural experience" (Ellis et al., 2011), done collaboratively by multiple researchers as a way to find convergence and divergence among their experiences. This methodology is an epistemologically and ontologically interpretivist/constructivist qualitative approach that "challenges the hegemony of objectivity or the artificial distancing of self from one's research subjects" (Chang et al., 2013, p. 18), since "all understanding is already interpretation" and researchers are "always already part of what is being interpreted" (Nixon, 2012, p. 33).

Doing ethnographic research online recognizes that the internet mediates social interactions that are worth documenting and interpreting (Hine, 2017). Autoethnography focuses on the researcher's personal experiences (Adams, 2008; Bochner & Ellis, 2016), which is particularly advantageous when conducted digitally, as an online observer would be unaware of others' full context. While autoethnography has the limitation of representing one person's subjective, partial view, conducting it collaboratively with others as CAE allows us to combine multiple lenses on the same or similar phenomena. CAEs offer rich, thick descriptions, which would allow readers to better understand our experiences that may be unfamiliar to many readers. We also chose CAE from a critical lens of empowering people to represent themselves and interpret their own experiences as full participants in research, rather than more colonialist approaches of external researchers setting a research agenda and interpreting other people's experiences from their own lens. Our work is modeling self-determination while writing about self-determined learning. It is also a kind of decolonial participatory practice that empowers each person to speak for themselves and not have their experience interpreted by an external researchers' gaze.

Writing this CAE together, we formed a WhatsApp group, and met multiple times on Zoom and wrote narratives on separate Google docs sharing our experiences of IEH using concrete stories. We then commented on each others' documents, reorganized the narratives, and selected parts of them to include as findings in different parts of the final paper. Then we commented on each others' Google docs to help each other find connections to theory and to each other's narratives.

Working together, we discuss and become more conscious of our understanding of our own selves, mirroring for each other and interpreting together in ways that we as individuals would likely not have arrived at on our own. Selecting quotes to include in this chapter was based on how well the quote showcases one of the four elements of IEH praxis as on-demand learning: we asked ourselves, where do we have examples of heutagogy (learner agency, self-determination, self-efficacy, flexibility, nonlinearity), transformative learning through communal reflection, emergent

strategy including intentional adaptation, or equity-oriented processes and practices—emphasizing each person's marginality and where they found themselves within Equity Unbound's activities, offerings, and community. We were conscious that these areas overlap slightly, and also that the way we have told the story tries to differentiate between how the different phases of IEH (pre-design, design, facilitation, and sustaining community) apply these principles, but sometimes a story encompasses multiple principles over multiple phases of IEH. We felt that centering the holistic perspective on the story would be most useful to readers, rather than complete separation across different sections. Each person coded their own longer narrative, then placed it in the document in the appropriate place (modeling the agency we value). Then Maha as first author read everything together, and moved some things around to help with the building of the narrative, occasionally checking in with authors if they were OK with this. Each person was involved in the shortening of their own narratives in order to reduce word count.

12.3.2 Positionalities of Authors

Each author of this CAE is marginal in some form. Our positionalities follow.

12.3.2.1 Irene

A facilitator, BBA degree holder, the IAF[2] regional director for Africa, content developer, and mentor with many years of building learning communities across Africa and globally. I leverage my expertise in digital tools and skills to transformative virtual programs for many organizations. I am committed to IEH, design of socially just and inclusive online spaces and professional development in educational technology. Founded The Heart of African Facilitation to support facilitators globally, working at the intersection of gender equity, financial inclusion, and capacity development.

12.3.2.2 Maha

I'm a full-time educational developer, a professor of practice at the American University in Cairo and mom. My child was young in the early stages of my career, so I used my expertise in online learning to build communities online—all of which led to the co-founding of Virtually Connecting[3] (VC) and Equity Unbound. I am a critical

[2] International Association of Facilitators https://iaf-world.org/.

[3] We had to remove details about Virtually Connecting (VC) for space reasons. This was a grassroots movement that challenged academic gatekeeping at conferences by having volunteers connect virtual folks who could not join conferences with on-site conference participants for informal, hallway type conversations.

pedagogue and open, connected educator who researches socially just care (Bali & Zamora, 2022a).

12.3.2.3 Mia

I am professor of both Literature and Writing at Kean University in Union, NJ. My work has always centered narrative, language, and intercultural understanding. I shun academic gatekeeping impulses and continue to work toward IEH. I have been immersed for 20+ years in a university with an unequivocally diverse student body, representing every race, age, religion, ethnicity, culture and creed. Some of my students are economically disadvantaged, and many work either part or full time. Each semester, I embrace co-creation with my students and also serve as a mentor to many graduate students and junior faculty. The significance of our lived experiences has become a critical foundation for my designs for equitable learning, as well as my own research and scholarly writing.

12.3.2.4 Nadine

I am Equity Unbound's program manager and an independent consultant in learning design, which includes course design and content development, process management and education quality. I teach educational technology at the Professional Educator Diploma at AUC. Previously I was the senior Instructional designer and team lead at AUC, which is where I started my faculty development, edtech and instructional design career. I am a critical learning designer and pedagogue who likes to question and push against invisible boundaries in learning experiences.

12.3.2.5 Yasser

I am an assistant program manager at Equity Unbound, as well as a disability advocate and researcher focused on social justice in education, equity, and inclusion. As a totally blind Egyptian person, my positionality shapes how I understand and engage with the world. I joined Equity Unbound in 2022 as an attendee at the Mid-Year Festival, and have since grown into a co-organizer and taken on multiple roles supporting more on-demand and self-determined approaches to learning and collaboration.

12.3.2.6 Yasmine

I graduated a year ago from the American University in Cairo (AUC) with a bachelor's degree in Political Science, and a double minor in Educational Studies and Mass Communication. I currently work at the Center for Learning and Teaching

at (AUC) with the Educational Development and Assessment team. I aim to foster more inquiry-based, open learning spaces within my close-knit AUC community and hopefully on a broader scale, based on my experience working for Equity Unbounds' MYFest.

12.4 Findings

The findings below are an amalgamation of our autoethnographic narratives that highlight the praxis of IEH within Equity Unbound's offerings.

12.4.1 Evolution of Equity Unbound

Before we showcase how IEH works in practice, we explain the context of the four types of professional learning we are discussing.

12.4.1.1 Continuity with Care March 2020

When many educational institutions worldwide in March 2020 required teaching to move online, two of the co-founders of Equity Unbound (Mia and Maha), decided we needed to shift our focus from students to educators.

We intentionally adapted to what our community needed at the time by initiating **"continuity with care,"** crowdsourcing a document with strategies to move gently and prioritize care when moving online; we held video conferencing conversations among educators and with students on how to move online with care, discussing our well-being in these difficult times. A small group of global educators sustained their support for one another through a Twitter DM we had started at the time, and continue to this day (2026), having migrated to Signal. From this group, the idea of MYFest22 came (see 4.1.3).

12.4.1.2 Community Building Resources August 2020

Around July 2020, we noticed a new need: many educators were about to start a new semester with students fully online without ever meeting them in person. Most had no experience teaching online before, and no idea how to build community online. We knew how to do this based on our community building experiences from both Virtually Connecting[4] and Equity Unbound. Meeting the urgency and intentionally

[4] Virtually Connecting is a community of volunteers dedicated to enlivening virtual participation in academic conferences and widening access. See https://www.virtuallyconnecting.org.

adapting again, Equity Unbound teamed up with OneHE to create a participatory open educational resource showcasing strategies for building community online. With more than 50 resources, our design was intentional: firstly, we wanted to "keep it real" and "do it urgently." We met with members of the community and chose to sit in our own homes while filming ourselves modeling community building activities. We then discussed together the ways these activities might adapted to different contexts. The emergent need of the time led to unpolished yet meaningful videos that were authentic and actionable, designed with diverse educators.

12.4.1.3 Mid-Year Festival (2022-Present)

The development of MYFest was also emergent, responding to community needs. In early 2022, the world was beginning to come back to in-person education, but there were still many proceedings that continued to be held online, including conferences. We noticed toxic positivity regarding the return to in person. People were burnt out, and were badly in need of joy, rejuvenation, and support for their well-being. We (13 educators from different countries) subverted the old model of in-person conferences which were traditionally held for a few consecutive days, realizing that online conferences need not have that logistical restriction. Instead, we designed a three-month long conference—"Mid-Year Festival" (MYFest)—that took place June, July, August. Educators could dip in and out of sessions based on their own schedules—self-directed learning. We eschewed the typical "Zoom fatigue" resulting from seven hours of virtual sessions in a row. We avoided FOMO (fear of missing out) and choice fatigue by not offering parallel sessions. Instead, 5–10 sessions were distributed throughout the week and time zones, never overlapping. We offered tracks on community building, well-being and joy, social justice and critical pedagogy, open and digital pedagogy, and space for intergenerational learning where we could actively bring family members including children to sessions. We maintained flexibility to keep adding to the schedule over time, depending on what emerged from sessions and what was happening in the world around us. It was open self-determined learning, and we invited participants to "choose their own learning journey" (Bali et al., 2022). We received funding the first year, and further funding for more years, and some participants became co-organizers in future iterations.

12.4.1.4 IEH Series (2023, 2024, 2025)

This 3 or 4 workshop series was co-created and co-facilitated to help participants learn and practice IEH themselves. We re-designed the offering each consecutive year so people could attend again and still benefit. The co-facilitators were always diverse (often representing marginal groups) and our series design evolved, including synchronous and asynchronous components.

12.4.2 Pre-Design

What follows are several examples showing how pre-designing by involving diverse, marginalized groups supports the integration of new, marginalized participants and empowers them to take on greater roles.

12.4.2.1 Nadine: Pre-Design with Marginal Participants as Founders, Designers, and Beneficiaries

Pre-design is about the equitable participation of the most marginalized in designing solutions on their own terms. Sometimes, the open educational practice of getting together with peers from all over the world experiencing similar challenges or frustrations is the best way to offer "on-demand" peer learning. One of the reasons MYFest was called "Mid-Year" and not "Summer" festival is that one of those who envisioned the proceedings lived in South Africa, where June–August are not summer months. This kind of adjustment (re-centering from the margin) is a hallmark of IEH.

After quitting my full-time job, I (Nadine), joined Equity Unbound in a remote position. At the time, I was familiar yet not central to Equity Unbound. I had engaged with the community as a participant and facilitator in a few previous MYFest sessions. When I jumped at the opportunity to be a Program Manager, I dove right into a new role and brought fresh perspective which was welcomed. And just like that, I was home.

Our IEH series was intentionally co-created and co-facilitated with diverse people: we had a different combination of people each year from multiple countries: university professors, educational developers, community college professors, freelance facilitators, graduate and undergraduate students, able-bodied and visually impaired facilitators. By having such diverse facilitators, we were able to create something that was more relevant to people in different roles in education, and also make our work more accessible to the visually impaired. Truly self-determined learning involves the people on the margins having a say in design. This "pre-design" aspect of IEH is critical. We ask ourselves first: whom do we involve in the design and whose needs are we considering in the design?

12.4.2.2 Pre-Designing Against Institutional Hierarchies

Irene:

Working together with others across the globe to plan, design or even put a session together is one of the gifts I (Irene) have found in MYFest. The most interesting experience is the unlikely alliances that are formed. New friendships and the connections take shape when we discover shared interests. At the beginning of this journey, I met Maha at a conference organized by the Center for Innovation in Learning and Teaching (CILT) at the University of Cape Town. I clearly remember how warm

and welcoming her session felt. Prof. Maha asked us to call her "Maha." In that moment, she undermined the hierarchy so prevalent in academia, and I realized we shared something important. No titles, just being human. In my previous work, I have observed the struggle when participants join alongside their supervisors. Titles like "Professor" or "Director" tend to carry more weight, and equality in online facilitation spaces is often difficult to achieve. Sometimes I was unsure how to show up or where I belonged. But Maha would gently remind me, "But you are here,… that is what counts." Those simple words gave me comfort and confidence. Slowly, I began to contribute more, and eventually, I found myself becoming part of the larger Equity Unbound community.

12.4.2.3 Pre-Designing with Diverse Creators and Participants

Maha:

For the community building resources co-created during the pandemic, we knew that what might be appropriate in one context could be different in another. We also knew that seeing how people in different parts of the world design for online communities would ultimately be beneficial to everyone. So we invited educators who taught different disciplines from different parts of the world (i.e., Kenya, Italy, Lebanon, Egypt, Australia, the US, UK and more). The educators suggested and modeled diverse activities, while they also reflected with us on their activities. The diversity of people in these demo videos allowed for useful reactions to emerge: e.g., during one activity where we were invited to open our cameras and show our rooms, one person talked about how poor connectivity would make it difficult, and others talked about how there were kids in the room or the room was messy and they did not want to show it. Right away, the need to "intentionally adapt" became apparent and instructive. Consequently, alternative activities were also discussed.

Yasser:

I (Yasser) still remember when Maha told me that I had attended most of the MYFest 2022 sessions. I felt genuinely happy and proud, not because of the number itself, but because I had chosen learning that resonated with me. It was learning I felt fully in control of, shaped by my own agency and guided by what I had determined for myself. My engagement was driven not by obligation, but by meaning.

I was invited to co-organize the 2023 and 2024 iterations of MYFest, which shifted my relationship to the festival. I began thinking more intentionally about how learning experiences could remain connected, responsive, and sustaining. This was not simply about decision-making. It was about continuing to belong to the community beyond the formal MYFest experience.

Co-organizing meant hosting sessions, speaking with facilitators, and amplifying student experiences that are often left unheard. It also involved ongoing conversations with the team about challenges, access, and how to offer intentionally equitable sessions. These dialogs mattered deeply to me because they reflected a shared commitment to creating learning experiences that respond to real needs.

12.4.3 Design

How do we center equity in design?

12.4.3.1 Designing for Community Building

Irene:

MYFest is my happy place—these are the words I use to describe my gratitude, attitude and how I feel when I show up at our sessions and meetings. Where else have you seen children, parents, family, friends and even pets join a session, just to listen in, just to say hello. Where have you had cross-generational and cross-continental reading and co-creation of stories that bring joy and laughter? Where would you find the youth and children happy to lead a session and adults listen attentively without judgment? Where else can you find a "quiet room" during breakout sessions on Zoom (for those who may not want to join the smaller conversations)? Where else would you find presenters and facilitators describing the images on a slide in order to be accessible and inclusive?

12.4.3.2 Designing for Inclusivity and Agency

Yasser:

When I first visited the Equity Unbound website in 2022 and read "choose your learning journey" and "pay what you can, attend what you want," I began rethinking what learning could be and how it might shape both professional and personal growth. As a student, I was especially drawn to being in community with educators and sharing the challenges we face within our systems.

I attended MYFest that year as a participant, and from the start, the experience felt different. My first session was a poetry session, where I was struck by the warmth and depth of connection in the room. Sessions on educational technology, well-being, community building, and upgrading resonated deeply with me. Having spent much of my education in grade-centered systems that rely on inaccessible technologies and rigid assessments, I valued having a space where I could speak openly as a blind student and be met with care and respect.

MYFest centered choice, readiness, and personal relevance. Offering free access to students reflected a commitment to social justice, and my participation felt welcomed rather than conditional. The wide range of sessions gave me real agency to learn according to my interests, energy, and needs. Learning was driven by curiosity rather than obligation, and there was no pressure attached to attendance. It was something to return to when it felt right. Recorded sessions and accessible resources strengthened this experience by allowing me to engage on my own terms and revisit ideas over time. These recordings functioned for me as on-demand resources, making it possible to reflect more deeply and engage in ways that aligned with my access needs and

learning rhythm. MYFest opened a new way of imagining education, one in which learning is supported rather than enforced, and where autonomy, care, and access are central rather than afterthoughts.

12.4.3.3 Designing for Joy

Irene:

I am not a lecturer, although I spend a lot of my time with many. I don't work in higher education like most of those in MYFest. Initially, I felt I was the odd one out. I wondered if I would ever fit in. At first, I did not know if I had anything to share that others could learn. It turned out that the space that MYFest created was so welcoming that I forgot that I was among professors and lecturers and other highly educated persons. Music and dance are my favorite methods for bringing Equity Unbound participants together. I realized that we are all the same across the globe in that we love music, we love dance, and this offering became a kind of "glue" among us.

12.4.3.4 Designing for Flexibility and Self-Regulation

Nadine:

As the Program Manager of Equity Unbound, when I am not facilitating or hosting, I am also a participant. Sometimes there were specific sessions I couldn't attend due to my time zone, but I was still able to log in, stay muted and off camera, and simply listen in while going for a walk or making dinner, etc. These sessions were experienced like a podcast (one of my favorite ways of learning). Sometimes one doesn't have the mental or physical energy to participate fully in virtual sessions but having the chance to listen and learn has really enhanced my own professional development. This growth includes my identity as an educator and instructional designer, not just as a program manager.

The community agreements (described in Sect. 4.4.1) make clear that at its core, Equity Unbound is about being intentionally flexible, gentle, equitable, hospitable, and approachable to everyone. The MYFest program is designed to be a "buffet" style (with participants choosing what they want to attend). They do not need to feel like they are missing out. Self-directed learning theory posits that adult learners are capable of taking control of their own learning journey, identifying their own needs, setting their own goals and implementing actions to achieve their goals, to become active agents in their educational process (Knowles, 1975)..

The program is equitably distributed across multiple time zones based on information we obtain in advance via the registration form. The program runs Monday through Thursday because Friday is a weekend in Egypt (where many participants reside). Our varied time zone scheduling ensures that most participants and community members from Africa, Middle East, Europe and North America are able to join

us to some extent. If there are popular sessions we sometimes repeat them during time zones that are suitable for Australia and Asia-based participants.

Having choice is characteristic of on demand and self-regulated learning. According to Zimmerman (2000) self-regulated learning relates to "self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals" (p. 14). As a critical pedagogue, educator and instructional designer I am able to choose the sessions to attend while supporting MYFest as a program manager. Even hosts are encouraged to sign up to support the sessions most enjoyable and applicable to our interests.

12.4.3.5 Designing to Model Equitable and Caring Communal Spaces for Educators

Yasmine:

As a young student moving across four different schools, I was bombarded with different flashy slogans, each one proclaiming it offered the right formula: "Determination is Success"; "Care, Challenge, Inspire"; "Leadership through Education." Yet, despite all these catchphrases, my actual experience on the ground told a different story. I never felt the care, inspiration, or structured guidance that might have engendered within me the motivation or confidence to explore my personal strengths, let alone feel empowered to respond to the challenges of today's world.

In my final year before graduation from university, I joined MYFest as a program management and support intern. It was one of the most enlightening and transformative lifelong learning experiences. Besides providing practical engagement, it introduced me to a vibrant academic community guided by IEH. This praxis was a direct answer to my earlier educational experiences. In MYFest, I learned that nurturing educators results in further acts of care. If educators are the ones responsible for creating caring environments, then they themselves "should be learning in transformative ways that promote these capabilities and attitudes" (Bali & Caines, 2018, para 12).

From "behind the scenes" in MYFest, I saw firsthand the fundamental gap between how my own teachers must have been taught vs IEH. My teachers were trained through hierarchical, exclusionary frameworks and gatekeeping environments. These contexts cannot engender in them an instinct for guidance, care or agency. So it seemed only natural that educators have struggled to transmit such values in their practice.

This revelation made me trace back why I often felt disoriented and unprepared as a kid. Education systems employ rigid, hierarchical, one size fits all environments (Bali & Caines, 2018) that dictates what subjects and skillsets are collectively deemed more important (English, Math, etc.). Teaching cannot adapt to students' skills or interests. Therefore students cannot engage in what truly appeals to them. MYFest's guiding framework of IEH departs from such traditional methods with a "build your own learning journey" and offering flexible modes of engagement. "On demand" learning should empower students for genuine contribution.

12.4.3.6 An Ecosystem of Joy, Creativity, Care, and Critique

Irene:

Although I have been a facilitator for a long time, the practice of accessibility and inclusion, and of IEH, was confusing. I wanted these ideas to make sense in simple, practical terms. Over time, and through many sessions and interactions, I have come to find a way of sharing these values. The transformation that I have experienced comes from the "simplicity" of the design and processes in this community.

MyFest learning spaces intentionally blend well-being, creativity, and critical inquiry. They support more human, relational forms of knowledge-making. For example, the *Music and Dance* sessions and the *Readers Theater* sessions have embodied joy, play, and collective presence, reminding us that learning is not only cognitive but also physical and emotional. Sessions like *"I've seen this, I love it"* and the asynchronous *Wisdom of Fools* storytelling project created gentle, accessible entry points for sharing inspiration, lived experience, and reflective narratives across time and space. At the same time, intellectual depth was sustained through offerings such as *Understanding vs. Intelligence: Some (Current) Limits of AI Writers*, which invited critical examination of emerging technologies without losing sight of human meaning-making. *Imagination Book Circles*, *Voice & Silence Framework*, and *Poems and Pedagogy* further demonstrated how reading, silence, poetry, and dialog can be used as pedagogical tools to surface multiple voices, honor reflection, and nurture imagination. MYFest is a learning ecosystem where joy, creativity, critique, and care are not peripheral, but central to equitable and transformative educational practice.

Yasmine:

MYFest's allocation of entire session "tracks" dedicated to themes of "Community Building" and "Well-being and Joy" stood out for me. I remember how the "Healing and Compassion Circle" deeply resonated. Sharing my emotions with a professional community really broke an important barrier. It made me aware that professional development must embody the spirit of authentic human connection. I wished that as a child I had had such experiences weaved into the design and the structure of my formal learning.

12.4.3.7 Designing for Emergence

Maha:

All offerings were designed for and with emergence. What might our community need? How quickly can we respond to a community need? How can we keep adapting as needed? The community building resources emerged from educators' needs for creative and practical ideas. MYFest emerged from a post-pandemic need for a new kind of professional development. In MYFest emergence occurs as we lay a foundation of offerings, but maintain flexibility, adding to the schedule over time. We respond to what people ask for or what the world needs most. Our "choose your own learning journey" encourages people to shape the program and become active participants or even co-organizers. By receiving funding to pay facilitators, we

were able to offer attendance on a sliding scale or for free. As funding was offered for subsequent years, more active participants became co-organizers. Their diversity contributed to the emergence of new voices and new ideas like our "Curious Coffees" that enables serendipitous meetings between participants.

12.4.3.8 Mia: Energy Budgeting by Design

In our first year of design of MYFest we declared the festival a "No FOMO zone." The pandemic taught us quite a bit about burnout and screen time saturation. Our offerings are intentionally interspersed throughout three months, with a "buffet-style approach." "No FOMO" meant we would avoid scheduling overlapping events, so anyone could attend as many sessions as they wished within reasonable time zone limits. The "fear of missing out" is a real phenomenon. Oftentimes people feel like they aren't doing enough, or that "they are coming up short." MYFest helped me understand the reality of my time and its connection to being human. I had to unlearn a productivity model for my own sense of time (often run on the fumes of guilt) and accept my own time limitations. You can't be everywhere at once. There is little room to be imaginative or receive new wisdom if your time is too tightly packed. MYFest made me reckon with my own energy budgeting and discover a sense of my own personal internal balance sheet of human energy income against expenditure. Some activities bring us energy and fill us up, and some actions deplete our energy. Our varying amounts of energy also shift over time with our identity, our responsibilities, our phase in life, and the spaces we choose to move in.

MYFest helped me understand my own sense of time and energy more intimately as I learned to adapt more like a plant, who fine tunes their ability to sense the environment. I accepted that I wasn't able to attend a lot of what intrigued me on the schedule. This was more difficult than it sounds. I curated the schedule each week carefully, identifying what I could contribute. This process of self-acceptance was a key aspect of my growth overall. I found ways to participate that allowed me to integrate more of my in-person life with MYFest online. For example, I would participate in MYFest sessions while also walking in the woods, attending to both my body and mind. I was able to facilitate online sessions in MYFest while also teaching IRL (i.e., the "Writing Hour with Miaha" was a hybrid session while leading an in-person Writer's Retreat at Kean University). I also facilitated a session series entitled "Mentor Insights and Conversations: Writing Process Feedback and Support" which blended MYFest participants with a group of my MA students working on their MA thesis.

These small strategies helped to maximize the impact of my energy, and also helped me learn its value. How much energy does it cost you to do the things you normally do? Getting a sense of what you're "spending" will let you know whether you're over budget, what's giving you some energy back, and where you could be over spending. By calibrating my internal energy budget, I aligned myself to care for the MYFest community with more effective precision.

12.4.4 Facilitation

12.4.4.1 Community Agreements

Nadine:

The Equity Unbound community agreements (http://bit.ly/IEH24agreements) were co-created with participants during the January 2023 IEH series. We start every session or conversation by sharing these. Here are the first few:

- You are welcome here—regardless of race, ethnicity, gender identity, sexual orientation, ability/disability—all are welcome in this space
- Make space for others
- Critique ideas not people
- Assume positive intentions
- Participate to the extent that makes you comfortable.
- Aim to be accessible and describe visuals.

The host also always reminds participants to come as they are and participate to the extent that makes them feel comfortable. There is no forced on-camera or on-mic participation. People are welcome to interact as they prefer; through chat or by unmuting, with their camera on or off, or in silence. We offer a "quiet room" option during breakout room activities for participants who choose to opt out of that moment of interactivity..

Irene:

In a world that often promotes tolerance rather than acceptance, the community agreements at the start of every MYFest session stand out. While we call them "community agreements," I have come to see them as "the love we live by." They have transformed how I design and facilitate sessions, and I now intentionally weave these IEH values into my work and share them globally.

12.4.4.2 Intentionally Equitable Facilitation (Nadine)

We consistently ask facilitators and supporting members of the community to host with our core IEH values and practices. Sessions are not designed in a lecture style. Rather, interactive learning experiences give participants chances to engage and interact with everyone. We design accessible sessions and resources to ensure they are inclusive. We leave enough time for participant questions and contributions, polls, discussions, games, or breakout room exercises, guided discussions, and reflections. Everyone has a chance to contribute the way they are most comfortable.

12.4.4.3 Intentional Adaptation in Hosting (Yasser)

There were moments during some sessions when facilitators were unaware of, or not attending to, the principles of equitable facilitation that Equity Unbound emphasizes. In those moments, other facilitators and hosts stepped in. We spoke directly with facilitators and, when needed, made intentional adjustments to better serve our community. These interventions were not about correction for its own sake, but about protecting the learning space and ensuring that participants felt included and supported. I also had ongoing conversations with Nadine about patterns of low attendance in certain sessions. Rather than viewing this as a failure on the part of participants, we treated it as an invitation to listen more carefully. We paid attention to people's interests, energy, and availability, recognizing that meaningful participation cannot be forced through fixed schedules.

In 2025, Maha and I decided to co-host several community building series, creating slower, more grounded spaces for reflection rather than simply participation. These sessions invited people to show up as they were, without performance or pressure, and to engage in ways that felt honest and human.

MYFest has been a life-changing opportunity for me as a student. Through it, I led and co-facilitated sessions with fellow community members. I also learned how to facilitate book circles which reshaped how I read, listen, and think with others. Reading in community taught me to slow down, attend to multiple perspectives, and approach texts as a shared, reflective practice rather than a solitary or extractive task.

12.4.4.4 A Student Perspective on Facilitation (Yasmine)

Being part of the MYFest community allowed me to see the "human" behind the teacher. I noticed this when I was entrusted to interview participants, seeking insights and feedback on their MYFest experience. Their passion regarding their MYFest experience was palpable. Well-being and joy were the two most recurring interview themes. I noticed a longing for a professional context focused solely on community and connectedness. To experience care from "hosts" of MYFest sessions was key (as opposed to other professional settings that treated them as bureaucratic actors in a transactional setting). Their appreciation for MYFest was natural, as it fostered an environment that meets their psychological needs (Ryan & Deci, 2022).

On a more profound level, I learned not to underestimate my position as a "mere" student. I discovered that I had much to give to this community. As an intern, I never thought I had the knowledge to contribute to any of the conversations with leading professionals in their respective fields. I thought my role would be confined to logistics management (alongside observing and learning a bit of course). Yet I was repeatedly encouraged to integrate, participate, and contest. Not because of expertise, but because of the recognition of my positionality as a student as valuable in contributing to this space.

Not only was I being recognized, but I was being assigned major responsibilities. Ironically, I found I was responsible for making the online space hospitable for the

very individuals who I would expect to lead. But within that space, power dynamics deliberately dissolved, and I learned to lead with care.

In hindsight, I now understand that students are systematically distanced from educational development contexts, oftentimes intentionally. We are programmed to succumb to the power dynamic that limits our role to observation only. We are relegated to recipients instead of agents. Perhaps this is what had disillusioned me in the first place. MYFest taught me that students are primary stakeholders and drivers of change for the future. In my previous formal learning contexts, I was prompted to "take ownership of my learning" but with no tools to guide me in doing so. With MYFest, guided by the spirit of IEH, I gradually developed a real sense of agency, because the learning environment itself actually made room for it.

12.4.4.5 An Academic's Growth in Self Awareness (Mia)

As an academic, it has long been drilled into my core that anything meaningful and important should be thoroughly researched and mastered before publicly connecting on the topic. MYFest helped me recognize that this needed to be "unlearned." Achieving full command and deep expertise in a subject or skill, often through intense focused practice over time is the only way to show up appropriately. This conviction, the result of years of professionalization, follows like a shadow, ever-present and often hindering my own sparks of curiosity and the light that comes with genuine wonder. In Equity Unbound, I learned to become self-aware of this conundrum internally.

I think that self-awareness is the ability to consider how your actions, thoughts, or emotions do or don't align with your internal standards. It's the mind's inner mirror that reflects to us what we're doing and thinking. MYFest is a space that allows me to show up with more curiosity and wonder than formal scholarly preparation. I have learned to design interactive and open conversations about many ideas that I recognize as important, but still don't feel like I have full command of. For example, in MYFest 25 I facilitated a session on "Linking Wellness with Justice." The session was deeply impactful to me because it gave me the space for a conversation that I had not yet mastered as a presenter. The self-awareness required to recognize the "need to be an expert" was important. I was able to recognize my own discomfort in lacking formal expertise in certain sessions I was leading, at the same time that I was able to overcome that feeling with a new sense of curiosity and hope for intellectual connection and dynamism. The constant practice of self-awareness for unlearning the "mastery impulse" encompasses direct learning by looking back on time in order to contemplate one's behavior and its consequences. This requires honest moments devoted to thinking about what has transpired—what has worked, what didn't, what can be done, and what can't. It's thoughtful and deliberate. It is also vulnerable. Through the effort to co-design for MYFest, I have apprehended my own sincere wish to learn more via intergenerational connection. In particular, I want to listen to younger generations or the elders beyond my own time and life scope. I was lucky to share the MYFest space with both of my high school aged sons, as well as my

elderly mother. And I was lucky enough to learn from retired and older colleagues as well as the children (especially those attending Reader's Theater). Self awareness enables more deliberate action that more fully incorporates the world around us. With self-awareness, we are more likely to refine and redress our actions toward the things we care about, increasing the likelihood of making a difference.

12.4.5 Sustaining Community

12.4.5.1 Emergent Sustained Community in Continuity with Care (Maha)

To organize the first "continuity with care" virtual meeting, we created a Twitter DM with all the participants. Although intended as a one-off thing, this DM group continued on for years, allowing us to support one another through ups and downs. When Twitter was sold to Elon Musk (whose values threatened much of what we believed in) we moved it to Signal, and the group continues on today. Some of the ideas that led to the community building resources and MYFest originated from discussions within that group.

12.4.5.2 Sustaining Learning Through Video

Maha:

The community building resources site is an open educational resource, so each individual educator can browse it on their own time, select what might fit their needs, and benefit from the adaptations already offered. People were also invited to suggest adaptations based on their own contexts. This site is an example of "on-demand" because of how quickly we managed to get the resource up and running (we launched in August with about 6 resources and had 30 + by the end of December). We have kept adding over time. When the number of resources grew, we developed categories to make them easier to browse, and added a brief self-paced pathway course with short videos and small exercises.

Nadine:

MYFest offers on-demand, self-directed learning through our MYFest video recordings. Our YouTube channel is a resource for all participants, so they may watch/rewatch sessions. The wider community and public may choose to watch sessions as well.

12.4.5.3 Sustaining Community as Connected Learning

Nadine:

Our sense of community is seeded with participants who know each other previously, resulting in organic connected learning experiences. Connected learning occurs through the formation of networks, where individuals connect with various information sources, such as experts in the field, and peer communities among others. It's also based on the ontological view that there is distributed knowledge that occurs as a result of the diversity in opinions and across a network of learners and connections (Siemens, 2004). Connectivism/connected learning is present as a result of IEH, as well as the community bond that is so special to Equity Unbound. We consistently strive to achieve both asynchronous and ongoing community engagement. MYFest is an anchor to overall community engagement during the calendar year, but there are challenges to sustainability yearlong (in the off months).

Maha:

Sustaining a community in a visible form (like an ongoing social media space for the entire community via Slack or Discord) has not worked well. In lieu of asynchronous conversation, we have tried different forms of mailing lists to inform participants of Equity Unbound events throughout the year (rather than just during MYFest). Community members often come to specific topical sessions, or less formal community gatherings offered year round. There are also smaller groups that are connected on WhatsApp (e.g., those who engaged in Book Circles). From the interviews conducted in 2024, we know that participants want more year-round engagement. This is something we are still working on achieving in a manner that feels "just right" for our community's needs.

12.5 Discussion

Professional lifelong learning is inequitable when it is financially prohibitive (e.g., conference fees and travel costs), ableist (e.g., not designed for people with visual or hearing impairments), socially insensitive, gendered (e.g., ignoring caretaking responsibilities), and/or colonialist (e.g., promoting hegemonic worldviews). For learning to be accessible and agentic, learners must have choice not only over what they learn, but also how, when, and with whom, and whether they participate as co-creators. This reflects what Nancy Fraser (2005) calls "parity of participation."

Equity Unbound's practices during COVID-19 challenged the neoliberal instinct to pool resources toward continuity of content delivery, and instead supported educators with the intuition to create caring learning communities at a time of trauma and physical social distancing.

MYFest emerged to focus our response to whatever needs educators had post-pandemic, while centering community and well-being beside academic learning,

making space for those in education as whole individuals, who have family and other loved ones around them.

None of these initiatives was offered top-down by one or two people. All involved diverse co-creators who shared similar values and helped sustain and grow the community.

12.5.1 Dispositions that Grew from the Praxis of MYFest/ IEH

Mia:

As I reflect on our four years of MYFest planning and design experiences, I realize that the overall journey has included essential "unlearning" processes. I have come to shed previously held professional habits and ingrained expectations. I have let go of more traditional academic methods of inquiry and preparation. In their place, I have chosen to nurture personal dispositions that seem to me now essential to the work of building a network founded in socially just distributed care. A disposition is something that lives inside an individual—a habit of mind integrated into one's beliefs or actions. What personal dispositions have I let evolve internally when pursuing our Equity Unbound work? And what has held those dispositional leanings back in the past? I now understand that the ways in which I have grown in Equity Unbound can also be a lens into the important connection between personal transformation and the overall thriving of a community. In writing about self-awareness and energy budgeting, I reflect on human/humane dispositions as critical elements in moving toward moral justice. Our dispositional leanings (like self-awareness or energy budgeting) are our valid and important pathways to collectively solving the inequities of the world. In this time that seems to continually drift toward anti-humanism, we can intentionally center certain human dispositions as fundamental to healing ourselves and the world we live in, together.

12.5.2 Connections to Theory

We showed how we **pre-design** by applying **heutagogical** principles, such as centering adult learners' agency, metacogition, self-efficacy, and nonlinearity through the "choose-your-own-learning-journey" approach, and the ways we have intergrated diverse participants as co-creators of experiences and co-organizers of future offerings, inventing new formats, inviting new facilitators, and facilitating themselves.

We have shown how we **design** for **equity**, aiming to support and welcome people from the global South or without funding (through free access), students, learners with disabilities, and to account for differences in internet access, comfort with breakout

rooms, and home situations by designing spaces that allow for variety in form and extent of engagement. The community agreements, themselves co-created by the community, are an element of continually reminding ourselves and our participants of the values we hold and how we intend to implement them in practice when we are together.

We have shown how we apply respond to uncertainty/ambiguity via **"intentional adaptation**" during the pandemic and via our **facilitation** during sessions. We have shown how we **sustained community** in order to achieve "cumulative" rather than "epochal" transformative learning experiences over several months and for some community members, several years.

The extended time we spent together over three months enabled us to build trust and make connections across tracks and sessions, and because MYFest ran for three consecutive years with small events in between, the community came to know one another and continued to co-construct knowledge together in ways that became transformative for those who were deeply engaged.

We realized that the way we had expressed our IEH praxis was missing the important element of "care" for and with one another that is essential for all of this to work—for the ideals of IEH to come to fruition, we need to do it all in an environment of socially just distributed care (Zamora & Bali, 2025), where participants contributed to caring for and with one another in ways that center social justice and enact it in a relational manner (Noddings, 1992). See Fig. 12.2, showing care as surrounding the other elements of IEH.

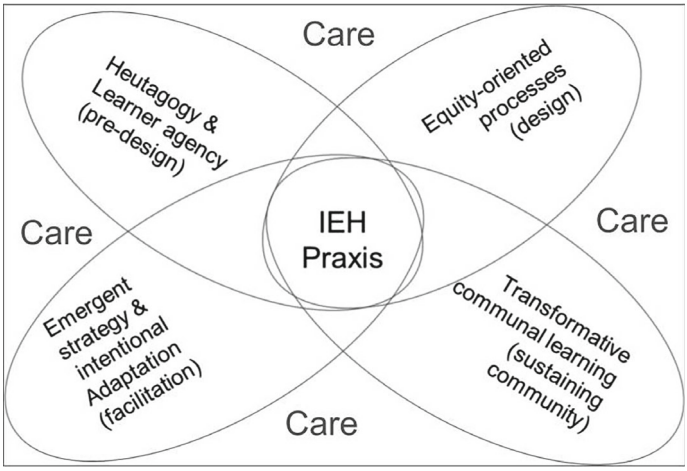


Fig. 12.2 IEH Praxis revised

12.5.3 Limitations of the Ways We Have Practiced IEH

Many professional development contexts require some kind of validation or certification in order for it to carry credibility or weight with employers. Although several participants have asked Equity Unbound to issue certificates or badges, we have rarely been able to address this need. The "choose your own learning journey" and "participate as feels right for you" approach makes it more complex to decide whom to issue certificates for. For the IEH series (which is a shorter offering with fewer sessions) we did more structured asynchronous work and clear criteria for receiving certificates. In some ways, the idea of offering certification does not fit our ethos. We believe in acknowledging and valuing different ways of learning. But perhaps a reflective portfolio approach can be used in future to help meet this need. That way, we maintain the intrinsic motivation that is more appropriate within self-determined learning, without overly focusing on extrinsic rewards.

We also noticed that it is difficult to engage undergraduate students, K–12 educators, and early career educators unless we invite them into specific sessions or roles. Our community tends to include more mid- and late- career educators. This suggests a need for more sustained outreach and attention to these groups' needs throughout the year, not only during events.

Since MYFest began in 2022, we have tried multiple ways to support asynchronous engagement during and beyond the three-month period, with limited success. This is partly due to fewer year-round offerings compared to June, July, and August, the decline of Twitter as a shared space for educators, and a growing preference for synchronous over sustained asynchronous interaction in large groups. Slack and later Discord worked intermittently. Smaller groups, such as book circles that formed WhatsApp groups, have been more sustainable, likely because of their intimacy and shared focus on reading specific texts together.

We also learned that asynchronous engagement sustained the community in ways we had not initially recognized. Many people missed live sessions but watched recordings, and still felt fully part of the community. In one IEH series, we shared daily email tips with short videos and simple activities. Although participants did not always engage in visible ways, they later described how they had meaningfully used and reflected on what we shared.

It is important to consider that emergence comes with less structure, and that this builds within a community some tacit knowledge that may be invisible to outsiders, new members, and those who are most marginalized, and that the unstructured aspects of IEH may be intimidating until someone gets used to them. Perhaps different audiences would be less comfortable with uncertainty and emergence.

Finally, any community that centers care risks its caregivers burning out, and even when the intention is for socially just distributed care (Zamora & Bali, 2025), this ideal is not always possible. Sustaining such communities cannot be sustained merely as a labor of love. In reality, our operational responsibilities would shift without funding support. We cannot expect a gift economy to maintain our established operations, especially when key contributors might not always hold stable, full-time

jobs. In addition, people's circumstances change over time (e.g. some may move away from higher education into consulting or other opportunities), or grow into positions within higher education with very rigorous time demands, including upper administrative roles.

12.6 Conclusion

12.6.1 Highlights and Recommendations

If we were to offer concrete practices for others providing professional lifelong learning in emergent and responsive ways (rather than "on-demand," which reflects market logic more than community need) that are also agentic, self-regulatory, and transformative, we would recommend the following approaches for applying IEH:

1. Pre-design by involving those furthest from justice as co-organizers. Don't just survey them to listen to their needs, involve them in the design process fully (what Nancy Fraser, 2005 calls "parity of participation"). Create spaces where people can participate and design on their own terms.
2. Design for accessibility, flexibility, inclusivity, and remember to design for joy and well-being, and not only to create a space for learning in the moment, but a space that builds community that can support that learning in that moment and beyond. Design for emergence and allow for new needs and ideas to come up and create space for them. By design. Design spaces that are anti-hierarchical as much as possible.
3. Facilitate equitably. Co-create community agreements. Remind people to adapt in the moment when new inequalities arise.
4. Sustaining community. This is the hardest part and takes up so much affective labor, but keeping the community connected in between events is what keeps it strong and allows you to know what they need. Ensure some of what you create is recorded or documented in ways that allow people to "catch up," or design asynchronous opportunities for those who can't make the timings you provide.

12.6.2 Limitations

This collaborative autoethnography has looked at a range of professional development activities from different roles: sometimes as co-organizers, as participants, as student interns, etc. Ultimately, all of us are people for whom this approach "works" and "resonates." We helped co-create the approach we are reflecting on, and so we are partial to it. What has worked for us, we recognize, may be too "unstructured" for some people, or may appear too radical or foreign a concept, and the perspective of people who choose not to engage or join us is not included in this paper.

Another limitation of this paper is the application to the field of education, where most people present are either teachers, professors, facilitators, instructional designers, librarians, educational developers, or currently a grad or undergrad student in education or training: this is a select group of people who already care about education and are likely quite self-aware and interested in learning with others to begin with, in informal settings outside of their full-time context. They are also people who are willing to learn online. It may be the case that people who do not have these tendencies would not necessarily feel comfortable or excited to learn in the IEH way.

12.6.3 Directions for Future Research

While we have interviewed participants in the past about their experiences of Equity Unbound's offerings, a direction for future research may be to explore people who are our target audience, but who have not participated fully. We could explore ways to encourage them to join us, or to experiment with different approaches co-designed with them: undergraduate students, K-12 teachers, educators earlier in their career.

It may also be useful to explore whether IEH, as an approach to designing professional development, would have resonance in training settings outside of education, and whether it may have resonance within institutions willing to do things differently. Our approach so far has been to work outside of any formal institutions, but perhaps the approach can be applied or adapted within networks or organizations such as ours. What are the limitations of IEH? Where is its potential for transferability?

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References

Adams, T. E. (2008). A review of narrative ethics. *Qualitative Inquiry, 14*(2), 175–194.

Bali, M., & Caines, A. (2018). A call for promoting ownership, equity, and agency in faculty development via connected learning. *International Journal of Educational Technology in Higher Education, 15*(1), 46–70.

Bali, M., Caines, A., DeWaard, H., & Hogue, R. (2016). Ethos and practice of a connected learning movement: interpreting virtually connecting through alignment with theory and survey results. *Online Learning, 20*(4) https://doi.org/10.24059/olj.v20i4.965

Bali, M., & Zamora, M. (2022a). The equity-care matrix: Theory and practice. *Italian Journal of Educational Technology.* https://doi.org/10.17471/2499-4324/1241

Bali, M., & Zamora, M. (2022b). Intentionally Equitable Hospitality as critical instructional Design. In J. Quinn, M Burtis, & S. Jhangiani (Eds.), *Designing for Care.* Hybrid Pedagogy publishing. https://designingforcare.pressbooks.com/chapter/intentionally-equitable-hospitality-as-critical-instructional-design/

Bali, M., & Zamora, M. (2023). Designing and adapting for community with Intentionally Equitable Hospitality. *Learning design voices.* University of Cape Town. https://edtechbooks.org/ldvoices/Intentionally_equitable_hospitality

Bali, M., Zamora, M., & Station, G. (2022, August 24). Building community in online conferences, events. *Inside Higher Ed*. https://www.insidehighered.com/views/2022/08/24/building-community-online-conferences-events-opinion

Barnett, R. (2023). Only connect: Designing university futures. *Quality in Higher Education, 29*(1), 116–131.

Blaschke, L. M. (2021). The dynamic mix of heutagogy and technology: Preparing learners for lifelong learning. *British Journal of Educational Technology, 52*, 1629–1645. https://doi.org/10.1111/bjet.13105

Bochner, A., & Ellis, C. (2016). *Evocative autoethnography: Writing lives and telling stories* (1st ed.). Routledge. https://doi.org/10.4324/9781315545417

brown, a. m. (2017). *Emergent strategy: Shaping change, changing worlds.*

Chang, H., Ngunjiri, F.W., & Hernandez, K. C. (2013). *Collaborative autoethnography*. Left Coast Press, Inc., Walnut Creek.

Cosnefroy, L., & Carré, P. (2014). Self-regulated and self-directed Learning : Why don't some neighbors communicate ?. *International Journal of Self-Directed Learning*, 11–2, 1–12. ⟨hal-01410802⟩

Ellis, C., Adams, T. E., & Bochner, A. P. (2011). Autoethnography: An overview. *Historical Social Research/Historische Sozialforschung, 36*(4 (138)), 273–290. http://www.jstor.org/stable/23032294

Fraser, N. (2005). Reframing justice in a globalizing world. *New Left Review, 36*, 69–88.

Freeman, J. (2013). The tyranny of structurelessness. *WSQ: Women's Studies Quarterly*, *41*(3), 231–246.

Hine, C. (2017). Ethnography and the internet: Taking account of emerging technological landscapes. *Fudan Journal of the Humanities and Social Sciences, 10*(3), 315–329. https://doi.org/10.1007/s40647-017-0178-7

Knowles, M. S. (1975). *Self-directed learning* (Vol. 291). New York: association press.

Mezirow. (2006/2018). Transformative learning. In K. Illeris (Ed.), *Contemporary theories of learning* (2nd ed.). VitalBook file.

Nixon, J. (2012). *Interpretive pedagogies for higher education: Arendt, Berger, Said, Nussbaum and their legacies.* Bloomsbury.

Noddings, N. (1992). *The challenge to care in schools: An alternative approach to education.* Teachers College Press.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, Article 101860.

Ryan, R. M., & Deci, E. L. (2022). Self-determination theory. In F. Maggino (Ed.), *Encyclopedia of Quality of Life and Well-Being Research*, https://doi.org/10.1007/978-3-319-69909-7_2630-2

Siemens, G. (2004). *Connectivism: A learning theory for the digital age.*

Trondsen, E., & Vickery, K. (1997). Learning on demand. *Journal of Knowledge Management, 1*(3), 169–180.

Wenger, E., Trayner, B., & de Laat, M. (2011). Promoting and assessing value creation in communities and networks: a conceptual framework. *Rapport 18*, Ruud de Moor Centrum, Open University of the Netherlands.

Zamora, M., & Bali, M. (2025). From socially just care to socially just distributed ecosystems of care. *Journal of Learning Development in Higher Education* [Preprint], (35). https://doi.org/10.47408/jldhe.vi35.1333

Zeidner & P. Pintrich (Eds.), *Handbook of self-regulation* (pp. 13- 39). Academic Press.

Zimmerman, B. (2000). Attaining self-regulation: A social cognitive perspective in M. Boekaerts. *Handbook of self-regulation* (pp. 13–39). El-Sevier.

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Part IV
Global Case Studies and Models

Vocational and Post-school Institutions, Lifelong Learning Systems, National Policies

Chapter 13
Global Pathways to Skills on Demand: Practical Models and Toolkits for On-Demand Learning Across Vocational, Higher, and Lifelong Education

Tran Quang Bao Phuc and Tran Thi Truc Duyen

Abstract This chapter explores the global growth of On-Demand Learning (ODL) as a response to rapid technological change, shifting labour markets, and more diverse learner needs across vocational, higher, and lifelong education. It argues that ODL is more than digital delivery or short-course provision. Instead, it represents a flexible and modular approach that reshapes how skills are accessed, developed, recognised, and connected to work over time. Drawing on cases from both the Global North and Global South, the chapter shows that ODL does not follow a single model. Its pathways vary according to governance capacity, institutional arrangements, labour market conditions, infrastructure, and equity priorities, which helps explain why similar reforms produce different outcomes across contexts. The analysis draws on learner-centred and constructivist perspectives, innovation diffusion, and policy transfer to explain how ODL is adopted, translated, and embedded in different systems. It also highlights the central tensions of ODL between just-in-time access and credible progression, rapid modular delivery and deeper competence formation, and labour market responsiveness and broader goals of inclusion, recognition, and learner dignity. In response, it proposes a four-dimensional implementation toolkit covering: (1) curriculum modularisation and credentialing design, (2) technology and delivery models, (3) ecosystem partnerships, and (4) equity and inclusion mechanisms. Rather than offering fixed solutions, the toolkit provides an adaptable framework to help policymakers, institutions, employers, and development actors design ODL systems that are context-sensitive, scalable, and truly learner-centred.

Keywords Global comparative pathways · On-demand learning · Skills-on-demand systems · Learning system design and toolkits · Vocational higher · Lifelong education

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13.1 Introduction: The Global Turn Towards On-Demand Learning

Automation, artificial intelligence, and platform-based economies are reshaping industries while also altering how work is organised, how value is created, and how skills are defined and rewarded (Abdullah et al., 2026; Chan, 2025; European Union, 2025). As the pace of change accelerates, skills become obsolete more quickly (Buchanan et al., 2010; Dickerson et al., 2023) than curricula can be updated (Council of Europe, 2025). So continuous learning increasingly replaces periodic education (Billett, 2024; Gouthro, 2022).

These developments place significant pressure on education and training systems originally designed for more stable economies and predictable school-to-work transitions (UNESCO, 2021). In many contexts, learners and employers face widening mismatches between education provision and labour market needs, contributing to underemployment, limited mobility, and unequal access to opportunity (Farran & Nunez, 2025). For working adults, mid-career professionals, and displaced workers, long and sequential degrees are often impractical. Increasingly, there is a need for learning pathways that enable timely skill acquisition, flexible participation, and recognition by both institutions and labour markets (International Labour Organization, 2020).

It is within this context that On-Demand Learning (ODL) has emerged as a prominent paradigm across vocational education and training, higher education, and lifelong learning. In this chapter, ODL is understood as a flexible, modular, and learner-driven approach that enables individuals to acquire relevant skills at times, paces, and in formats aligned with their needs. ODL expands access to industry-relevant learning through short modules, digital resources, micro-credentials, and skill-based units that can be combined and reconfigured over time (Avis, 2024; Cedefop, 2025c; Future Skills Centre, 2023; International Labour Organization, 2025b). In practice, ODL aims to reduce friction between learning and work by supporting timely, targeted learning while contributing to longer-term progression (Avis, 2024; Cedefop, 2025c; Future Skills Centre, 2023; International Labour Organization, 2025b).

Two features are central. First, ODL emphasises modularity, with learning organised into smaller units that can be completed independently and, in many cases, stacked towards broader qualifications (Cedefop, 2025b; International Labour Organization, 2025b; UNESCO IIEP, 2023). This structure allows learners to enter and exit learning pathways more fluidly and to update competencies without restarting an entire programme (Cedefop, 2025b; International Labour Organization, 2025b; UNESCO IIEP, 2023). Second, it emphasises learner agency, as individuals play an active role in selecting content, sequencing learning, and shaping the pace of progression, often enabled by digital platforms and new credentialing practices (Council of Europe, 2025; International Labour Organization, 2025b).

ODL is increasingly valued for its ability to narrow the gap between formal education and workplace needs, particularly where qualifications may not reflect job-ready skills (Cedefop, 2025b). By strengthening links between learning and

work, it treats upskilling and reskilling as ongoing activities. That supports employability and adaptation in labour markets with frequent shifts across roles and sectors (Billett, 2024; Decius et al., 2024). However, scaling ODL raises implementation challenges beyond access, including digital inclusion, quality assurance, credential recognition, and system capacity. Because these are shaped by governance, labour market structures, and infrastructure, ODL can be implemented in markedly different ways across contexts, creating trade-offs for learners, institutions, and policymakers.

This chapter examines how ODL is being put into practice across different regions through a comparative analysis of selected cases from the Global North and the Global South. The chapter does not treat ODL as a single model or a universal solution. Instead, it uses cross-regional comparison to identify common implementation patterns and to distil practical strategies for system design and policy decision-making. It explores how governments, education and training providers, and industry actors are rethinking delivery models, credentialing arrangements, and policy frameworks to embed ODL within broader skills ecosystems.

The chapter has three closely connected aims. First, it maps concrete ODL models across vocational, higher, and lifelong learning contexts, showing how flexibility, modularity, recognition, and labour market relevance are organised in different systems. Second, it examines the contextual conditions, implementation pathways, and core tensions that shape ODL adoption and scaling across cases. Third, drawing on these comparative insights, it proposes a practical implementation toolkit that translates these tensions into adaptable design dimensions and guiding considerations for stakeholders seeking to strengthen and localise ODL ecosystems.

13.2 Conceptual and Theoretical Foundations

13.2.1 Learner-Centred and Constructivist Foundations of ODL in Skills Ecosystems

At the pedagogical level, ODL is better understood through learner-centred and constructivist traditions than as a set of delivery techniques alone. These traditions view learning as active, situated, and shaped through experience, reflection, interaction, and application in real contexts, rather than as the passive receipt of fixed content (Lave & Wenger, 1991; von Glasersfeld, 1995; Weimer, 2013). From this perspective, learners are not simply given content; they make choices, connect new learning to prior knowledge and experience, and shape pathways around their goals, needs, and circumstances (Cobern, 1993; von Glasersfeld, 1995; Weimer, 2013).

This broader foundation is useful for understanding ODL across vocational, higher, and lifelong learning settings. ODL reflects learner-centred and constructivist principles by offering flexible entry points, modular progression, and greater scope for learners to influence pace, sequence, and mode of participation (UNESCO IIEP, 2022, 2023; von Glasersfeld, 1995; Weimer, 2013). It supports more personalised and

context-responsive learning pathways, while also recognising that learners engage with education from different starting points, life stages, and institutional settings (UNESCO IIEP, 2022, 2023).

Learner-centred and constructivist perspectives help explain the core tensions within ODL. Learner-centred approaches emphasise flexibility, choice, and responsiveness to diverse learner needs, while constructivist perspectives emphasise that meaningful learning develops through guided practice, feedback, interaction, and engagement in real or simulated contexts (Cobern, 1993; Lave & Wenger, 1991; von Glasersfeld, 1995; Weimer, 2013). ODL is therefore shaped by recurring tensions between timely access and deeper competence formation, modular flexibility and coherent progression, and wider participation and trusted recognition. Its effectiveness depends on how well flexible learning opportunities are combined with credible progression, appropriate support, and forms of engagement that sustain deeper learning (UNESCO IIEP, 2022, 2023).

Finally, learner-centred and constructivist perspectives underline that inclusion must be designed into ODL from the start. Because learning depends on active participation, support, and recognition, flexibility alone is not enough (UNESCO IIEP, 2022). Systems must also address unequal access to technology, guidance, institutional recognition, and supportive learning environments (UNESCO IIEP, 2022, 2023). Otherwise, ODL may reproduce existing inequalities in new and more fragmented forms.

13.2.2 Diffusion of Innovation as an Explanatory Framework: How ODL Spreads and Scales

Diffusion of Innovation (DoI) theory is a useful way to explain why ODL becomes well established in some places, but in other places it stays patchy or only appears in small pilot projects. Rogers' (2003) DoI examines how new ideas, practices, and technologies spread through social systems over time (Currie et al., 2021). In this chapter, DoI is not used to label adopter types. Instead, it helps clarify when ODL practices such as modular curricula, digital credentials, mobile learning, or AI-supported guidance are more likely to be adopted, normalised, and scaled.

DoI highlights four innovation attributes that shape adoption (Oh et al., 2025). ODL spreads faster when it shows clear relative advantage (better speed, relevance, cost, or access), strong compatibility (fits qualification frameworks, institutional routines, employer expectations, and cultural norms), low complexity (platforms, credential rules, and data systems are workable), and high trialability/observability (easy to pilot with low risk and benefits are visible and credible).

DoI further highlights diffusion pathways through reforms, organisational experimentation, professional communities, and employer recognition of micro-credentials (Currie et al., 2021; Oh et al., 2025). Still, DoI can underplay structural constraints (e.g., infrastructure gaps and power/resource inequalities), so it is used alongside policy transfer and mobility theory to explain how ODL travels and changes across contexts.

13.2.3 Policy Transfer, Policy Mobility, and Contextual Adaptation: How ODL Travels Across Borders

Diffusion of Innovation (DoI) helps explain how ODL spreads within education and training systems, but policy transfer and policy mobility help explain how ODL models move between systems, often across countries and regions, and why they change along the way. Policy transfer asks what is being transferred, who is involved, and what effects follow (Ciantar, 2025; Dolowitz & Marsh, 2000). Policy mobility adds that policies rarely travel unchanged; they are reshaped through networks, narratives, institutions, and power relations (McKenzie, 2017; McKenzie et al., 2015). This is common in skills reform, where models are borrowed through international cooperation, donors, and consultancy networks.

From this perspective, ODL is not a fixed package. What travels can include qualification standards, credit frameworks, modular curricula, micro-credentials, partnerships, platform systems, and underlying ideas about skills and funding (Ciantar, 2025). Borrowing may be voluntary, negotiated, or influenced by funding conditions and policy agendas. Outcomes depend on governance capacity, institutional fit, and historical legacies, so imported models may be integrated, adapted, or kept as pilots.

Policy mobility highlights contextual adaptation (McKenzie, 2017; McKenzie et al., 2015). In places with informality, linguistic diversity, or uneven infrastructure, ODL works only when core ideas are translated into local arrangements. 'Frugal innovation' captures this: low-cost, flexible, often more inclusive solutions such as mobile-first learning, community hubs, hybrid apprenticeships, or decentralised credentialing. Together, these perspectives guide the analysis of what helps ODL gain traction, how cross-border policy circulation shapes national strategies, and why the Global North and South can follow different implementation pathways.

13.3 Methodology

This chapter is a non-empirical, conceptually driven study. It builds a structured comparative synthesis of how ODL is implemented across vocational education and training, higher education, and lifelong/adult learning systems. It does not report original fieldwork or statistical analysis. Instead, it uses a transparent approach that combines a shared conceptual framework, theory-informed interpretation, and purposive case illustrations to produce practical, policy-relevant insights.

To strengthen rigor, the chapter uses two complementary lenses. Diffusion of Innovation and policy transfer/policy mobility do different but connected analytical work in this chapter. Diffusion of Innovation helps explain how ODL practices such as modularisation, micro-credentials, and digital delivery gain acceptance, spread, and become embedded within systems (Moore et al., 2025). This lens therefore guides the analysis in Sects. 13.4 and 13.5 of why some cases show stronger institutionalisation, while others remain more partial or adaptive. Policy transfer and policy mobility help

explain how ODL ideas travel across borders and sectors, and why similar reforms are reshaped in different ways once they enter new institutional and labour market contexts (Ciantar, 2025; Dolowitz & Marsh, 2000). This lens supports the chapter's comparative argument that divergence across cases is not simply about adoption, but about translation and contextual adaptation. These lenses provide the bridge from the case analysis to the implementation toolkit, which is designed as an adaptable framework rather than a single transferable model.

Cases are purposively selected using four inclusion criteria to illustrate contrasting Global North and Global South configurations, aiming for analytical (not statistical) generalisation. First, each case had to show a recognisable and policy-relevant form of ODL rather than isolated digital learning activity. Second, each case had to provide sufficient secondary evidence on governance, curriculum/credential design, delivery model, partnerships, and inclusion mechanisms to support structured comparison. Third, the selected cases were chosen to represent contrasting implementation logics across Global North and Global South settings, rather than to identify 'best practice' systems. Fourth, the sample was designed to capture variation in institutional capacity, labour market structure, and technology infrastructure, since these contextual conditions are central to the chapter's explanation of divergence. Cases were excluded where evidence was too limited, where initiatives were too localised or pilot-based to illuminate system-level dynamics, or where they did not show a sufficiently clear ODL architecture across the chapter's four analytical dimensions. Evidence also comes from triangulated secondary sources (research, policy documents, frameworks, and authoritative reports).

The analysis takes a systems perspective, treating ODL as an ecosystem rather than a single tool or teaching method. To support coherence and comparability across diverse contexts, each case is examined through the same analytical lens: (1) governance and institutional logic, (2) curriculum and credentialing arrangements, (3) technology and delivery model, (4) ecosystem partnerships, and (5) equity and inclusion challenges and trade-offs. Using these shared dimensions throughout avoids a set of loosely linked country descriptions and supports more systematic comparison.

The analysis proceeds in three linked stages. First, the selected cases are examined through a shared analytical lens to describe how ODL is organised across contexts (Sect. 13.4). Second, cross-case comparison is used to identify contextual pathways, shaping factors, and recurring tensions in ODL design and implementation (Sect. 13.5). Third, these cross-case findings are synthesised into a Practical Implementation Toolkit, in which the recurring tensions identified in the comparison are translated into design dimensions and guiding principles for policy and practice (Sect. 13.6).

The synthesis of the Practical Implementation Toolkit is guided by three principles: context sensitivity; modularity without fragmentation (clear credentials and progression); and equity as a systemic design condition. First, context sensitivity ensures that the toolkit is used as an adaptable framework rather than a fixed model. Second, modularity without fragmentation emphasises that flexibility must still be supported by clear credentials, progression routes, and system coherence. Third, equity as a systemic design condition means that inclusion is treated as a core part of

ODL design, not as an additional consideration. Accordingly, these principles shape how the toolkit organises its design dimensions and how they should be applied across different contexts. The toolkit is the chapter's main synthesis output, turning comparative insights into adaptable design principles and decision prompts.

13.4 Global Case Studies and Models

This section compares how On-Demand Learning (ODL) is applied worldwide in different social, economic, and institutional settings. Using Global North and South examples, it looks at how ODL is adopted within education and labour markets, the challenges of implementation, and how well it supports flexibility, access, and job relevance.

13.4.1 Global North: Institutionalised Pathways to On-Demand Learning

Finland: Modular VET as a National Lifelong Learning Infrastructure

Finland is a clear example of ODL embedded within a national lifelong learning architecture. Rather than treating flexibility as an add-on to traditional vocational education and training (VET), Finland has restructured VET around modular, competence-based learning (Ministry of Education & Culture, 2019; Ministry of Education and Culture & Finnish National Agency for Education, 2019). Learners progress through stackable units of competence aligned with national occupational standards, allowing partial qualifications and targeted skill acquisition without completing full programmes at every stage (Ministry of Education and Culture & Finnish National Agency for Education, 2019; OECD, 2025). These modules are mapped to the Finnish National Qualifications Framework (FiNQF), which strengthens recognition and portability across sectors (Cedefop, 2015, 2025a; ReferNet Finland & Cedefop, 2025; UNESCO et al., 2023).

Two reinforcing mechanisms support this model. First, alignment with FiNQF provides system-wide rules for credentialing and progression (ReferNet Finland & Cedefop, 2025). Second, the Service Centre for Continuous Learning and Employment (JOTPA) coordinates lifelong learning opportunities, particularly for adults seeking reskilling and upskilling in response to labour market change (Ministry of Education & Culture, 2019). Together, these features position ODL as a permanent infrastructure rather than a short-term response to skills shortages.

Finland's approach also highlights practical challenges. More individualised pathways increase the need for consistent assessment and strong quality assurance, and educators require support to shift from traditional instruction to personalised,

competence-based evaluation (Cedefop, 2025a; European Commission: Directorate-General for Education Youth Sport and Culture, 2025; Ministry of Education & Culture, 2019; ReferNet Finland & Cedefop, 2025). Overall, Finland suggests that modular ODL works best when it is linked tightly to qualification frameworks and backed by institutions that coordinate provision, recognition, and guidance over the life course.

Australia: Policy-Led Micro-Credentials for System Coherence

Australia offers a policy-led approach to ODL that aims to bring coherence and credibility to a rapidly expanding short-course market (Australian Department of Education Skills & Employment, 2021; Jobs & Skills Australia, 2023, 2025). Unlike Finland's deep institutional redesign, Australia treats micro-credentials as a key tool for flexible upskilling across higher education and vocational sectors (Australian Department of Education Skills & Employment, 2021; Selvaratnam et al., 2024). This approach responds to fast-changing skill needs while also aiming to reduce fragmentation across the system (Australian Department of Education Skills & Employment, 2021; Jobs & Skills Australia, 2023, 2025).

A central feature of this strategy is the National Microcredentials Framework (Australian Department of Education Skills & Employment, 2021). The framework provides shared definitions, quality indicators, and principles for credit alignment, with the goal of improving portability and the signalling value of short credentials across institutions and sectors (Australian Department of Education Skills & Employment, 2021). Many micro-credentials are industry-endorsed and focus on clearly defined skills gaps in areas such as health, cybersecurity, digital technologies, and construction (Selvaratnam et al., 2024). Government investment in online platforms further supports access and visibility by cataloguing and delivering offerings that are often co-designed by universities, Technical and Further Education institutions, employers, and training providers.

Australia's experience also highlights important implementation tensions. Building consistent recognition and stackability across states and institutions remains challenging, and rapid growth can lead to oversaturation and weak differentiation among credentials (Australian Department of Education Skills & Employment, 2021; Jackson, 2024; Selvaratnam et al., 2024). Without careful governance, flexibility may reduce clarity rather than strengthen it. Overall, Australia shows that ODL scales more effectively when micro-credentials are governed by shared standards and connected clearly to existing qualification frameworks and credit transfer systems.

Canada: College-Led Responsiveness and Employer Co-Design

Canada illustrates an implementation logic centred on institutional responsiveness and employer co-design, rather than national uniformity (Colleges & Institutes Canada, 2021; Future Skills Centre, 2023). Its network of colleges and institutes plays a central role in the skills ecosystem, with strong mandates for applied learning and close links to local labour markets (Colleges & Institutes Canada, 2021). In this context, ODL has often developed through provincial and regional initiatives that prioritise speed, relevance, and practical employment outcomes.

A distinctive feature is the use of rapid upskilling hubs within colleges (Colleges & Institutes Canada, 2021; Future Skills Centre, 2023). These hubs design and deliver short, modular programmes in collaboration with employers, especially in high-need areas such as health care, clean technology and clean energy, and information technology. Programmes are typically competency-based and offered through flexible formats, including online and hybrid delivery (Patterson & Hepburn, 2025). Provincial micro-credential frameworks support recognition and signalling, often using digital badges, while shared platforms such as eCampus Ontario improve transparency and access to recognised micro-credentials (Pichette & Courts, 2024; Schultz, 2024).

This decentralised model enables agility, but it also creates coordination challenges. Differences across provinces can make recognition harder beyond local labour markets, and maintaining consistent quality assurance requires ongoing attention (Colleges & Institutes Canada, 2021; Future Skills Centre, 2023; Schultz, 2024). Overall, Canada shows how ODL can scale through strong delivery capacity at the institutional level, with employer partnerships and flexible programme design strengthened by credible provincial recognition mechanisms.

Comparative Synthesis: A Shared Institutional Logic with Different Expressions

In many Global North settings, ODL has emerged within mature education and training systems with established qualification frameworks, strong regulation, and long-standing ties between providers, employers, and the state. For that reason, ODL is rarely introduced as a stand-alone innovation. It is usually embedded in existing arrangements, where flexibility and modularity are treated as system-level design features shaping learning, credentialing, and progression.

This embedding creates a shared implementation logic: ODL is scaled through formal mechanisms that protect coherence and credibility. Modular learning is aligned with national or subnational qualification frameworks, short credentials link to recognised standards, and quality assurance remains central. Across Finland, Australia, and Canada, ODL tends to be most effective when it sits within recognised policy and institutional frameworks, supported by mechanisms that build quality, recognition, and labour market trust (Australian Department of Education Skills & Employment, 2021; Colleges & Institutes Canada, 2021; Pichette & Courts, 2024).

However, the shared logic looks different in practice. Finland emphasises system-wide integration through modular VET and strong national coordination (European Commission: Directorate-General for Education Youth Sport and Culture, 2025; Ministry of Education & Culture, 2019). Australia prioritises policy standardisation via a national micro-credentials framework (Australian Department of Education Skills & Employment, 2021). Canada focuses on institutional responsiveness, with colleges leading employer co-design through rapid upskilling hubs supported by provincial recognition systems (Colleges & Institutes Canada, 2021; Pichette & Courts, 2024).

These differences shape learner and employer experiences and help explain why similar tools can produce varied outcomes, setting up a clear contrast with Global

Table 13.1 Comparative overview of Global North ODL models

Dimension	Finland	Australia	Canada
Governance model	Centralised, publicly funded system with strong national coordination	Federated system guided by national policy frameworks	Provincial leadership with national collaboration mechanisms
ODL mechanism	Modular VET aligned with the Finnish National Qualifications Framework (FiNQF)	National Microcredentials Framework across higher education and VET	Employer-driven rapid upskilling hubs led by colleges
Institutional logic	ODL embedded as national lifelong learning infrastructure	ODL coordinated through policy standardisation to ensure system coherence	ODL driven by institutional responsiveness to local labour markets
Target learners	Adult learners and lifelong learners seeking reskilling and progression	Working professionals and job-switchers seeking flexible upskilling	Displaced workers and upskillers responding to local labour shortages
Key strengths	Strong integration, recognition, and progression pathways	Standardisation, portability, and signalling value of credentials	High responsiveness, strong employer links, and applied delivery capacity
Key coordination challenge	Maintaining consistent assessment and quality across individualised pathways	Ensuring recognition and differentiation across states and institutions	Aligning quality assurance and recognition across provinces

Source Author synthesis based on the case analyses in Sect. 4.1

South cases. Table 13.1 summarises variations in governance, delivery, and target learners.

13.4.2 Global South: Adaptive and Access-Oriented Pathways to On-Demand Learning

Singapore: State-Orchestrated Lifelong Learning with Individual Choice

Singapore offers a distinctive case that bridges Global North and Global South dynamics. It combines a highly capable state with a formal labour market (Kuan, 2026; SkillsFuture Singapore, 2025). It also faces strong pressure for continuous

skills renewal due to rapid restructuring and workforce ageing (SkillsFuture Singapore, 2025). ODL is organised through strong central coordination, while also placing choice and responsibility at the level of the individual learner.

The core approach is the SkillsFuture initiative, which frames lifelong learning as both a national strategy and an individual obligation (Kok Yam & Boey, 2025; Kuan, 2026; SkillsFuture Singapore, 2025; Tan, 2025). Citizens receive learning credits that can be used across approved courses, including short, modular offerings linked to industry needs (OECD, 2025; Tan, 2025). Digital platforms and data-driven tools, including AI-based guidance, support pathway selection based on labour market trends and learner profiles (SkillsFuture Singapore, 2025). Stackability and recognition are built in so that short courses contribute to longer qualification and skills pathways. Singapore's VET system, including the Institute of Technical Education (ITE), further supports work-based learning through structured practical training and close public–private collaboration (Kuan, 2026; OECD, 2025; Tan, 2025).

Equity and inclusion remain current challenges (Kok Yam & Boey, 2025; Kuan, 2026; SkillsFuture Singapore, 2025; Tan, 2025). People outside stable employment may find it harder to benefit, and the model can shift navigation burdens onto individuals (Kok Yam & Boey, 2025). Overall, Singapore shows how rapid scaling is possible when the state acts as system integrator, but flexibility still requires support to avoid widening gaps.

India: Platform-Based ODL at Population Scale

India illustrates an ODL pathway shaped primarily by scale. With a very large youth population, widespread informality, and uneven access to formal education, the key challenge is reaching learners at mass scale while maintaining relevance to work (Choudhury et al., 2025; Gupta & Dharap, 2024; Tomar & Singh, 2025; Vincent & Rajasekhar, 2023). ODL has therefore developed through national policy frameworks and large digital platforms designed to support widespread upskilling and reskilling.

Initiatives such as the Skill India Mission, led by the National Skill Development Corporation, provide a coordinated structure for skills development (Maitra et al., 2024; Ministry of Skill Development & Entrepreneurship, 2025; Prasad, 2025). The National Skills Qualifications Framework (NSQF) supports flexible pathways across vocational education, higher education, and lifelong learning, including recognition of skills gained through non-formal and informal routes (Maitra et al., 2024; Ministry of Skill Development & Entrepreneurship, 2025; UNESCO et al., 2023). Digital platforms, including eSkill India, deliver modular courses and micro-certifications aligned with Industry 4.0 sectors, often in local languages. Partnerships with technology firms, NGOs, and training providers enable localisation, digital mentoring, and blended delivery (Ministry of Skill Development & Entrepreneurship, 2025).

Scaling ODL in this way also creates challenges. Ensuring consistent quality across providers requires ongoing governance and data coordination (Ministry of Skill Development & Entrepreneurship, 2025). Strengthening employer recognition and bridging digital access gaps across regions and gender groups also depend on sustained coordination and oversight (Ministry of Skill Development &

Entrepreneurship, 2025). India's experience shows how public–private digital platforms and flexible recognition systems can institutionalise ODL in a highly diverse and complex context.

Vietnam: Incremental ODL through TVET Reform and Hybrid Digital Delivery

Vietnam represents an incremental and hybrid pathway to ODL shaped by rapid economic change, a large young workforce, and deep integration into global manufacturing and service chains (Asian Development Bank, 2020). Rather than emerging through fully digital platforms or highly decentralised models, ODL in Vietnam is closely linked to ongoing reforms in technical and vocational education and training (TVET), combined with selective use of digital and modular delivery (Asian Development Bank, 2020; The World Bank et al., 2023).

The institutional base for ODL is anchored in the TVET system under the Ministry of Labour, Invalids and Social Affairs (Asian Development Bank, 2020). Recent reforms have promoted competency-based training, closer alignment with industry standards, and greater flexibility in programme design (UNESCO & Vietnam Ministry of Labour—Invalid and Social Affairs, 2018). The Vietnam Qualifications Framework provides a reference for linking learning outcomes across levels and creates space for modular approaches beyond traditional full-length programmes.

In practice, ODL has developed through a mix of formal reform and pragmatic experimentation. Vocational colleges and training centres offer short and modular courses targeting skills in manufacturing, logistics, tourism, and information technology, often in partnership with enterprises (Mori & Stroud, 2023; Nguyen, 2021). Digital tools are used mainly for theoretical components, while practical training remains workshop- or workplace-based.

A defining feature is the emphasis on blended delivery rather than fully online models. While digital adoption has increased, recognition of short courses, credit transfer, and prior learning remains uneven. Vietnam's experience shows ODL can expand gradually by working within existing institutions. It also highlights the need for stronger recognition and inclusion mechanisms to support lifelong learning at scale.

Kenya: Mobile-First ODL for Informal and Rural Learners

Kenya illustrates an access-first pathway to ODL shaped by a predominantly young population, persistent rural–urban disparities, and a largely informal economy (International Labour Organization, 2024; Ngware et al., 2024). While the education system faces structural difficulties in delivering vocational and digital skills at scale, Kenya has become a regional leader in mobile-enabled learning. Digital TVET initiatives, supported by the Kenya School of TVET (KSTVET) and international partners such as the ILO and Columbia SIPA, use mobile-first platforms to deliver localised content that works in low-bandwidth areas (Columbia University SIPA, 2025; International Labour Organization, 2024, 2025a). A distinctive feature is blended apprenticeship models that combine online theory with community-based practical training. Many programmes prioritise rural youth, women, and informal sector workers, and offer short, targeted modules that fit around work and family

responsibilities (Columbia University SIPA, 2025; International Labour Organization, 2024; Ngware et al., 2024). Delivery often involves NGOs, social enterprises, and private providers working closely with local communities, with content linked to livelihoods in agriculture and services (The World Bank et al., 2023).

Key constraints include limited devices and connectivity in rural areas, along with the need for localised assessment methods to validate skills (International Labour Organization, 2024). Even so, these approaches have broadened access for underserved learners, with evidence that community-based learning can improve retention and employment outcomes (International Labour Organization, 2025a). Kenya's experience suggests that low-tech mobile delivery, combined with community engagement, can expand ODL in low-resource settings, though longer-term impact depends on stronger links to credential recognition and sustainable support.

Brazil: Hybrid Public-Corporate Ecosystems for Skills Development

Brazil illustrates a hybrid pathway to ODL shaped by deep social inequality and uneven access to digital education (Amaral et al., 2016; Pozzer & dos Reis Neuhold, 2025). ODL is embedded within established public-corporate training ecosystems, where institutions such as SENAI play a central role (OECD, 2022). SENAI uses industry-led governance with public mandates to provide vocational and technical training aligned with labour market needs (OECD, 2022; Packard & Almeida, 2018). This approach supports employment, improves productivity, and promotes economic adaptation.

In practice, ODL often takes a blended form. Modular courses are delivered through community learning centres and public–private initiatives, combining online content with in-person training. These programmes focus on digital literacy, entrepreneurship, and work readiness, particularly for vulnerable groups (Amaral et al., 2016; Packard & Almeida, 2018). NGOs such as Recode complement this model by delivering project-based and peer-supported digital learning in underserved urban communities, especially among youth (OECD, 2022).

This multi-sector approach expands access and builds confidence, with evidence of improved employment outcomes and pathways to further education or small-scale enterprise. However, challenges remain. Certification recognition across decentralised providers is uneven, and digital exclusion persists in informal settlements and peripheral regions. Brazil's experience shows that hybrid public-corporate arrangements can scale ODL with credibility. However, inclusive impact depends on deliberate community engagement and sustained coordination beyond formal industry networks.

Comparative Synthesis: Adaptive Logics under Constraint

In many Global South settings, ODL has grown in a more adaptive and decentralised way than in the Global North. This reflects different starting conditions, i.e., limited resources, informal labour markets, and uneven institutional capacity (Avis, 2024). ODL is therefore less often driven by system-wide reform and more often shaped by practical responses to urgent skills and access needs.

Instead of prioritising standardisation and coherence, Global South approaches tend to focus on reach, affordability, and speed. Many initiatives use hybrid delivery, bringing together governments, private platforms, NGOs, and community-based providers. Innovation often emerges from necessity, as actors try to widen access, support inclusion, and deliver job-relevant learning at scale. Across Singapore, India, Vietnam, Kenya, and Brazil, ODL commonly combines public policy, digital platforms, institutional providers, and community delivery to cope with pressures of scale, informality, and uneven capacity, with access and relevance as the main drivers.

Within this shared logic, countries take different routes. Singapore uses strong state orchestration alongside individual choice (Kok Yam & Boey, 2025; Kuan, 2026). India emphasises population-scale platforms and flexible recognition. Vietnam follows an incremental path, embedding ODL within TVET reform and blended delivery. Kenya targets rural and informal learners through mobile-first and community-based models (International Labour Organization, 2024). Brazil shows how public-corporate and NGO partnerships can reach marginalised urban groups (OECD, 2022; Packard & Almeida, 2018). Table 13.2 summarises these governance and delivery variations. These pathways contrast with Global North models, but they are not 'transitional'; they are context-specific solutions to shared challenges of reach, equity, and labour market connection, highlighting the need for adaptation rather than replication.

13.5 Comparative Analysis: Contextual Pathways and the Core Tensions of ODL

The comparison suggests that Global North and Global South pathways differ mainly in institutional logic shaped by context, not in overall 'quality'. This analysis takes a historical and critical view that recognises how colonial legacies, uneven development, and global economic restructuring continue to shape the conditions under which ODL develops. These structural differences influence the starting conditions, governance capacity, delivery infrastructures, and learner opportunities available across contexts. For example, Kenya, Brazil, and India often implement ODL under tighter resource constraints and more unequal access (Behera et al., 2025; Choudhury et al., 2025; Columbia University SIPA, 2025; International Labour Organization, 2024; Ministry of Skill Development & Entrepreneurship, 2025; Vincent & Rajasekhar, 2023). Finland, Australia, and Canada operate within more established regulatory and institutional systems (Australian Department of Education Skills & Employment, 2021; Colleges & Institutes Canada, 2021; European Commission: Directorate-General for Education Youth Sport and Culture, 2025; Pichette & Courts, 2024; ReferNet Finland & Cedefop, 2025). These differences matter because they shape how ODL is organised, who it is designed for, and how learning is recognised and connected to labour market opportunity.

Table 13.2 Comparative overview: Adaptive ODL pathways in the Global South

Dimension	Singapore	India	Vietnam	Kenya	Brazil
Governance model	Strong state coordination with individual choice	National policy frameworks with public–private platforms	State-led TVET reform with gradual decentralisation	Hybrid governance with NGOs and community actors	Public-corporate partnerships with NGO involvement
ODL mechanism	SkillsFuture credits and modular, stackable courses	Large-scale digital platforms and micro-certification	Short and modular TVET courses with blended delivery	Mobile-first digital TVET and blended apprenticeships	Blended modular training via community centres
Institutional logic	State as system integrator	Scale-oriented platform governance	Incremental reform within existing institutions	Access-first, community-based delivery	Inclusion through multi-sector ecosystems
Target learners	Adult learners and mid-career workers	Large youth population and informal workers	Existing workers in manufacturing and services	Rural youth, women, informal sector workers	Marginalised urban and low-income groups
Delivery mode	Digital platforms with guidance tools	Online and hybrid learning at population scale	Blended learning, practice-based training	Mobile learning with community practicals	Online plus in-person community training
Key strength	Rapid scaling with clear pathways	Mass reach and flexible recognition	Alignment with employers and TVET structures	Expanded access in low-resource settings	Strong inclusion and community engagement
Key constraint	Equity for those outside stable employment	Quality assurance and digital divides	Weak recognition and stackability	Credential recognition and sustainability	Uneven certification and digital exclusion

Source Author synthesis based on the case analyses in Sect. 4.2

As Table 13.3 indicates, Global North systems more often prioritise coherence, standardisation, formal integration, and clearer progression across curriculum, credentialing, and recognition, while Global South pathways place greater emphasis on access, inclusion, reach, and adaptive delivery under more uneven institutional and labour market conditions (Asian Development Bank, 2020; Australian Department of Education Skills & Employment, 2021; Avis, 2024; Colleges & Institutes Canada, 2021; International Labour Organization, 2024, 2025a; Ministry of Education & Culture, 2019; Ministry of Skill Development & Entrepreneurship, 2025; OECD, 2022, 2025; Packard & Almeida, 2018; SkillsFuture Singapore, 2025; UNESCO & Vietnam Ministry of Labour—Invalid and Social Affairs, 2018). These contrasts are also reflected in governance arrangements, technology choices, target learners, and equity strategies. Both groups respond to skills change and labour market uncertainty, but through different institutional and delivery configurations. Table 13.3 synthesises these patterns. The discussion therefore treats ODL not simply as flexible provision, but as a system design challenge shaped by recurring tensions between just-in-time access and credible progression, rapid modular delivery and deeper competence formation, expanded participation and trusted recognition, and labour market responsiveness and broader educational goals. In this sense, Global North and Global South pathways can be read as different ways of managing the core tensions of ODL.

Importantly, these differences should not be read as evidence of weaker ambition or policy intent. Core ideas, i.e., flexibility, modular learning, learner agency, and closer links to skills demand, appear across all cases, but their practical form varies with institutional maturity, labour market structures, and governance capacity. To make this variation analytically clearer, the discussion that follows reads divergence through three linked lenses: (1) systemic readiness versus adaptive innovation, (2) contextual factors shaping design trade-offs, and (3) a continuing tension between just-in-time access and professional competence. These differences therefore show not whether ODL is present or absent, but how different systems negotiate its underlying tensions in practice.

13.5.1 Contextual Pathways: Systemic Readiness and Adaptive Innovation

Across the cases, a key difference is between systems with strong readiness and those shaped by adaptive innovation. This distinction helps explain why ODL takes different contextual pathways across systems. In practice, these pathways reflect different ways of balancing flexibility, recognition, and progression under different institutional conditions. In many Global North contexts, ODL builds on mature education and training systems. Established qualification frameworks, formal quality assurance, and stable state-provider-employer relationships make it easier to embed flexibility, so ODL features are integrated into existing structures rather than launched

Table 13.3 Comparative framework: ODL in the Global North and Global South

Dimension	Global North	Global South
Starting conditions	Mature education and training systems with established qualification frameworks and strong regulatory capacity	Uneven institutional capacity, resource constraints, and fragmented or informal labour markets
Primary orientation	System coherence, standardisation, and long-term institutional integration	Access, inclusion, reach, and pragmatic responses to urgent skills needs
Implementation logic	Institutionalised pathways with ODL embedded in existing VET, higher education, and lifelong learning systems	Adaptive pathways developed incrementally through hybrid, decentralised, or platform-based arrangements
Governance model	Predominantly state-led or publicly coordinated with clear regulatory oversight	Hybrid and multi-actor governance involving states, platforms, employers, NGOs, and communities
Role of institutions	Public institutions act as system integrators ensuring quality, recognition, and progression	Institutions act as anchors or facilitators within broader delivery ecosystems
Curriculum structure	Modular and competency-based curricula aligned with national qualification frameworks	Partial or incremental modularisation combined with traditional or non-formal programmes
Credentialing	Formal micro-credentials and stackable modules with clear progression routes	Mixed credential landscape with uneven recognition and emerging micro-credentials
Recognition of prior learning	Institutionalised or expanding within formal systems	Highly salient but uneven, especially for informal workers and adult learners
Technology and delivery	Integrated digital platforms, blended systems, and advanced guidance tools	Mobile-first, blended, and low-bandwidth solutions adapted to infrastructure limits
Target learners	Adult learners, mid-career professionals, and displaced workers	Youth, informal workers, rural populations, women, and first-time credential seekers
Labour market alignment	Strong employer signalling and formal occupational standards	Emphasis on employability, livelihoods, and income generation under fragmented signalling
Equity and inclusion	Universal access framed through lifelong learning pathways	Targeted strategies to address structural exclusion and access gaps

(continued)

Table 13.3 (continued)

Dimension	Global North	Global South
Key strengths	Credibility, portability, and system-wide coherence	Flexibility, reach, contextual relevance, and frugal innovation
Key challenges	Risk of over-standardisation and institutional inertia	Quality assurance, recognition, sustainability, and scaling beyond pilots

Source Author synthesis based on the case analyses in Sects. 4.1 and 4.2

as separate initiatives. Finland shows deep integration through modular, competence-based VET aligned with the national qualifications framework and coordinated lifelong learning support (Cedefop, 2015; Ministry of Education & Culture, 2019; ReferNet Finland & Cedefop, 2025). Australia follows a policy-led path, using a national micro-credentials framework to maintain coherence and portability in a growing short-course market (Australian Department of Education Skills & Employment, 2021; Jackson, 2024; Jobs & Skills Australia, 2023). Canada highlights institutional responsiveness within a credible system, with colleges running rapid upskilling hubs co-designed with employers and backed by provincial recognition (Colleges & Institutes Canada, 2021; Future Skills Centre, 2023). Here, the main challenge is coordination, so modular learning stays credible, comparable, and linked to progression routes. In these settings, ODL is more often organised so that flexibility is embedded within established structures of recognition and trust.

Many Global South contexts start from less stable conditions: uneven capacity, limited resources, informal labour markets, and learning needs tied to immediate livelihoods. ODL therefore grows through adaptive approaches such as mobile-first delivery, blended community models, and hybrid partnerships across public agencies, private platforms, NGOs, and local providers. Kenya illustrates low-bandwidth mobile TVET and blended apprenticeships for rural youth and women (Columbia University SIPA, 2025; International Labour Organization, 2024). India scales platform-based ODL through national frameworks, large e-learning systems, micro-certification, and recognition of prior learning (Choudhury et al., 2025; Maitra et al., 2024; Prasad, 2025). Brazil shows corporate-community ecosystems where SENAI and NGOs support digital literacy and entrepreneurship for underserved groups (Amaral et al., 2016; OECD, 2022). Singapore is distinctive: strong state orchestration plus individual choice via SkillsFuture credits and AI guidance, yet inclusion gaps remain for those outside stable employment (Kok Yam & Boey, 2025). In these contexts, ODL more often develops through pathways that prioritise reach, responsiveness, and affordability first, while coherence, portability, and progression are built more gradually or unevenly.

These pathways are not binary. Some sit in between, like Vietnam, where ODL expands through TVET modernisation, enterprise partnerships, and blended delivery, while recognition and stackability remain uneven (Asian Development Bank, 2020; The World Bank et al., 2023; UNESCO & Vietnam Ministry of Labour—Invalid

and Social Affairs, 2018). That shows a spectrum shaped by policy choices and capacity, not fixed North–South types. The comparative point, then, is not that one group values ODL more than the other, but that systems differ in how they balance flexibility with institutionalisation, and speed with credible skills formation.

13.5.2 Factors Shaping ODL Pathways Across Contexts

Beyond overall differences in system readiness, the cases show several connected factors that shape how ODL is designed, delivered, and experienced, and what options are realistic in each context. These factors help explain why similar ODL tools produce different practical trade-offs across settings. They shape whether modular learning supports progression or fragmentation, whether wider participation leads to recognition, and whether flexibility can be connected to more meaningful competence formation. Governance capacity is a key starting point. Where governments can coordinate standards, funding, and quality assurance, ODL can scale through formal frameworks. Finland's modular VET and Australia's national micro-credentials framework show how coordination builds recognition and trust. Where governance is weaker or fragmented, ODL more often grows through hybrid arrangements. Kenya and Brazil illustrate this, with delivery shared across state agencies, NGOs, employers, and community actors.

Labour market structure also matters. In formal labour markets, clear occupational standards help modular credentials signal value to employers. In informal or mixed economies, learners may prioritise income generation over formal progression. India's focus on recognition of prior learning and Kenya's community-based apprenticeships reflect the need to value skills gained outside formal jobs. This means that ODL may be organised either around longer-term credential value or around more immediate livelihood relevance, depending on context.

Digital infrastructure and affordability shape delivery. Higher-income systems can run integrated platforms, data systems, and AI guidance (e.g., Singapore and Australia). Lower-resource settings often require mobile-first, low-bandwidth solutions, as seen in Kenya's mobile TVET and Brazil's blended community delivery. These differences affect not only how ODL is delivered, but also how far access can be linked to deeper learning, since wider reach often still depends on blended or practice-based arrangements where competence cannot be built through digital delivery alone.

Cultural and linguistic diversity affects inclusion: standardised content scales but can exclude multilingual learners. India's local-language approach and Brazil's community programmes show the need for localisation, not just translation. Finally, learner profiles differ: Global North ODL often targets mid-career upskilling, while Global South and transitional contexts include first-time credential seekers, informal workers, rural learners, and adults juggling work and family; Vietnam illustrates this mix. Overall, these factors explain why similar ODL tools produce different outcomes: divergence reflects context-sensitive adaptation, not weaker ambition.

What looks like the same ODL mechanism on the surface may therefore carry very different implications for participation, competence, and progression across contexts.

13.5.3 Revisiting the Central Tension: Just-In-Time Learning and Professional Competence

Across the cases, ODL is shaped not only by differences in governance, infrastructure, and labour market conditions, but also by a central tension within the model itself. ODL is valued for its just-in-time logic: it offers speed, flexibility, modular access, and closer alignment with changing skill demands. This is visible in models such as Australia's micro-credentials framework and India's large-scale digital skills platforms, where short courses and modular learning are designed to respond quickly to labour market change (Australian Department of Education Skills & Employment, 2021; Gupta & Dharap, 2024; Maitra et al., 2024). In this sense, ODL supports employability, productivity, and faster upskilling.

Many forms of professional competence cannot be built through rapid access alone. They depend on guided practice, repetition, judgement, feedback, and embodied engagement in real or simulated work settings. This is why several cases in the chapter rely on blended or practice-based models rather than fully digital delivery. Finland links modular learning to competence-based VET and recognised progression routes (Ministry of Education & Culture, 2019; ReferNet Finland & Cedefop, 2025). Vietnam combines short and modular courses with workshop- and workplace-based training (Asian Development Bank, 2020; UNESCO & Vietnam Ministry of Labour—Invalid and Social Affairs, 2018). Kenya also combines mobile learning with community-based practical training and blended apprenticeships (International Labour Organization, 2024, 2025a). These examples show that ODL works best when flexibility is connected to credible competence formation.

This central tension is closely tied to other pressures within ODL. When systems prioritise speed and labour market signalling, the balance can shift away from recognition, inclusion, and longer-term learner mobility, sharpening the tension between economic alignment and broader social-democratic aims (Cieslik et al., 2022; Council of Europe, 2025; Jackson et al., 2025). In the same way, modular and digital delivery can widen access quickly, but without trusted credentials, guidance, and progression routes, expanded participation may still lead to low-recognition pathways rather than meaningful opportunity (Cedefop, 2025b, 2025c).

The key issue, then, is not whether ODL should be flexible, but how flexibility can be organised so that it does not weaken coherence, recognition, or deeper learning. This is the main reason for the toolkit in Sect. 13.6. Its four dimensions, i.e., curriculum and credentialing, technology and delivery, partnerships, and equity and inclusion, are proposed as practical ways to balance timely access with credible progression, modularity with coherence, and responsiveness with meaningful professional formation.

Overall, the comparative analysis suggests that ODL is best understood not as a single reform model, but as a set of context-dependent responses to recurring design tensions. The toolkit that follows is therefore introduced not as a universal solution, but as a practical framework for making these trade-offs more explicit and for organising ODL in ways that remain flexible, credible, and context-sensitive.

13.6 From Comparative Analysis to Design: A Practical Implementation-Oriented Toolkit

Based on the regional case studies, this section presents a Practical Implementation Toolkit. Instead of prescribing fixed policies, it summarises common design dimensions across contexts into a practical framework to help educators, policymakers, providers, and employers plan, assess, and improve ODL in different systems.

13.6.1 Curriculum and Credentialing Design: Modularisation, Competency Alignment, and Recognition

A scalable and credible ODL system starts with how learning is structured and how it is recognised. Instead of long, time-bound programmes, ODL breaks learning into modular, competency-based pathways that learners can combine, pause, and resume over time. Done well, this supports learner agency, keeps learning relevant to work, and improves mobility across education levels and sectors. Table 13.4 shows that countries organise this differently depending on institutional capacity, labour market needs, and access priorities.

Curriculum modularisation and competency-based design

Modularisation and competency-based design means turning curricula into small, stackable units tied to specific competencies or job tasks. Learners can take what they need 'just in time' without enrolling in a full programme, and progress is based on demonstrated mastery rather than seat time. Competency anchoring also improves labour market relevance by linking outcomes to work practice and occupational standards. In highly institutionalised systems like Finland, modular VET aligns tightly with national qualification frameworks, so learners can move smoothly between partial and full qualifications (Cedefop, 2025b). In large, diverse systems like India, national skills frameworks map competencies to sector standards, allowing modular training to scale while supporting different entry points. This combination delivers two benefits: faster updating/recombining of modules as demand shifts, and better coherence because modules feed into recognised progression routes rather than becoming isolated courses.

Table 13.4 Curriculum and credentialing logics across ODL contexts

Contextual emphasis	Curriculum focus	Credentialing strategy
Institutionalised systems (e.g., Finland)	Modular, competency-based curricula aligned with national frameworks	Stackable modules linked to formal qualifications
Policy-coordinated systems (e.g., Australia)	Industry-informed short courses	National micro-credentials frameworks and digital registries
Large-scale adaptive systems (e.g., India)	Competency mapping across sectors	Public–private micro-certification linked to skills frameworks
Access-oriented systems (e.g., Kenya)	Mobile and community-based modular learning	Blended apprenticeship models and RPL recognition
Incremental reform systems (e.g., Vietnam)	Modular TVET combined with blended delivery	Partial stackability within evolving qualification frameworks

Micro-credentials and credential portability

Micro-credentials and portability are a common way to recognise modular learning (International Labour Organization, 2025b; OECD, 2021; Rajabalee, 2023). Their value depends less on the 'badge' format and more on whether they connect to broader credential systems (Abdullah et al., 2026; Gurjar et al., 2026).

Where micro-credentials sit inside national or regional frameworks, with shared standards and digital registries, they become more portable and trusted (Bideau & Kearns, 2022; Council of the European Union, 2022; OECD, 2021; Tamoliune et al., 2023). Australia shows how national coordination can reduce fragmentation and strengthen labour market signalling. In more decentralised settings such as Kenya or Brazil, short certificates and digital badges often expand access first, while formal recognition pathways develop more gradually (International Labour Organization, 2025a). A key risk here is creating credential 'dead ends'. Strong ODL systems avoid this by linking micro-credentials to diplomas, degrees, or vocational awards so learners can build recognised pathways over time (International Labour Organization, 2025b).

Recognition of prior learning as core infrastructure

Recognition of Prior Learning (RPL) is another core (and often underdeveloped) piece of ODL infrastructure (Assinger, 2023; Boden et al., 2024). RPL validates skills gained through work, community activity, or self-directed learning, especially important where informality is high or adult learners are a major group (Assinger, 2023; Kraus, 2025; Salzmann et al., 2025). It reduces duplicated learning, speeds reskilling, boosts learner confidence (Masoabi, 2023; Meghnagi & Tuccio, 2022), and helps employers see skills that would otherwise remain invisible (Assinger, 2023).

Effective RPL needs frameworks that accept varied evidence, assessment methods that balance rigour with access, and the capacity to deliver assessments at scale

(Kraus, 2025; Meghnagi & Tuccio, 2022; Salzmann et al., 2025). Without these supports, RPL risks remaining symbolic rather than transformative.

Design implications and common challenges

Common challenges include weak standards that fragment modules, uneven employer recognition across regions/institutions, institutional resistance to modularisation and RPL, and quality assurance for assessing non-formal learning at scale. Table 13.5 highlights the most common implementation challenges that arise when designing and scaling ODL systems, particularly in relation to standards, recognition, institutional change, and quality assurance.

Policy and practice recommendations

1. Develop National or Regional Qualification Frameworks that incorporate modular, stackable structures with cross-sector alignment.
2. Mandate the integration of RPL in all adult learning and TVET systems.
3. Co-design curricula with industry to ensure that credentials, whether micro or formal, reflect real job requirements.
4. Create digital credential registries that ensure recognition, portability, and transparency for learners and employers.
5. Incentivise modularisation in public institutions through funding models and quality assurance policies.

Overall, ODL curriculum and credential design should focus on flexibility, relevance, and clear recognition. Across both structured systems like Finland and adaptive contexts like Kenya, the key shift is away from content delivery toward demonstrated skills. When learning is organised around what learners can do, rather than what they attend, ODL better supports movement across education, work, and lifelong learning pathways.

Table 13.5 Common implementation challenges

Challenge	Description
Lack of national standards	Without clear frameworks, modular programs can be fragmented or non-transferable
Employer recognition gap	Some micro-credentials lack recognition by industries outside their origin region
Institutional resistance	Traditional universities or training bodies may resist modularisation or RPL
Quality assurance for non-formal learning	Difficult to assess skills learned outside formal settings

13.6.2 Technology and Delivery Models: Access, Personalisation, and System Coordination

Technology is a key enabler of ODL, but its real value is not simply putting learning online. It matters because it changes who can access learning, how people participate, and how the system stays coordinated and trustworthy. Technology works best when it supports learning beyond physical institutions, enables flexible pathways, and helps systems scale to diverse learners. At the same time, outcomes depend on infrastructure, governance capacity, and good pedagogy, not technology alone. Table 13.6 highlights how countries use different tech strategies based on their capacity and learner needs.

Across contexts, ODL tends to integrate technology around three connected goals: expanding access, supporting learner navigation and personalisation, and enabling coordination and trust at system level.

Blended delivery as a stable model

Many ODL systems rely on blended models that combine online learning with in-person elements (workshops, workplace training, or community facilitation). This reflects a practical reality: vocational and professional skills often require hands-on practice even when theory can be delivered flexibly. Blended delivery also strengthens quality and governance by reducing reliance on constant connectivity, enabling more credible assessment, and creating touchpoints for guidance. Kenya's digital TVET model, i.e., mobile learning plus community-based apprenticeships, shows how blended delivery can expand rural access while keeping learning locally relevant (International Labour Organization, 2024; The World Bank et al., 2023).

Mobile-first and low-bandwidth access

Where connectivity, devices, and affordability are constraints, mobile-first design is not optional; it is foundational. Offline/asynchronous options and lightweight content help learners fit study around work and family responsibilities. This shifts the focus

Table 13.6 Global applicability: technology strategies in ODL

Country/region	Tech strategy	Feature
Singapore	AI-driven personalisation	Skills matching and customised learning dashboards
Kenya	Mobile-blended rural access	TVET via mobile phones & community apprenticeships
India	Low-tech & multilingual access	eSkill India & content in 10 + Indian languages
Brazil	Community & open-source models	Recode uses open educational resources & local NGO delivery
Australia	Credentialing infrastructure & national platforms	My eQuals & LMS integration with HE and VET

away from complex platforms towards usability and reach: short modules, simple interfaces, and content that works on basic devices. India's eSkill India platform is used as an example of multilingual, low-bandwidth access that builds flexibility into the conditions of participation.

Personalisation and learner navigation

As ODL expands, learners face more choices across courses, credentials, and pathways. Technology can help through progress tracking, learning analytics, and recommendation tools that support pacing and decision-making. Singapore's SkillsFuture platform illustrates data-driven guidance linking learning options to labour market information and learner profiles (Kok Yam & Boey, 2025; SkillsFuture Singapore, 2025). However, the chapter stresses that these tools should support, not replace, human guidance, and must include transparency, accountability, consent, and ethical data use to avoid reinforcing inequalities.

Digital infrastructure for coordination and recognition

Scaling ODL requires systems that can recognise outcomes across institutions. Fragmented platforms and incompatible credential systems weaken portability and trust, especially as modular learning and micro-credentials grow. Interoperable infrastructure like credential registries, verification, shared learning records helps, as shown in Australia's credentialing systems and Brazil's use of LMS and open educational resources to support scale and localisation. The key idea is: treat technology as shared infrastructure, not isolated tools; otherwise, fragmentation simply grows. Table 13.7 outlines how different design emphases connect specific technology choices with core system functions.

Common constraints and design implications

Across contexts, several constraints as shown in Table 13.8 appear repeatedly in technology-enabled ODL systems. Gaps in digital access and skills limit participation, especially for rural and marginalised learners. Weak infrastructure restricts fully

Table 13.7 Dominant technology integration logics in ODL systems

Design emphasis	Technology focus	Primary function
Access expansion	Mobile-first and offline-capable delivery	Extend participation under infrastructure and affordability constraints
Quality and engagement	Blended delivery models	Combine flexibility with credible assessment and learner support
Navigation and progression	Learning analytics and guidance tools	Support informed choice, pacing, and pathway coherence
Portability and trust	Digital credentialing and verification systems	Enable recognition across providers and sectors
Scale and localisation	LMS platforms and open educational resources	Reduce cost and support contextual adaptation

Table 13.8 Common implementation challenges

Challenge	Description
Digital divide	Learners lack access to devices, connectivity, or digital skills
Infrastructure limitations	Especially acute in rural or low-income areas
Platform fragmentation	Too many systems without interoperability or standardisation
Data privacy and trust	Concerns over how learner data is stored, used, and protected
Pedagogical adaptation lag	Teachers/trainers may lack capacity to design and deliver digital learning

online delivery, which explains the continued importance of blended and mobile-first models. Platform fragmentation makes learning harder to navigate and reduces credential portability, while concerns about data privacy and trust influence system uptake.

The shared implication is clear. Technology in ODL should be treated as system infrastructure, not as isolated tools. Choices about platforms, delivery modes, and data standards shape who can participate, how learning is recognised, and whether flexibility leads to real opportunity.

Policy and practice recommendations

1. Invest in infrastructure equity: Public–private partnerships should expand broadband, device access, and mobile-first platforms in rural or underserved areas.
2. Support educator digital training: Teachers and trainers need professional development in online pedagogy and platform navigation.
3. Mandate platform interoperability: Ensure LMS, credentialing, and labour market platforms 'talk to each other' for seamless learner experience.
4. Encourage inclusive design standards: Platforms should be device-agnostic, multilingual, and accessible to persons with disabilities.
5. Establish digital trust frameworks: Include data protection laws, ethical AI guidelines, and learner consent mechanisms.

Overall, technology in ODL must be inclusive by design. The goal is not 'high-tech' for its own sake, but fit-for-purpose design that expands access, improves guidance, strengthens recognition, and supports more equitable outcomes across contexts.

13.6.3 Ecosystem Partnerships: Co-creation, Coordination, and Shared Ownership

ODL differs from traditional education not only in how learning is organised, but also in who helps design and deliver it. Strong ODL systems are not closed institutions. They work more like learning ecosystems, where governments, education providers, employers, and community actors collaborate. In this setup, partnerships

are not optional, they are essential for relevance, scale, and long-term sustainability. Table 13.9 shows how countries organise these collaborations to support relevance, scale, and local delivery.

A key lesson from the cases is that ODL works best when partnerships are built on co-creation, not simple outsourcing. Co-creation means partners jointly shape curricula, delivery models, and credentialing arrangements. This shared ownership helps learning stay responsive to labour market needs while remaining socially legitimate and locally grounded.

The role of partnerships in ODL ecosystems

Partnerships support ODL systems in three main ways. First, they improve relevance. Employer involvement in curriculum design links learning outcomes to real work practices, reduces the training-to-employment gap, and speeds adaptation to shifting skill needs. Second, partnerships support scale and sustainability. Public–private and community collaborations pool funding, infrastructure, and expertise, reducing reliance on a single institution or short-term donor projects, especially important in low-resource settings. Third, partnerships strengthen access and trust. NGOs and community organisations often act as bridges to learners, supporting outreach, mentoring, and guidance for rural learners, women, informal workers, and others who may not easily access or trust formal systems.

Common partnership models in ODL

Across countries, several common partnership models recur.

Employer-education co-design: Employers work with providers to design (and sometimes deliver) training. Canada's college-led rapid upskilling hubs (e.g., healthcare, clean energy, digital) show how this can improve employment outcomes, as long as engagement is ongoing and safeguards prevent training from becoming too narrow or firm-specific.

Public–private platform partnerships: Governments partner with firms and industry groups to scale ODL through shared digital platforms that combine courses,

Table 13.9 Partnership models and implementation examples in ODL Systems

Country	Type of partnership	Implementation highlights
Canada	Employer-college hubs	Sector-specific, agile training centres
India	Public–private eLearning consortia	eSkill India aggregates content from corporate partners
Brazil	NGO-corporate hybrid	Recode/SENAI integrates community outreach & digital upskilling
Australia	State-led partnerships	Region-specific micro-credential funding models
Kenya	TVET-community collaboration	Blended delivery using NGOs and local centres

credentials, and progression tools. India's national e-learning platforms illustrate this, but strong governance is needed for quality, data protection, and interoperability.

NGO-community-corporate hybrids: NGOs and community organisations deliver locally (facilitation, mentoring, learner support), often funded by corporate or public partners. Brazil's SENAI-linked initiatives with NGOs such as Recode show how this can expand inclusion, though it requires stable funding and capacity-building to scale.

Regional/local government coordination: Subnational governments can convene local ecosystems so ODL reflects local labour market needs, as seen in regional training and micro-credential initiatives in Australia (Australian Department of Education Skills & Employment, 2021; Selvaratnam et al., 2024). Table 13.10 summarises dominant logics, not exhaustive national arrangement.

Constraints and coordination challenges

Partnerships also bring coordination challenges: different incentives (short-term employer needs vs. longer-term education aims), unequal capacity (smaller NGOs vs. larger institutions), and fragmentation when collaboration grows without shared standards. Sustainability is a recurring risk when partnerships rely on temporary funding or individual champions. Table 13.11 summarises these challenges and highlights the need for clear governance that defines roles, aligns incentives, and makes collaboration routine.

Table 13.10 Partnership logics in ODL ecosystems

Partnership emphasis	Primary actors involved	System function
Curriculum relevance	Employers and education providers	Align learning outcomes with occupational practice
Platform-based scale	Governments, industry, digital providers	Coordinate provision and credentialing at scale
Access and trust	NGOs, community organisations, learners	Expand participation and local legitimacy
Local alignment	Regional or municipal authorities	Link ODL to place-based economic strategies

Table 13.11 Common partnership implementation challenges in ODL ecosystems

Challenge	Description
Misaligned incentives	Employers may prioritise short-term needs; institutions may resist change
Trust gaps	Community learners may not trust formal systems or private actors
Capacity asymmetry	NGOs often lack infrastructure for large-scale program delivery
Coordination fragmentation	Multiple actors with overlapping roles and objectives
Sustainability beyond pilots	Many partnerships fade after initial funding or donor cycles

Policy and practice recommendations

Several design lessons emerge from comparative experience:

1. Set clear policy frameworks that require co-design between industry and education in curriculum, certification, and internships, with shared goals and accountability.
2. Invest in 'anchor institutions' such as colleges, learning hubs, sector bodies, or trusted NGOs that can bring partners together and coordinate delivery.
3. Use outcome-based funding to align incentives, linking support to learner completion, employment, or further study, while keeping flexibility in delivery.
4. Provide capacity-building support for community organisations so they can adapt and deliver ODL without deepening inequalities.
5. Create partnership registries or learning networks to reduce duplication, share resources, and strengthen transparency and trust.

The message is that ODL coherence comes from structured collaboration, not central control alone. Well-designed partnerships help systems stay responsive while maintaining inclusion and trust. Together with curriculum design and technology integration, partnerships shape not only delivery, but also whose knowledge is valued and how opportunities are shared.

13.6.4 Equity and Inclusion Mechanisms: Access, Participation, and Meaningful Outcomes

ODL can be flexible and easy to scale, but fairness does not happen automatically. If inclusion is not planned from the start, ODL may mainly benefit learners who already have good internet and devices, and who feel confident working with formal institutions. That is why equity and inclusion need to be built into the system, not added later (Cedefop, 2025c).

The core goal is straightforward: access should lead to real participation, recognised learning, and clear progression. Many underserved learners, i.e., rural youth, women, informal workers, people with disabilities, and displaced learners, face overlapping barriers. These barriers are not only digital, but also financial, cultural, and institutional (Behera et al., 2025; Bruin et al., 2025). So inclusion requires connected solutions, not one-off projects. Table 13.12 illustrates how different ODL systems design and implement inclusion strategies to reach underserved learners and support equitable participation.

Digital inclusion and foundational access

A first priority is digital inclusion beyond connectivity. Learners need devices, affordable data, basic digital skills, and safe places to learn (UNDP, 2024). Community learning hubs and blended models can make access practical, not just theoretical. Kenya's community-based digital TVET linked with local apprenticeships is one

Table 13.12 Comparative illustrations: Inclusion strategies in ODL systems

Country	Inclusion Strategy	Highlight
Kenya	Rural access via blended community models	Targets girls and youth in arid regions
India	Linguistic diversity and informal learner access	Multiple languages, RPL, mobile-first
Brazil	NGO-led delivery to low-income communities	Youth-centred design, digital literacy via Recode
Singapore	Flexible credits & AI career tools	Supports re-entry and career shifts, esp. for women
Australia	Universal access policies in HE/VET	Inclusion of First Nations and remote learners

example of how this can work for rural learners, especially young women (International Labour Organization, 2024). Such models reduce the risk that ODL is available in principle but unreachable in practice.

Gender-responsive and life-course-sensitive design

Gender remains a persistent source of inequality, particularly in technical and male-dominated skills pathways (Khorana & Caram, 2026; World Economic Forum, 2024). Flexible delivery helps women only when programmes reflect real constraints, such as caregiving and safety concerns (Cedefop, 2025c). Useful supports include flexible schedules, safe learning environments, mentoring, and targeted guidance (Khorana & Caram, 2026; World Economic Forum, 2024). Singapore's SkillsFuture credits show how flexible support can help women during caregiving or career transitions (Kok Yam & Boey, 2025; Kuan, 2026). More broadly, life-course-sensitive design recognises that learners may enter, exit, and re-enter education due to work, migration, or family responsibilities. Flexibility must therefore be supported by guidance and social support, not just modular courses.

Cultural, linguistic, and local relevance

Standardised content can scale, but it can also exclude learners in multilingual contexts or where examples feel distant from daily life. Multilingual and localised content, and formats that reduce literacy barriers, help widen participation. India's multi-language learning platforms are a good example of this approach.

Recognition and support for informal learners

Building on RPL as system infrastructure, inclusion for informal learners depends on recognition plus support. RPL can validate skills gained through work and life (Masoabi, 2023; Salzmann et al., 2025). However, it must connect to pathways into jobs or further study (Masoabi, 2023). Supportive ecosystems including mentoring, career guidance, financial assistance, and psychosocial support help ensure that recognition leads to progression rather than symbolic inclusion. Mentoring and guidance matter here, as shown in Brazil's NGO-SENAI-linked programmes,

enabling underserved youth to convert informal learning into recognised credentials. Table 13.13 summarises dominant inclusion logics rather than exhaustive national practices.

Common risks and design tensions

Scaling ODL too quickly can reduce local fit and learner support. Improving digital access alone may not lead to recognised credentials or clear progression. And if inclusion depends on short-term funding, it often stays on the sidelines. Systems that ignore barriers may grow fast but deliver weak results, while systems that embed inclusion in curriculum, technology, and partnerships support real mobility and opportunity. So equity must be built into ODL from the start; success is not just participation, but lasting pathways to recognised outcomes.

Policy and practice recommendations

1. Mandate digital equity audits for national ODL platforms before rollout.
2. Fund 'last-mile' infrastructure and community learning centres in underserved areas.
3. Include inclusion KPIs in funding and evaluation of training institutions.
4. Mainstream RPL into formal education and employment gateways.
5. Create gender and inclusion toolkits for training providers and employers engaged in ODL delivery.

Together with modular curricula, enabling technologies, and ecosystem partnerships, equity and inclusion complete the core architecture of effective ODL systems. Inclusion is not an add-on. It is the condition under which ODL delivers on its promise of broader opportunity and meaningful social impact.

Table 13.13 Equity and inclusion logics in ODL systems

Inclusion emphasis	Design mechanism	System function
Foundational access	Digital inclusion initiatives and community hubs	Enable participation under infrastructure and affordability constraints
Gender and life-course equity	Flexible scheduling, mentoring, and safe learning environments	Support sustained engagement across life transitions
Cultural and linguistic inclusion	Multilingual, localised, and multimodal content	Reduce exclusion linked to language and cultural distance
Informal learner recognition	RPL and alternative assessment pathways	Convert experiential learning into recognised outcomes
Sustained participation	Wraparound support and trusted intermediaries	Link access to completion, recognition, and progression

Table 13.14 Integrating the four design dimensions of on-demand learning systems

Design dimension	Primary design focus	Core system function	Contribution to ODL effectiveness
Curriculum and Credentialing Design	Modularisation, competency alignment, micro-credentials, RPL	Defines *what* counts as learning and *how* it is recognised	Enables progression, portability, and credibility of learning pathways
Technology and Delivery Models	Blended delivery, mobile-first access, analytics, digital infrastructure	Shapes *how* learners access, navigate, and scale learning	Expands reach, supports guidance, and enables coordination at scale
Ecosystem Partnerships	Employer co-design, public–private platforms, community actors	Determines *who* designs, delivers, and validates learning	Anchors relevance, sustainability, and shared ownership
Equity and Inclusion Mechanisms	Digital inclusion, gender-responsive design, localisation, wraparound support	Conditions *who benefits* from ODL and under what circumstances	Translates access into meaningful participation and mobility

13.6.5 Integrating the Four Design Dimensions: From Components to System Coherence

The four design dimensions explain how ODL can move from separate projects to a connected learning system. Each covers a different need: what is learned and recognised, how access and coordination work, who shapes delivery, and how equity is protected. They only add value when aligned. When they work together, learners gain real agency via flexible entry and exit, guided pathways, recognition of diverse learning, and credible opportunities over time.

Table 13.14 illustrates each dimension's design focus, system function, and contribution to learner mobility and legitimacy. The dimensions are distinct but interdependent, so the toolkit is not a checklist or a sequence. Weakness in one area can undermine the rest; for example, modular courses without shared digital systems can fragment learning; technology without recognition limits mobility; and employer engagement without equity safeguards can deepen exclusion.

13.7 Conclusion: Rethinking Learning Systems for a Skills-On-Demand Era

This chapter argues that ODL should be understood not simply as flexible or digital provision, but as a system design challenge. Across the cases, its promise lies in expanding timely access to learning, while its difficulty lies in ensuring that such

access remains connected to credible progression, trusted recognition, and meaningful competence formation. The toolkit responds to this challenge by showing how choices in curriculum, technology, partnerships, and equity interact in shaping who can learn, how learning is recognised, and whether it leads to real opportunities over time.

Comparative analysis shows that ODL does not converge into a single global model. In many Global North contexts, it is institutionalised through policy integration, recognised qualification frameworks, and coordinated quality assurance; modularity and micro-credentials matter most when linked to credible progression routes and supported by stable state-provider-employer relationships. In many Global South contexts, ODL grows through adaptive innovation, i.e., mobile-first and blended delivery, community facilitation, and hybrid partnerships that expand access under resource and infrastructure constraints. These are not 'less developed' versions of Northern models, but different logics shaped by governance capacity, labour market formality, digital infrastructure, and cultural/linguistic diversity. Incremental TVET reforms show a spectrum, not a simple North–South divide. The comparison therefore suggests not that some systems are more 'on-demand' than others, but that different systems manage the tensions of ODL in different ways. In some contexts, the priority is to embed flexibility within strong structures of recognition and progression; in others, the priority is to widen access, reach, and relevance first, while coherence and portability are built more gradually.

Across settings, the key issue is how ODL manages the tension between just-in-time access to learning and the slower processes through which credible professional competence is formed. If systems prioritise speed and labour market signalling too narrowly, learning may be reduced to short-cycle signalling; if access expands without trusted recognition and progression routes, learners may still remain in low-recognition pathways. Strong ecosystems manage these risks through portable credentials, proportionate quality assurance, and metrics that track both labour market outcomes and longer-term learner progression. More broadly, ODL is most effective when it does not treat speed, modularity, or labour market responsiveness as ends in themselves, but connects them to trusted recognition, meaningful participation, and deeper competence formation.

Finally, the comparison shows that learner agency is central to ODL, but it is never self-sufficient. The value of flexible and just-in-time access depends on whether learners also have the support needed to turn access into credible participation, progression, and competence formation. Different learners, e.g., adult upskillers, displaced workers, rural youth, women returning to work, and informal workers, require different combinations of mobile access, localised content, flexible pacing, guidance, and recognition of prior experience (Cieslik et al., 2022; International Labour Organization, 2025b). This is precisely why the toolkit matters. By organising these needs into four design dimensions, i.e., curriculum and credentialing, technology and delivery, partnerships, and equity and inclusion, it clarifies what can travel across contexts, what must be adapted, and what requires sustained investment. The toolkit is therefore best understood not as a fixed model for scaling ODL, but as

a practical framework for organising learner-centred responses to the core tensions of ODL across different settings.

Overall, ODL's value depends less on platforms or credential volume than on whether pathways are credible, portable, and life-improving. Its long-term contribution will depend on whether systems can make learning timely without making it thin, flexible without making it fragmented, and inclusive without leaving learners in low-recognition pathways.

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References

Abdullah, N. F., Heidary, S., Zulkifli, I. H., Abu-Samah, A., Ibrahim, R., Subhi, N., Nordin, R., Behjati, M., & Zennaro, M. (2026). Micro-credential for Industry 4.0: Engineering safety and reliability with integrated machine learning and soft skills. *Cogent Education*, *13*(1). https://doi.org/10.1080/2331186X.2025.2598923

Amaral, N., Almeida, R., & de Felicio, F. (2016). *Assessing advances and challenges in technical education in Brazil*. World Bank Study. https://doi.org/10.1596/978-1-4648-0642-1

Asian Development Bank. (2020). *Vietnam: Technical and vocational education and training sector assessment*. https://doi.org/10.22617/TCS200002-2

Assinger, P. (2023). Recognition of prior learning in workplaces: Exploring managerial practice by the means of a heuristic conceptual framework. *Studies in Continuing Education, 45*(3), 378–395. https://doi.org/10.1080/0158037X.2022.2109615

Australian Department of Education Skills and Employment. (2021). *National microcredentials framework*. https://www.education.gov.au/higher-education-publications/resources/national-microcredentials-framework

Avis, J. (2024). Vocational education and training: Just transitions in the global South and North. *Journal of Education and Work, 37*(7–8), 522–534. https://doi.org/10.1080/13639080.2025.2472147

Behera, P., Singh, M., & Tarai, S. (2025). Short-term vocational courses as a career-building program for the youth in Chhattisgarh. India. *Child and Youth Services*, *46*(2), 443–466. https://doi.org/10.1080/0145935X.2024.2340551

Bideau, Y.-M., & Kearns, T. (2022). A European approach to micro-credentials for lifelong learning and employability. *Journal of European CME*, *11*(1). https://doi.org/10.1080/21614083.2022.2147288

Billett, S. (2024). Learning across working life: Educative experiences and individuals' participation. *Studies in Continuing Education, 46*(2), 143–159. https://doi.org/10.1080/0158037X.2023.2221650

Boden, C. J., Cherrstrom, C. A., Sherron, T., Mohamed, M., Wilson, L., & Pomeroy, K. (2024). A decade of global prior learning assessment: A systematic literature review. *Journal of Continuing Higher Education, 72*(1), 104–121. https://doi.org/10.1080/07377363.2022.2119800

Bruin, M., Tutlys, V., Ümarik, M., Loogma, K., Kaminskienė, L., Bentsalo, I., Väljataga, T., Sloka, B., & Buligina, I. (2025). Participation and learning in vocational education and training—a cross-national analysis of the perspectives of youth at risk for social exclusion. *Journal of Vocational Education and Training, 77*(3), 706–727. https://doi.org/10.1080/13636820.2023.2283745

Buchanan, J., Scott, L., Yu, S., Schutz, H., & Jakubauskas, M. (2010). Skills demand and utilisation: An international review of approaches to measurement and policy development. *OECD Local Economic and Employment Development (LEED) Papers, OECD Local Economic and Employment Development (LEED) Working Papers*, *2010*(4). https://doi.org/10.1787/5KM8ZDDFR2JK-EN

Cedefop. (2015). *Analysis and overview of national qualifications framework developments in European countries: Annual report 2014* (27). Publications Office of the European Union. https://www.cedefop.europa.eu/en/publications/6127

Cedefop. (2025a). *European inventory of national qualifications frameworks 2024: Finland*. Publications Office of the European Union. https://doi.org/10.2801/7801720

Cedefop. (2025b). *Making qualifications and skills more visible: The potential of national qualifications frameworks (NQFs) in the Union of Skills*. Publications Office of the European Union. https://www.cedefop.europa.eu/en/publications/9207

Cedefop. (2025c). *Shaping learning and skills for Europe: A time for commitment*. Publications Office of the European Union. https://doi.org/10.2801/2783450

Chan, S. (2025). *Artificial Intelligence in Vocational Education and Training: Understanding learner and teacher perspectives on the integration of generative AI through participatory action research*. Springer Singapore. https://doi.org/10.1007/978-981-96-6001-8

Choudhury, P. K., Mallick, H., & Kumar, A. (2025). Vocational education, skill training and self-employment: Evidence from India's non-farm sector. *Journal of Vocational Education and Training, 77*(4), 912–938. https://doi.org/10.1080/13636820.2024.2359369

Ciantar, M. (2025). Researching policy transfer of vocational education and training across the European Union: A systematic literature review. *Journal of Vocational Education and Training, 77*(5), 1235–1259. https://doi.org/10.1080/13636820.2024.2442030

Cieslik, K., Barford, A., & Vira, B. (2022). Young people not in Employment, Education or Training (NEET) in Sub-Saharan Africa: Sustainable development target 8.6 missed and reset. *Journal of Youth Studies*, *25*(8), 1126–1147. https://doi.org/10.1080/13676261.2021.1939287

Cobern, W. W. (1993). Constructivism. *Journal of Educational and Psychological Consultation, 4*(1), 105–112. https://doi.org/10.1207/S1532768XJEPC0401_8

Colleges & Institutes Canada. (2021). *The status of microcredentials in Canadian colleges and institutes: Environmental scan report*.

Columbia University SIPA. (2025). *Mobile learning, lasting impact: From digital upskilling to economic empowerment for rural women in Kenya*. SIPA Capstone Program. https://www.sipa.columbia.edu/sipa-education/capstone-workshops/mobile-learning-lasting-impact-digital-upskilling-economic

Council of Europe. (2025). *Learning democracy in vocational education and training in Europe*. Council of Europe Publishing. https://www.coe.int/en/web/education/newsroom/-/asset_publisher/fkf5o6A9gZZK/content/new-publication-anthology-on-learning-democracy-in-vocational-education-and-training-in-europe

Council of the European Union. (2022). *Council recommendation on a European approach to micro-credentials for lifelong learning and employability*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2022.243.01.0010.01.ENG

Currie, G., Henderson, A., & Hoult, R. (2021). Diffusion of innovation in an Australian engineering school. *Australasian Journal of Engineering Education, 26*(2), 219–226. https://doi.org/10.1080/22054952.2021.1979174

Decius, J., Knappstein, M., & Klug, K. (2024). Which way of learning benefits your career? The role of different forms of work-related learning for different types of perceived employability. *European Journal of Work and Organizational Psychology, 33*(1), 24–39. https://doi.org/10.1080/1359432X.2023.2191846

Dickerson, A., Bocock, L., Hillary, J., & Simcock, D. (2023). *The skills imperative 2035: An analysis of the demand for skills in the labour market in 2035*. https://www.nfer.ac.uk/publications/the-skills-imperative-2035-an-analysis-of-the-demand-for-skills-in-the-labour-market-in-2035/

Dolowitz, D. P., & Marsh, D. (2000). Learning from abroad: The role of policy transfer in contemporary policy-making. *Governance, 13*(1), 5–23. https://doi.org/10.1111/0952-1895.00121

European Commission: Directorate-General for Education Youth Sport and Culture. (2025). *Education and training monitor 2025: Finland*. Publications Office of the European Union. https://data.europa.eu/doi/10.2766/9857814

European Union. (2025). *The future of European competitiveness: Part A—A competitiveness strategy for Europe*. https://doi.org/10.2872/1823372

Farran, I., & Nunez, I. (2025). Converging pathways: New approaches to integrate vocational education training and higher education. *Journal of Vocational Education and Training, 77*(4), 1147–1165. https://doi.org/10.1080/13636820.2024.2428769

Future Skills Centre. (2023). *Employer and employee perceptions of micro-credentials*. https://fsc-ccf.ca/wp-content/uploads/2023/06/NAIT_FSC_Report_April2023-1.pdf

Gouthro, P. A. (2022). Lifelong learning in a globalized world: The need for critical social theory in adult and lifelong education. *International Journal of Lifelong Education, 41*(1), 107–121. https://doi.org/10.1080/02601370.2022.2033863

Gupta, R., & Dharap, O. (2024). How is India skilling its youth? A comprehensive study. *Journal of Vocational Education and Training, 76*(4), 818–844. https://doi.org/10.1080/13636820.2022.2098171

Gurjar, P., Ringo, J., Waller, M., & Gilliland, S. (2026). Skill badging: Using micro-credentials to improve holistic student development and career readiness. *College Teaching, 74*(1), 24–32. https://doi.org/10.1080/87567555.2023.2291350

International Labour Organization. (2020). *How to facilitate the recognition of skills of migrant workers: Guide for employment services providers*. https://www.ilo.org/publications/how-facilitate-recognition-skills-migrant-workers-guide-employment-services

International Labour Organization. (2024). *Transforming TVET in Kenya: A collaborative journey with the ILO, ITCILO, and KSTVET*. International Training Centre. https://www.itcilo.org/stories/transforming-tvet-kenya-collaborative-journey-ilo-itcilo-and-kstvet

International Labour Organization. (2025a). *Kenya's TVET system transforms through innovations and training*. https://www.ilo.org/resource/article/kenya%E2%80%99s-tvet-system-transforms-through-innovations-and-training

International Labour Organization. (2025b). *Microcredentials for youth and work*. https://www.ilo.org/publications/microcredentials-youth-and-work

Jackson, D. (2024). Work-integrated learning: Opportunities and challenges in Australia. *Higher Education Research and Development, 43*(3), 767–773. https://doi.org/10.1080/07294360.2024.2307929

Jackson, D., Dean, B. A., & Eady, M. (2025). Equity and inclusion in work-integrated learning: Participation and outcomes for diverse student groups. *Educational Review, 77*(2), 329–350. https://doi.org/10.1080/00131911.2023.2182764

Jobs and Skills Australia. (2023). *Vocational education and training in regional, rural and remote Australia*. https://www.jobsandskills.gov.au/publications/vocational-education-and-training-regional-rural-and-remote-australia

Jobs and Skills Australia. (2025). *Education and training divides—Gendered skills, pathways and outcomes*. https://www.jobsandskills.gov.au/publications/education-and-training-divides-gendered-skills-pathways-and-outcomes

Khorana, S., & Caram, S. (2026). Mind the gap: Gender equality and economic empowerment in the Commonwealth. *The Round Table, 1–18*. https://doi.org/10.1080/00358533.2025.2607588

Kok Yam, T., & Boey, D. (2025). *The evolving SkillsFuture movement: A decade of workforce transformation realising a lifelong learning nation: Global perspectives and opportunities*. https://knowledge.csc.gov.sg/ethos/

Kraus, K. (2025). Why the expected change did not happen: Frictions between different logics of action when implementing recognition of prior learning for low-qualified workers. *Studies in Continuing Education*. https://doi.org/10.1080/0158037X.2025.2515144

Kuan, L. (2026). *Lifelong Learning and the SkillsFuture Movement in Singapore.* https://doi.org/10.1142/9789811211522_0007

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge University Press. https://doi.org/10.1017/CBO9780511815355

Maitra, S., Maitra, S., & Thakur, M. (2024). Uncertain itineraries: Dual system of training and contemporary TVET reforms in India. *Journal of Vocational Education and Training, 76*(3), 556–575. https://doi.org/10.1080/13636820.2022.2042724

Masoabi, C. S. (2023). Sustainable—Lifelong learning in transit from TVET to the university: A recognition of prior learning phenomenon. *European Journal of Sustainable Development*, *12*(4), 330. https://doi.org/10.14207/ejsd.2023.v12n4p330

McKenzie, M. (2017). Affect theory and policy mobility: Challenges and possibilities for critical policy research. *Critical Studies in Education, 58*(2), 187–204. https://doi.org/10.1080/17508487.2017.1308875

McKenzie, M., Bieler, A., & McNeil, R. (2015). Education policy mobility: Reimagining sustainability in neoliberal times. *Environmental Education Research, 21*(3), 319–337. https://doi.org/10.1080/13504622.2014.993934

Meghnagi, M., & Tuccio, M. (2022). The recognition of prior learning: Validating general competences. *OECD Social, Employment and Migration Working Papers, OECD Social, Employment and Migration Working Papers*, *270*. https://doi.org/10.1787/2D9FB06A-EN

Ministry of Education and Culture. (2019). *Vocational education and training promotes lifelong and continuous learning in Finland*. https://okm.fi/documents/1410845/4150027/Lifelong+and+continuous+learning+in+Finland.pdf/8cc84ec0-06bf-583b-1a45-38dec497da3d/Lifelong+and+continuous+learning+in+Finland.pdf

Ministry of Education and Culture, & Finnish National Agency for Education. (2019). *Finnish VET in a nutshell*. https://okm.fi/documents/1410845/4150027/Finnish+VET+in+a+nutshell_2023.pdf/8bcf6d55-8838-c215-42a6-aeb36c67adcf/Finnish+VET+in+a+nutshell_2023.pdf?t=1693896359863

Ministry of Skill Development and Entrepreneurship. (2025). *Annual Report 2024–2025*. https://www.msde.gov.in/documents/reports/annual-report-ATM2ATMtQWa

Moore, R. L., Lee, S. S., Pate, A. T., & Wilson, A. J. (2025). Systematic review of digital microcredentials: Trends in assessment and delivery. *Distance Education, 46*(1), 8–35. https://doi.org/10.1080/01587919.2024.2441263

Mori, J., & Stroud, D. (2023). Education, vocational training, and labor markets in Vietnam: Mutual distrust and the supply-side approach. *International Handbook on Education Development in the Asia-Pacific,* 859–883. https://doi.org/10.1007/978-981-19-6887-7_58

Nguyen, S. H. (2021). The development of Vietnamese vocational education and training models since 1954. *International Journal of Training Research, 19*(3), 242–263. https://doi.org/10.1080/14480220.2021.1938635;SUBPAGE:STRING:ACCESS

Ngware, M. W., Ochieng', V., Kiroro, F., Hungi, N., & Muchira, J. M. (2024). Assessing the acquisition of whole youth development skills among students in TVET institutions in Kenya. *Journal of Vocational Education and Training*, *76*(1), 197–222. https://doi.org/10.1080/13636820.2022.2029544

OECD. (2021). Quality and value of micro-credentials in higher education: Preparing for the future. In *OECD Education Policy Perspectives* (40; OECD Education Policy Perspectives, Vol. 40). OECD Publishing. https://doi.org/10.1787/9c4ad26d-en

OECD. (2022). *Engaging employers in vocational education and training in Brazil: Learning from international practices (OECD Reviews of Vocational Education and Training).* OECD Publishing. https://doi.org/10.1787/d76a2fe6-en

OECD. (2025). *Vocational education and training systems in nine countries*. OECD Publishing. https://doi.org/10.1787/1a86eb6c-en

Oh, H., Ahn, H., & Park, E. (2025). Understanding user intention in metaverse education: A synthesis of diffusion of innovation and UTAUT2. *Behaviour and Information Technology, 44*(19), 4696–4712. https://doi.org/10.1080/0144929X.2025.2486583

Packard, T. G., & Almeida, R. K. (2018). *Skills and jobs in Brazil: An agenda for youth*. World Bank. https://doi.org/10.1596/978-1-4648-1293-4

Patterson, L., & Hepburn, G. (2025). Implementing a competency-based assessment approach to micro-credentials. *Distance Education, 46*(1), 95–112. https://doi.org/10.1080/01587919.2024.2441247

Pichette, J., & Courts, R. (2024). *Postsecondary-offered microcredentials in Ontario: What does the evidence tell us?* Higher Education Quality Council of Ontario. www.heqco.ca

Pozzer, M. R. O., & dos Reis Neuhold, R. (2025). Vocational education and training and regional development in Brazil. *Journal of Vocational Education and Training, 77*(1), 207–228. https://doi.org/10.1080/13636820.2025.2449657

Prasad, R. (2025). Neoliberal economic policies and development: A case study of Skill India Mission. *Journal of Vocational Education & Training*. https://doi.org/10.1080/13636820.2025.2479675

Rajabalee, Y. B. (2023). The implementation of micro-credentials in formal and informal learning: A systematic literature review. *International Journal of Learning and Teaching*, *9*(4). https://doi.org/10.18178/ijlt.9.4.328-336

ReferNet Finland, & Cedefop. (2025). *Finland: Updating competences in vocational qualifications*. National News on VET. https://www.cedefop.europa.eu/en/news/finland-updating-competences-vocational-qualifications

Rogers, E. (2003). *Diffusion of innovations*. Free Press. Stanford University. http://web.stanford.edu/class/symbsys205/DiffusionofInnovations.htm

Salzmann, P., Haemmerli, C. A., Engelage, S., & Baumeler, C. (2025). Facilitators of and barriers to recognition of prior learning in higher vocational and professional education. *Journal of Vocational Education and Training, 77*(4), 1005–1023. https://doi.org/10.1080/13636820.2024.2411512

Schultz, C. (2024). Experiences of microcredentials in Canada: Perspectives, possibilities, and a case for national data collection. *International Review of Applied Economics, 38*(4), 410–421. https://doi.org/10.1080/02692171.2024.2368793

Selvaratnam, R. M., Warburton, S., Parrish, D., & Crew, S. (2024). A maturity model for micro-credentialing and shorter forms of learning practice in Australasian universities. *Journal of Higher Education Policy and Management, 46*(4), 409–424. https://doi.org/10.1080/1360080X.2023.2299150

SkillsFuture Singapore. (2025). *Skills demand for the future economy report*. https://jobsandskills.skillsfuture.gov.sg/sdfe-2025

Tamoliune, G., Greenspon, R., Tereseviciene, M., Volungeviciene, A., Trepule, E., & Dauksiene, E. (2023). Exploring the potential of micro-credentials: A systematic literature review. *Frontiers in Education, 7*, 1006811. https://doi.org/10.3389/feduc.2022.1006811

Tan, C. (2025). Towards situational understanding: An examination of SkillsFuture in Singapore. *International Journal of Training Research*. https://doi.org/10.1080/14480220.2025.2599170

The World Bank, UNESCO, & ILO. (2023). *Building better formal TVET systems: Principles and practice in low- and middle-income countries*. The World Bank, UNESCO, and ILO. http://documents.worldbank.org/curated/en/099071123130516870

Tomar, R. S., & Singh, B. (2025). Better numbers or gimmick? India's rising equality and the world bank's New Gini Lens. *Round Table*. https://doi.org/10.1080/00358533.2025.2561728

UNDP. (2024). *From access to empowerment: Digital inclusion in a dynamic world*. https://www.undp.org/policy-centre/singapore/publications/access-empowerment-digital-inclusion-dynamic-world

UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. UNESCO. https://doi.org/10.54675/ASRB4722

UNESCO, ETF, & Cedefop. (2023). *Global inventory of regional and national qualifications frameworks 2022: National and regional case studies (Volume II)*. UNESCO. https://doi.org/10.54675/uazr7454

UNESCO IIEP. (2022). *SDG-4: Flexible learning pathways in higher education—From policy to practice: An international comparative analysis.* UNESCO. https://doi.org/10.54675/IRXZ6771

UNESCO IIEP. (2023). *Short courses, micro-credentials, and flexible learning pathways: A blueprint for policy development and action: Policy paper*. UNESCO IIPE. https://unesdoc.unesco.org/ark:/48223/pf0000384326

UNESCO, & Vietnam Ministry of Labour—Invalid and Social Affairs. (2018). *TVET country profile: Vietnam.* UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. https://unevoc.unesco.org/wtdb/worldtvetdatabase_vnm_en.pdf

Vincent, A., & Rajasekhar, D. (2023). Who participates in vocational education and training in India? An analysis of socio-economic determinants. *Journal of Vocational Education and Training, 75*(5), 890–909. https://doi.org/10.1080/13636820.2021.1989617

von Glasersfeld, E. (1995). Radical constructivism: A way of knowing and learning. *Routledge.* https://doi.org/10.4324/9780203454220

Weimer, M. (2013). *Learner-centered teaching: Five key changes to practice* (2nd ed.). Jossey-Bass.

World Economic Forum. (2024). *Global gender gap report 2024.* https://www.weforum.org/publications/global-gender-gap-report-2024/

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Chapter 14
On-Demand Learning for the Workforce in the Organized Sector: Mapping India's National Policies, Provisions, and the Futures

Santosh Panda and Sanjaya Mishra

Abstract This chapter analyses the Indian national policies on education, Vocational Education and Training (VET) and its regulatory frameworks, micro-credentialling, VET competency mapping and creditization, and the national credit framework. Based on this, it undertakes a critical examination of existing provisions and schemes for VET and vocational education, based on industry requirements for workforce skilling and competencies, as well as provisions for flexible, on-demand, and technology-enabled learning/training. Based on the available secondary literature and current experiences, the chapter focuses on institutionalized provisions and the flexibility for learners to take advantage of on-demand learning provisions, and makes recommendations for related policy and practice.

Keywords Vocational education and training · Workforce learning · On-demand learning · Skilling and employability

14.1 Introduction

On-Demand Learning is a relatively new concept and a system which is comparatively of recent origin in view of particularly the education and retraining of the workforce and continuing educational provisions for those: (i) who have been to the world of work but need to upgrade knowledge and skills through a process of credentialling, and (ii) who are under the process of entering the job market with required skills and competencies. The process of acquiring this on-demand learning could

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be formal, non-formal, and informal. It will be critical to examine the contextual application of on-demand learning in national contexts (in this case, India) and to evaluate the policies, provisions, mechanisms, and vision for the future/future skills (Ehlers & Eigbrecht, 2024; Marr, 2022).

This chapter analyses the existing provisions for continuing education/training of the existing workforce in the organized sector of the economy and those who are undergoing vocational education and training to enter the job market, especially with secondary-equivalent level of education, by mapping:

i. the national policies relating to vocational education and training (VET), industrial training, micro-credentialling, and the national skilling/vocational education frameworks (i.e. National Skills Qualification Framework—NSQF 2015—of the Ministry of Skill Development and Entrepreneurship; and the National Credit Framework—NCrF 2023—of the Ministry of Education, Government of India) and related regulations of the vocational and general education regulators;
ii. the existing mechanisms of formal and especially on-the-job education and training provisions and mechanisms including on-demand learning and related credentialling; and
iii. suggesting a framework for on-demand learning for the continuing and lifelong education of the workforce in the organized sector of the economy.

By doing so, the authors undertake policy analysis and review of existing practices to suggest a framework of on-demand learning by taking into consideration: skilling and employability, need-based education and support, institutional mechanisms, integration of technology in teaching and learning, equity and inclusion, credentialling and accreditation, and career progression. We have adopted an analytical descriptive review approach to present the case of on-demand learning in India. While doing so, the presentation and interpretation of the information is supported by the extensive experience of both the authors in Indian education system and elsewhere around the world. The discussions and proposed framework as well as the challenges identified for operationalization have their inherent limitations, though these emerge from collaborative critical discourse and debates between the two authors.

14.2 The Context

This chapter looks critically at the labour force in the organized sector—both public and private (the unorganized labour force comprises above 90% of the total labour force in the country, including daily wage labourers, construction workers, home-based workers, casual labourers, small-scale vendors, informal retail workers, and largely labourers in the agriculture sector), and more specifically, those who enter the job market after schooling and those undergoing vocational education and training, and therefore examines the school-level VET sector more specifically in the formulation of on-demand learning. The ‘organized sector’ refers to the sector of the economy which provides for regulated and organized employment with formal employment

contract and a system of recruitment-salary-insurance and other retirement benefits (with equal rights and responsibilities).

The Periodic Labour Force Survey (PLFS, Government of India) 2023–24 data reveal a clear transition pattern in how education shapes work participation in India. The worker-population ratio in 2023–24 in rural areas was 56.3% (male) and 34.8% (female), which is imbalanced in the urban areas—56.4% male and 27% female; the average being 43.7%. The self-employed, for whom on-demand learning provision will be crucial, comprise males (59.4%) and females (73.5%) in rural areas, and males (39.8%) and females (42.3%) in urban areas (NSO, 2024). The unemployment rate at all levels is 3.2% (more visible in urban areas), and this is also a segment of the population that needs further training and skilling to enter the job market.

Quoting the Economic Survey 2021–22, the government of India (GoI, 2022) reported for 2019–20 the total labour force in the organized sector at 96 million (17.8%) and in the unorganized sector at 440 million (82.2%). During 2019–20, of the total workforce of about 466 million, nearly 39% were illiterate, and the rest had education ranging from primary education to higher education, including formal and vocational training (Mehrotra, 2021). Based on 2019 estimates, the employment status of persons aged 18–65 years was reported as follows: 48.5% self-employed, 23% salaried, 23% casual labour, and 5.5% unemployed. While women constituted about 22% of self-employed persons (which includes homemakers), this was much lower at 16.8% (14.9% for scheduled castes and 4% for scheduled tribes) (Choudhury et al., 2025). There is a significant number of women who could benefit from appropriate on-demand learning provisions, not only to enter the job market but also to support self-employment.

Overall, work participation is highest among those with very low levels of schooling—59.6% among persons who are not literate and 68.5% among those educated up to the primary level—and then declines steadily as education rises, falling to 59.1% at the middle stage, 60.7% at the secondary level, and 45.9% at the higher-secondary stage. Participation then increases again among those with technical qualifications (73.6% for diploma/certificate holders), before moderating for those with general higher education (57.6% among graduates and 62.2% among post-graduates and above). Therefore, vocational/technical education assumes greater importance for employment and labour force participation, especially at the secondary education level which this chapter focuses on.

This pattern is evident across rural and urban India, but with important differences in magnitude. Rural labour markets absorb individuals with low schooling more readily—not literate: 62.8% rural vs 43.6% urban; up to primary: 72.8% rural vs 55.5% urban—reflecting wider availability of informal and agricultural work. However, participation drops after schooling in both contexts, falling to 53.8% in rural areas and 41.4% in urban areas at the secondary stage, and further to 50.6% and 37.7%, respectively, at the higher secondary stage.

The most favourable employment outcomes are observed among those with vocational credentials—74.9% in rural areas and 72.3% in urban areas for diploma holders—highlighting the labour-market value of technical skills. In contrast, general higher education yields more modest participation, with 59.5% of graduates in rural

areas and 55.9% in urban areas, and 65.9% and 60.3%, respectively, for post-graduates. This pattern shows that general schooling and degrees alone do not assure employment**,** and that technical and job-linked qualifications continue to provide clearer labour-market pathways—especially in urban areas, where participation without specialized skills drop sharply (NSO, 2024). Therefore, vocational education and training at the school level is critical to increasing employment of the secondary school graduates; and this level, followed by retraining/upskilling of secondary school graduates in employment, need the provision of on-demand learning more than any other sector.

The agencies providing vocational education, technical education, vocational training, and non-formal vocational education and training in the 'organized' sector include the following:

1. *Vocational* Education (Ministry of Education, All India Council for Technical Education, University Grants Commission):
    - School vocational education, open schools.
    - College vocational education, open universities.
    - Stand-alone vocational diplomas (polytechnic colleges, nursing colleges, teacher education colleges, etc.).
2. *Technical* Education (Ministry of Education, All India Council for Technical Education):
    - Polytechnics.
    - Engineering colleges.
    - Skills universities.
3. Vocational *Training*: (Ministry of Skill Development and Entrepreneurship, Directorate General of Training as national agency, National Council for Vocational Education and Training for regulation, National Skill Development Corporation for private-sector training/TVET, State Skill Development Missions, other Programme Implementation Agencies):
    - Pradhan Mantri Kaushal Vikas Yojna (PMKVY, including Jan Shikshan Sansthan- JSS and National Apprenticeship Promotion Scheme-NAPS), Advanced Training Institutes, State Skills Development Institutes (government funded-government managed, government funded-private managed, private funded-private-managed), ITIs.
    - 16 central Ministries' provision of vocational training.
4. *Non-Formal* Vocational Education and Training:
    - Ministry of Rural Development: Deen Dayal Upadhyay *Gramin Kaushalya Yojana* (15-36 years age; Certificate).
    - Ministry of Textiles: Integrated Skills Development Scheme (post-secondary education; SSC Certificate).

- Ministry of Housing and Urban Poverty Alleviation: Employment through skills training and placement (unskilled urban poor; entry qualification: skilling in any trade).

The institutionalized pattern of VET within the education system corresponding to the national eight-level skills qualification framework (NSQF) (MSDE, 2015) is shown in Fig. 14.1. Skills training is provided by a range of agencies and offered at different levels. In addition to traditional schools and universities and Industrial Training Institutes (ITIs), vocational training is also provided through the National Institute of Open Schooling, Open Universities, and many approved vocational training providers under the government-approved Sector Skills Councils. Recognition of prior learning (RPL) is a key foundation of skills training, especially for the purpose of certification of competencies.

The Indian school system comprises 1.47 million schools, with 248 million students, and a dropout rate ranging from 1.9% at the primary level to 14.1% at the secondary level (PIB, 2025). Vocational education has now been an integral part of the schooling system; there are parallel school vocational education streams; and

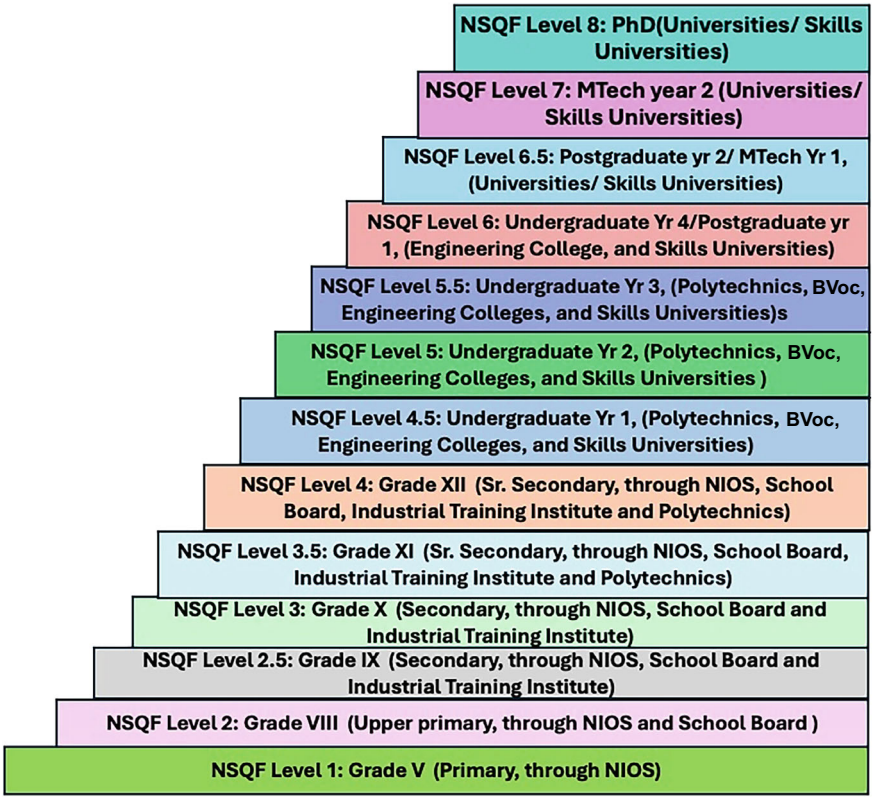


Fig. 14.1 Skills training levels in India (corresponding to NSQF)

there are full-time vocational education and training institutions in the country (i.e. Industrial Training Institutes, and Polytechnics) for the age group 15–19.

There are about 15,000 Industrial Training Institutes (ITIs) in the country, enrolling more than 2.7 million students annually (MSDE, 2020). These ITIs are supposed to target the employment market in the 15–19 age group, where the *labour force* in rural areas comprises 65.1% male and 30.8% female (both employed and unemployed), though the actual *workforce* is 59.5% male and 28.3% female (NSO, 2024). The data suggest the unemployment rate, the scope for VET, and the need for on-demand learning**.** Secondary education students have the choice, post-elementary education of grade 8, to opt for full-time vocational secondary and subsequently the ITI stream and the polytechnic stream for full-time vocational education (to become craftsperson and technician). The graduates of both the general senior secondary school stream (grade 12) and the polytechnic stream can also enter engineering colleges (to become engineers). On-demand learning is most crucial for these categories of students, some of whom may be opting for flexible entry-exit option, and some of the employed may be searching for a flexible pathway to full-time VET while in gainful employment.

14.3 The Policies

The schooling sector has undergone considerable transformation in terms of skilling and employability—i.e. in vocational education and training. While vocational subjects have been part of the curriculum, the contemporary reforms have led to the creation of a parallel stream of school vocational education, linking to ITIs and polytechnics, and subsequently to engineering diploma and degree colleges, as well as to the skills universities (about 20 skills universities in the country so far). The traditional 10+2+3 system of education (i.e. 10 years of secondary education, 2 years of senior secondary education, and 3 years of undergraduate education, based on the *National Policy on Education-1986*) has undergone transformation with the implementation of the *National Education Policy-2020* (NEP-2020) (GoI, 2020). The VET system was guided by the National Skills Qualification Framework (NSQF) with the creation of a new central Ministry of Skill Development and Entrepreneurship (MSDE, 2015), which has now led to formulation of the National Credit Framework-2023 (UGC, 2023), putting in place a national system of credit-based and learning outcome-based education and training, covering the entire education system from pre-school education to post-doctorate (i.e. one nation-one credit system), with provisions for horizontal and vertical mobility between general and vocational education, and recognition and accreditation of prior learning (RPL). There are also other skilling policies and provisions by the Ministry of Skill Development and Entrepreneurship: Pradhan Mantri Kaushal Vikas Yojana (PMKVY), Jan Sikhshan Sansthan (JSS), National Apprenticeship Promotion Scheme (NAPS), and Craftsman Training Scheme (CTS) through Industrial Training Institutes (ITIs). These policies are briefly analysed below, against which the ongoing practices are

examined to identify areas especially in the school-VET and post-school VET, that need further policy and regulatory intervention for on-demand learning.

Under the British rule, the adult basic literacy programme (in the form of night schools) started in 1882, and the adult education movement passed through the 1967–77 phase of functional literacy and the 1978- phase of developmental literacy (when the National Adult Education Programme was launched) (Shah, 1999). This is the foundation to a lifelong learning programme. The incorporation of skilling/industrial training is a post-NEP-1986 phenomenon. Following the NPE-1986, *Jana Shikshan Nilayams* (mass education centres) were established across the country to provide continuing education for neo-literates, school dropouts, out-of-school youth, and workers in the unorganized sectors, with a special focus on need-based vocational education and linking education to productivity. While the NPE-1968 emphasized education as a lifelong process, the NPE-1986 underlined lifelong education as the cherished goal for all, and especially for women, agricultural workers and industrial labourers. The 1986 policy also emphasized massive vocationalization of education (Panda, 2011).

From the ancient times to the emergence of the British Rule in India, vocational education was part of the community apprenticeship training, through hereditary ownership of various vocations, serving the community around. It was the Woods Dispatch of 1854 and the Hunter Commission recommendations of 1882 that provided foundations to renewed institutionalized vocational education in the country, and the Sargent Report of 1944 recommended for two streams of general and vocational schooling. It was then the Kothari Education Commission of 1964–66 recommended a new pattern of 10+2+3 system of education, school vocational education was taken seriously at the level of policy formulation and implementation with a proviso that 50% of school students should be diverted to the study of VET. True vocationalization in school education is a phenomenon of the 1980s. The Centrally Sponsored Scheme of *Rashtriya Madhyamik Shiksha Abhiyan* (national secondary education mission, 2013–14) vigorously implemented school VET from grade 9 onwards, compliant of the National Vocational Education Qualifications Framework (which in 2015 was revised to the National Skills Qualification Framework). It was only when a national policy on skilling was formulated in 2009 and when that was renewed with the establishment of a new central Ministry of Skill Development and Entrepreneurship in 2015 that VET was implemented with full vigour and regulatory frameworks.

14.3.1 National Skills Qualification Framework

It was in 2009 that the government of India promulgated the National Policy on Skill Development (NPSD), and in 2013 the National Vocational Education Qualifications Framework was redesigned as the National Skills Qualifications Framework (NSQF) based on which the UGC started the Bachelor of Vocational Education (BVoc) programme in higher education. In 2015, when the central Ministry of Skill

Development and Entrepreneurship (MSDE) was created, the NPSD was revised including changes to the NSQF (MSDE, 2015). The NCVET, which was established in 2018 as the sole regulator for VET in the country under the MSDE, promulgated the NSQF-2023 (GOI, 2023), and the 10-levels of NSQF were revised to an 8-level qualifications framework covering the entire education and training system in the country—4 levels till school education, and 4-levels for higher and further education. The national curriculum and credits framework for school education is also based on the NSQF, and the NCrF-2023 discussed below governs the creditization and learning outcomes of all levels of education including schooling and VET.

14.3.2 National Education Policy-2020

The NEP-2020, the latest policy on education which also covers schooling and VET, provided for multidisciplinary and holistic education, the integration of general and vocational education, horizontal and vertical mobility of students between academic and vocational streams, and consideration of curriculum credits by merging curricular, co-curricular and extracurricular activities. While skilling and employability were an essential component of the general curriculum (combining discipline and multidisciplinary competencies, social and like skills, and happiness competencies), VET was given full equivalence with general and professional education, and the curriculum and pedagogy were exclusively based on outcome-based learning. The acquisition, credit transfer, storage and redemption were carried out through a national Academic Bank of Credits (ABC—a national digital depository of earned credits and credentials) applicable to all levels of education and training, including recognition of prior learning (RPL). And, technology/ICT was recommended to facilitate teaching, learning, learner support, continuing professional development, institutional management, and inclusive and special-needs education. The ABC is a national functional credit accumulation system based on the eight levels of NSQF (starting from the lowest level of training in the unorganized labour sector and preschool/foundational schooling up to the level of doctoral/post-doctoral education), and is linked to the national DigiLocker, within which the citizens' national identity card is also stored and linked. All education and training institutions and students (including VET) (NCVET, 2024) are required to register at ABC for credit accumulation, transfer and redemption, and recognition of prior learning. The NEP-2020 once and for all established equivalence between general and vocational education/training, and between all modes of education delivery (F2F, distance, online, flipped, blended).

The NEP-2020 underlined the formulation of blended teaching-learning by educational institutions, judiciously combining F2F, self-learning, and online engagement and activities (Fig. 14.2), and incorporating skilling and micro-credentials, as well as 'integrated' technology-enabled teaching-learning—this formulation is invariably applicable to any on-demand learning provision. This formulation has only partially been reflected in institutional development plans (IDP) at various levels, including

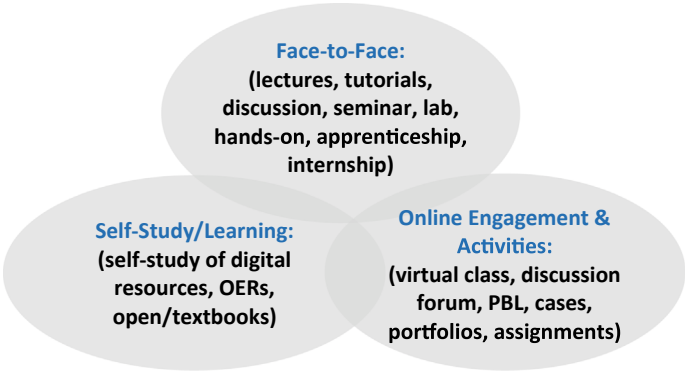


Fig. 14.2 Blended teaching-learning for on-demand learning

training in the organized labour sector, though the regulations for formal education and distance/online learning are yet to adopt such a blended learning/training formulation; and the country is yet to formulate a national policy on 'micro-credentialling' and 'blended learning'. Surprisingly, before the NCrF-2023 was promulgated by the national regulator, NCVET had already outlined the practice of blended training for skilling and TVET (NCVET, 2022). It may be noted that the policy has enabled a pedagogical framework for on-demand learning, where face-to-face, online, and self-study can be used effectively to gain skills and competencies, paving the way for on-demand learning in Indian institutions.

14.3.3 National Credit Framework (NCrF-2023)

The NCrF-2023 (UGC, 2023), which was jointly developed by the central ministries of Education and that of Skill Development and Entrepreneurship, and agreed upon by the regulators—National Council for Vocational Education and Training (ministry of skilling), University Grants Commission (ministry of education), and All India Council for Technical Education (ministry of education)—provides for One Nation-One Credit Framework, applicable to all levels of education and training. Not only that the nation has now one credit framework, but also the credit structure (combining academic, skilling/vocational, and experiential learning), creditization, credit accumulation (through a combination of F2F/distance and online learning/national online platform SWAYAM), RPL, credit redemption, multiple entry-exit, full equivalency between general and vocational education and between various modes of delivery, among others have been operationalized. There is a clear provision for industry linkage (through part-time engagement of industry experts or appointment of full-time professors of practice), and full compliance with the 8-level NSQF. This policy-

and regulation-based framework guides (and will continue to guide) the entire education and training sectors in the country, including informal, non-formal, and experiential learning. Although flexibility and inclusion are built into the provisions, a comprehensive framework for on-demand learning needs to be further articulated and developed. Technology-enabled learning and blended learning, combining self-study (resource-based learning), F2F lectures/tutorials/hands-on, and digital/online engagement and student learning applications including virtual internships, are the major transformative recommendations of the framework.

14.3.4 Guidelines on Recognition of Prior Learning

The VET national regulator has also issued regulatory guidelines on RPL in VET (NCVET, 2023) for all learners (including crafts persons, workers in the unorganized sectors, home makers, people whose qualification requirements have changed, retired workers, migrant workers, self-trained industrial workers, and sports persons), involving such methods like written test, viva voce, portfolio, interview, project, case study, competition, and blended assessment. The RPL outcomes may lead to full qualification, partial qualification, recognition, upskilling, credit exemption, credits towards a qualification, and certification. The RPL is based on the NCrF-2023 and guided by the NSQF's eight levels. The RPL incorporates the principle of multiple entry-multiple exit, and is operated through the national ABC platform.

For higher and further education, the UGC has also developed RPL guidelines (UGC, 2025), in consideration of the NCVET guidelines on RPL and the NCrF-2023, with provisions for multiple entry-multiple exit and assessment of prior learning by academic, industry, and regulatory bodies. The validated credits shall be deposited in the student's ABC for credit transfer and redemption. For school education and VET, the RPL framework shall be handy for on-demand learning since the employed graduates may use the prior experiences toward creditization and credit exemption in the national ABC; and this should be an integral part of any on-demand learning for this sector.

14.3.5 Guidelines on Skill Courses and Micro-Credentials

Though the VET sector has established regulations and guidelines on skill-based courses and programmes, including RPL competencies, the higher education sector, for the first time, developed detailed guidelines on skill-based courses and micro-credentials by taking into consideration the accumulation of credits in academic, skill, and experiential learning domains (UGC, 2024). Since this is linked to the NCrF-2023 and the VET credits are also based on the same credit framework, application of micro-credential-based learning in the VET sector could operate smoothly through

an on-demand learning framework, in which creditization shall operate at the national ABC.

The above policy analysis suggests that there are clear policy provisions and operational guidelines with respect to skilling, VET, micro-credentialling, RPL, and credit transfer, which should facilitate an on-demand learning framework and its operationalization. The open distance learning sector (open schooling and open university education) clearly implements skill-based, RPL-based, and ABC-based VET, with provision for on-demand learning (such as on-demand admission and on-demand assessment), though comprehensive on-demand learning may require seamless, flexible operation across all dimensions of education and training. As shall be seen in a section below, the operationalization of on-demand learning in the VET sector faces constraints related to policy implementation, training of functionaries, a credit-based and competency-based national resource repository, a technology-enabled national blended learning platform, and the full operationalization of the national ABC.

14.4 The Practices

The school vocational education is governed by the Central Sponsored Scheme (CSS) of the central Ministry of Education, whereby over 150 vocational courses at the higher secondary level are offered. This sector is critical since there is about 17% dropout rate, whereby dropped-out students take up low-level, low-skill jobs, especially in the informal sector. Exclusive VET is offered at the ITIs, followed by higher-level training at the polytechnics, and professional programmes are offered by the engineering colleges and universities. In the 15–19 age group, only 3% of the population receives vocational education and training (NSO, 2019), and most people receive skills training through hereditary professions, on-the-job training, and informal learning. The CSS operates the Craftsmen Training Scheme (CTS) and Apprenticeship Training Scheme (ATS). The trade apprenticeship scheme (TAS) is for the age group 15–18 post-ITI education, and the technical apprenticeship scheme (ATS) is for those who have had no training in ITIs.

The curricular schemes in the new system of '5+3+3+4' education in the *National Education Policy-2020* (primary age 3–8; preparatory 8–11; intermediate 11–14; secondary 15–18) have undergone changes in that in school education, unlike the previous system, national credit structure, equivalence to the first four levels of National Skills Qualification Framework (NSQF), vocational education, apprenticeship/internship, and research have been made as integral part of schooling.

The practices of VET across the spectrum of the organized education and training sector are briefly described below to provide a snapshot of what exists and where on-demand learning could be best suited vis-à-vis the provisions of the *National Credit Framework-2023*.

14.4.1 Craftsman Training Scheme

The Craftsman Training Scheme is implemented through secondary school-level 14,615 Industrial Training Institutes (ITIs, including 11,299 in private sector) across 800 districts in the country, with an enrolment of 3.2 million students each year in 101 trades. Started in 1950, it is one of the leading vocational training schemes in India, primarily aimed at ensuring employment opportunities for the youth by providing on-demand learning. The courses are offered in accordance with the National Occupational Standards developed by the relevant Sector Skills Council for each vocation/profession.

14.4.2 Advance Vocational Training Scheme

The Advanced Vocational Training Scheme (AVTS) is implemented by the Director General of Training of the central government through its regional centres. The training programmes are usually from one to six weeks duration. AVTS was launched with the support of UNDP/ILO in 1977 and has since been further strengthened with the support of the World Bank.

14.4.3 National Apprentice Promotion Scheme

Under the Apprenticeship Act, 1961, the National Apprentice Promotion Scheme is an initiative promoted by the Ministry of Skills Development and Entrepreneurship (launched in 2016). The key objective of the scheme is to prepare industry-ready skilled human resources in the country. Industries are supported with a 25% subsidy to recruit students from the country's skills training ecosystem (including ITIs and polytechnics) for apprenticeship training in their relevant job areas. The scheme is implemented through the Director General of Training (DGT) and the National Skills Development Corporation (NSDC). Over 260 trades at different levels are covered (offered through over 51,000 establishments), along with courses aligned with the NSQF and 2,500+ qualification packs relevant to specific job roles. The scheme provides on-the-job experience for learners. So far, above 4.3 million apprenticeships have been trained and engaged.

14.4.4 Jan Shikshan Santhan (People Education Centres)

JSS (in short) was originally launched in 1967 as 'Shramik Vidyapeeth' (Worker Education Centres) and was revamped in 2018 to provide need-based, on-demand

skills training to illiterates and neo-literates in their locality. The training providers are typically non-governmental organizations, and the programmes offered are aligned with local community demand to enhance families' livelihoods. An interesting feature of these programmes is that more than 80% beneficiaries are women. These trainees could eventually upgrade to higher levels of qualifications through a scheme of vertical mobility and on-demand learning.

14.4.5 Pradhan Mantri Kaushal Vikas Yojana (Prime Minister's Skills Development Plan)

The PMKVY (in short), a central government scheme (started in 2015), offers Indian youths the opportunity to undertake on-demand skills training for livelihoods. The scheme encourages on-the-job training based on recognition of prior learning, and facilitating on-demand learning to acquire job-oriented skills. Any citizen aged 15–59 can enroll in courses offered by approved training providers across the country. The skills assessment is done by third-party assessment agencies recognized by the VET regulator, the National Council for Vocational Education and Training (NCVET). The PMKVY now includes the schemes of JSS and NAPS under one umbrella of 'Skill India' Mission; and about 2.5 million are trained each year, covering so far above 16 million trainees since 2015. This is also another sector for future vertical mobility through flexible on-demand learning.

14.4.6 School TVET: CBSE Skills Education

The Central Board of Secondary Education (the national school education board) introduced skills courses from grade 9 onwards, though some skills modules are also offered from grade 6 onwards (e.g. foundation course on new generation skills). While at the secondary level (grades 9–10), one competency-based skill course is offered, at the senior secondary level (grades 11–12), students can take up three skill courses based on their choice. Nodal agencies like the Central Board of Secondary Education (CBSE) follow the 'hub and spoke' model—CBSE as the hub, and ITIs and polytechnics as spokes. Each of the skill courses involves 40–50% of practical learning experiences. These courses enable students to pursue a vocational pathway of their choice and enter the job market or continue with further higher studies in relevant skill areas [including higher vocational studies in polytechnics, Bachelor of Vocational Education (BVoc) in colleges, and in skills universities]. This is the main target group discussed in this chapter for the formulation of a framework on on-demand learning.

14.4.7 Skills Universities

Recognizing the importance of providing higher education for vocationally trained persons and undertaking research and development at higher levels, various state governments are promoting skills universities. There are about 20 public and private skills universities in the country that not only provide skills training in accordance with the guidelines of the regulator NCVET and Sector Skills Councils, but also conduct research and training programmes in accordance with the guidelines of the higher education regulator, the University Grants Commission. Especially, the skills universities are implementing the National Credit Framework-2023 in the vocational higher education sector. The skills universities provide more options for on-demand learning, ranging from short-term certificate courses to doctoral-level research. The courses and programmes offered include horizontal integration with industry and vertical movement for career progression, offering multiple entry and exit options as per the NEP-2020.

14.4.8 Sector Skill Councils and National Occupational Standards

The Sector Skills Councils are autonomous industry-led professional bodies established by the National Skill Development Corporation (of the central Ministry of Skill Development and Entrepreneurship). As of February 2026, there are 36 Sector Skill Councils in various areas. The SSCs determine the national occupational standards (NOS) for that specific job sector, based on which courses are offered by the providers and jobs are offered by the employers. The primary roles of the SSCs are:

- Identification of skill development needs, including the range and depth of skills to facilitate individuals to choose from.
- Determining skills/competency standards and qualifications and getting them notified as per NSQF.
- Standardization of affiliation, accreditation, examination, and certification processes in accordance with NSQF as determined by NSQC.

The SSCs serve as the apex body for skill development in a specific skill area. The National Occupational Standards developed by the Sector Skills Councils are approved by the NSDC and are used to develop qualification packs. The approved qualifications are included in the National Qualifications Register. These facilitate on-demand learning opportunities for anyone to take informed decisions for skills training in various areas, and are critical to any flexible on-demand learning formulation.

14.4.9 Missing Link in On-Demand Learning

While there is a need to transform the traditional non-outcome-based and non-learner-oriented teaching-learning in the ITIs (Tilak, 2018), studies show significant stress on learning and the learners in this type of vocational education (Pilz & Regel, 2021), and underline extension of the basket of competencies to be developed in students (Maitra & Maitra, 2021). In an in-depth study on the curricular and instructional processes at the IITs, Schneider et al. (2023), while implementing the Fuller and Unwin (2003) framework of workplace learning, suggest that most teaching-learning in the ITIs is teacher-centred and that teachers do not have much grounding, nor any continuous training, on micro-pedagogic aspects of constructivist workplace learning. The employers' expectations, though, are for more of applied and problem-based learning, while the VET context reveals more of lower-level cognitive learning and reproduction (Neroorkar & Gopinath, 2020). An on-demand learning (ODL) formulation needs to take these realities into account when developing transformative, continuous, need-based learning in the technical and vocational education sector. While the authors suggest remedying the provision of vocational teacher training, there is also an explicit suggestion that the colonial legacy of respecting general over vocational education (the latter therefore being pursued by the lower castes and the socio-economically disadvantaged population) needs to undergo transformation through changes in public perception induced by regulatory frameworks and employer choices.

Also, the mismatch between the education and skills of those seeking employment and those expected by employers in the industrial sector, and the need for additional skills and competencies for those aspiring to enter the job market, have been highlighted by some researchers (Pilz, 2016; Pilz & Ramasamy, 2022).

While the practices of skills training in India are based on a robust national policy/framework, the idea of on-demand learning is limited to skills on demand. This implies that the availability of skills training must be aligned with industry needs. The training provided aligns with job roles, and qualifications are industry-aligned. Practical skills training and industry apprenticeships also play a significant role in developing relevant skills amongst the learners. At least in the higher education sector, there are multiple entry and exit points to support on-demand learning (which is lacking in school-level education and training). A comprehensive on-demand learning system must provide for flexible learning opportunities beyond the entry and exit options. Learners must have flexible options to study at their own time and pace, especially to support those already working, and those from the remote areas. On-demand learning opportunities should provide equitable access for all, regardless of location, existing knowledge/skills/literacy, language proficiency, etc. Just-in-time training is also a key option, especially for those already employed. Such opportunities must be available via collaboration between specific industries and skills training providers, especially the skills universities.

14.5 The Futures: An On-Demand Learning Framework

The NCrF-2023 provides for horizontal and vertical credit transfer within VET and across general and vocational education. It has also provided for RPL, thereby ensuring conversion of work experiences into credits at an appropriate 'level' (as per NSQF) and transfer of credits to formal VET, and credit redemption towards a certificate/ diploma/degree.

A variety of agencies (formal and non-formal, government and private) are offering skills training at various levels—starting from the lowest level of illiteracy to the highest level of higher education—based on the VET national qualifications framework (NSQF) of the National Council of Vocational Education and Training (NCVET) and the federal Ministry of Skill Development and Entrepreneurship. The University Grants Commission has also released guidelines for the universities to include skills courses and offer micro-credentials. The overall Indian vocational education and training sector offers a robust opportunity to provide more flexible on-demand learning. We propose an imitational mechanism and a framework that could be implemented to further strengthen the ecosystem of skills education and training.

14.5.1 Institutional Provisions for On-Demand Learning

While there are several provisions to open up skills education and training, training providers (especially vocational training institutions and universities) are not yet prepared to offer on-demand learning options. While skills training would require careful institutional planning and optimization of existing facilities to offer on-demand learning, skills training providers must create policies and build staff capacity to adapt to new challenges. A clear understanding of on-demand learning is key to its implementation. On-demand learning goes beyond offering the much-needed training programmes; it is about making relevant training programmes available to those who need them at the right time, in the most affordable way, and with automatic provision for credit accumulation and redemption. It would require provisions for blended learning, as well as the deployment of advanced technologies such as AR/ VR for skills training. Modularization of the existing curriculum is an important way at the institutional level to offer on-demand learning. It would also facilitate micro-credentials, which can be stored and accumulated in the national Academic Bank of Credits for higher degrees. Institutions may adopt more open education practices, whereby allowing students to create their own curriculum from a bouquet of short and approved micro-credentials aligned to NSQF or job-role-based qualification packs. Such institutional provisions could not only increase enrollment in skills training but also increase the revenue stream for training providers by using their existing resources.

14.5.2 Adopting a Framework for On-Demand Learning

An on-demand learning system for skills training at the secondary and post-secondary level must be based on the principle of 'learning at the point of need'. Unlike traditional in-person training, it must prioritize the learner's schedule and immediate requirements over a fixed curriculum or timeline.

An on-demand learning framework needs the following components:

1. *Learner Autonomy and Flexibility*
   - Self-Pacing: Learners progress through training at their own speed, revisiting complex concepts or skipping known information.
   - Anytime, Anywhere Access: Training is available 24/7 across multiple devices (mobile, tablet, desktop) from the designated national platform, removing geographical and temporal barriers.
   - Asynchronous Interaction: While live support could be important, the core experience does not require the instructor and student to be available synchronously. However, there is specific regulatory requirement of face-to-face hands-on training for the skill components.
2. *Content Delivery*
   - Microlearning: Information is often broken down into 'bite-sized' modules or 'nuggets' (e.g. 3–5-minute videos or short infographics) to prevent cognitive overload.
   - Modularity: Lessons are learning outcome-based independent units, allowing users to consume exactly what they need without completing an entire course. The modularity must focus on NSQF alignment and offer credentials that could be stored and stacked in the Academic Bank of Credits.
   - Blended Learning: Offering skills training in a blended mode to optimize the infrastructure (see Fig. 14.2).
   - Searchability: High-quality metadata and indexing allow learners to search for specific topics or keywords to find instant answers. The availability of courses and training providers in a national registry is key to such searchability.
3. *Technology and Services*
   - Personalization Engines: Artificial Intelligence could be used to recommend content based on a learner's past behaviour, skill gaps, or stated interests.
   - Cloud-Based Infrastructure: Technology must ensure that the evidence of learning is saved across devices, allowing a user to start from where it was left in whatever device is used.
   - Offline Capability: Relevant training is also available in offline mode to polish skills training and certify the competencies especially at skill development centres.

4. *Assessment and Feedback*

   - Immediate Validation: Automated quizzes or interactive simulations provide instant feedback, letting the learner know if they have mastered the concepts and developed the skills. This requires a continuous assessment rubric for both cognitive learning and skill training.
   - Just-in-Time Support: Integration with AI chatbots or searchable FAQs provides help the moment a hurdle is encountered.

5. *Governance*

   - Recognition of Prior Learning: On-demand learning provides an opportunity for the learner to assess their existing skills and recognize prior learning with appropriate assessment and creditization.
   - Affordability: The cost of training must be reasonable to ensure access for those who need it in a timely manner. In addition, provision for scholarship/loans for training could enhance on-demand learning for skills training.
   - Open Educational Resources: Making learning content available online as open educational resources would facilitate more on-demand learning. Learners could study these resources at their own pace and time and seek a certificate, when ready. However, such a provision would require an appropriate policy to make the learning content available under Creative Commons licenses.

The on-demand learning framework for school vocational education and equivalent VET may be implemented in practice as elaborated in Table 14.1 in relation to enablers-current status-challenges/constraints.

The framework and its operationalization in VET underlines continuing education and lifelong learning through provisions of on-demand learning and associated provisions for creditization and credit redemption in the national ABC, which can also form the basis for job mobility, job promotion, and overseas credits/qualifications transfer.

14.6 Limitation and Conclusion

While the framework and operationalization suggestions proposed in this chapter stem from a critical review of the current situation, and existing policies related to skills development in India, it would be useful to undertake pilot studies, and further conduct surveys and take inputs from the stakeholders. Nevertheless, the discussions in this chapter despite its limitation could form the basic conceptual foundation for on-demand learning in India and elsewhere. As discussed in the above sections and

Table 14.1 Operationalization of on-demand learning for vocational education

Enablers	Current status	Constraints/challenges
Policy	NEP-2020 and NCrF-2023 are in place, facilitating flexible educational delivery and flexible learning including on-demand learning. RPL and multiple entry-exit guidelines are also in place which facilitate operationalization of on-demand learning.	There is absence of detailed blended leaning, and micro-credentialing, policies to support on-demand learning (which though currently depend on the macro NEP-2020).
Curriculum, skilling and employability	There is provision for (and partial application of) curriculum based on industrial and job requirements, linked to learning outcomes of each job sector through the Sector Skills Councils. The learning outcomes and curriculum contents are well defined in the NCrF-2023 and RPL guidelines, though there is the practice of rigid and standardized curricula.	The disconnect between learner needs, workplace needs, and institutionalized learning also includes absence of incorporation of twenty-first-century skills and what Ehlers and Eigbrecht (2024) call as 'future skills'. There is lack of credit-based and competency-based national digital resource repository at this level of education and training – the resources and courses available at the national online platform SWAYAM are not enough to operationalize a credit-based flexible on-demand learning. There is the need for 'personalized' adaptive learning for most effective learning outcomes and transfer of leaning to workplaces/enterprises. Equivalency: since the IITs and polytechnics follow the same NSQF guidelines as followed by the school vocational education, there should be equivalency of the graduates for the job market.

(continued)

Table 14.1 (continued)

Enablers	Current status	Constraints/challenges
Creditization, RPL, micro-credentialling, accreditation	Though there is no separate policy/ regulation on RPL and micro-credentialling, the University Grants Commission has provided guidelines on RPL in higher education (UGC, 2025) and micro-credentials (UGC, 2024). The national education policy NEP-2020 and the national credit framework NCrF-2023 provide enough room for locating need-based, flexible/ just-in-time, on-demand learning within this broader framework. The national digital depository Academic Bank of Credits (ABC) is well-positioned to take on this transaction in any flexible manner, tough additional provisions and mechanisms need to be built into this. Both horizontal and vertical mobility can be implemented through a 'hub and spoke' model of VET implementation.	The NSQF needs to be expanded to include vocation/domain/ job-specific frameworks. There is need to develop mechanisms for on-the-job VET qualifications by flexible on-demand offer of VET courses and credit transfer therein through the national ABC. Guidelines for RPL are yet to be fully implemented, including the basket of assessment rubric and nodal agencies to conduct the assessment (though there is a National Testing Agency for such purposes). Further, the assessment should be recognized for credit transfer across institutions and employers. Flexibility in credit transfer: students' credits earned from courses through the national online platform SWAYAM and open schools (like NIOS) should be considered in the ABC. The major challenge (and, so, a requirement) is that the VET student be provided with a 'system' where s/he can access a credited workplace-related course (or, a micro-credential) as per his/ her need at any point of time, and successfully complete them to transfer the earned credits to his/ her account in the ABC; and go on accumulating till one secures a certificate/ diploma/ degree. This is doable—it needs flexibility and appropriate provision in the 'system' and change in the mindset of people handling this. In that case, the digital resource-based learning platform (in this case, the national platform of SWAYAM) needs to be transformed into a flexible seamless learning ecosystem. The AI-based learning analytics shall facilitate personalized/ adaptive learning within this ecosystem. As is already formulated in NEP-2020, personalized learning, as applicable to all, is a combination of domain learning, multidisciplinary learning, and skilling (vocational, social and life skills, and happiness/wellbeing competencies).

(continued)

Table 14.1 (continued)

Enablers	Current status	Constraints/challenges
Infrastructure	Institutions have access to internet and satellite-based broadcasting, but these are not oriented towards need-based and curriculum-based on-demand learning requirements. The PM-eVidya provides a digital public infrastructure for education in the country providing access to massive online courses, direct-to-home channels, and specialized services for learners with disabilities.	While there is a strong national effort towards creating digital public infrastructure for education, last mile access to digital tools and infrastructure is relatively poor. Institutions need to focus on creating access points/digital labs for accessing AR/VR tools for virtual labs for skills training.
Digitization	While most institutions may not be fully digitized (including provision for SI-Ed), the existing digitization is not geared towards technology-enabled learning (TEL) and its pedagogies.	Lack of a tech-enabled national blended learning platform for on-demand learning, and its institutionalization through the 'hub and spoke' model.
Learning resources	The learning resources are available in print and digital formats (audio, video, online resources/ courses), though based on the structured curriculum without much flexibility and adaptability to individual learning needs.	Learning resources are largely available in traditional areas, and very little is available in the areas of skills training. A strong mission on creating open educational resources on skills may fill the gap to integrate resources aligned with the needs of local industries.
Institutional mechanism and capacity building	Teacher training is very important, and there are provisions for training of VET teachers: e.g. the continuing professional development programmes for teacher-mentors in government and government-aided schools (e.g. the Shyamchi Aai Foundation in the state of Maharashtra).	IDP and detailed mapping of institutional capacity and mechanism for linking on-demand learning with the NCrF-2023 and the national credit and credential depository of ABC. While regular training of especially the VET teachers is in place, a systematic effort for staff training and continuing professional development is needed to implement a flexible multiple entry-exit provision of on-demand learning.

(continued)

Table 14.1 (continued)

Enablers	Current status	Constraints/challenges
Organization, delivery and learner support	The 'hub and spoke' model needs to be broad-based. Also, collaboration with AICTE, DGET facilitates the use of skill centres for counselling and hands-on. Several private associated skill centres also provide hands-on training to school students. An example: 'Skills on Wheels' mobile skill training by 'Lend A-Hand India' in rural areas.	As articulated the NEP-2020 and described in Fig. 14.2 above, blended learning is best suited for on-demand learning to be offered through flexible, modular, learner-centred pathways. Learner autonomy in flexible on-demand learning is needed. Content delivery through blended learning 24x7. Personalization of learning is required for need-based creditized content and its delivery through interactive technologies including artificial intelligence and learning analytics. Linkage between skills universities-national online SWAYAM platform-VET institutions-skills development centres: It is not sufficient to formulate the policy (which exists), rather it is essential to operationalize the framework and provisions to achieve this linkage towards active learning and seamless creditization and accreditation through the ABC.
Continuing education and career progression	Continuing education, lifelong learning, and education and training for career progression policies and guidelines are available, being operationalized through the adult education programmes, open schooling and open university provisions.	The formulation of an on-demand learning framework and guidelines thereof needs distinct institutionalized provisions and operational mechanisms, though the learner may acquire some credit-based courses and micro-credentials from the distance and online learning institutions through the mechanisms of flexible learning, multiple entry-exit, and

in Table 14.1, appropriate policies, regulations, and guidelines are in place to facilitate the operationalization of on-demand learning for workers/aspirants in the organized sectors of the economy, especially at the secondary school VET and parallel ITI and polytechnic levels. The guidelines and existing practices are largely flexible and modular, gender and social status inclusive, and disability friendly. The existing institutions at school VET, ITIs, polytechnics, vocational colleges and skills universities are capable of implementing on-demand learning for fresh students and working graduates. However, it requires a seamless integration of institutionalized mechanisms, infrastructure, and teacher capacity building with the existing VET policies and the national credit regulation of NCrF-2023. There is absence of a systematic connect between (and which needs appropriate action for an on-demand learning operationalization): learner prior learning/experience, learner personalized learning, workplace requirements, curricular provisions and micro-credentialling, digital resource platforms and repositories, assessment rubrics and assessment agencies, creditization and credit transfer to national depository ABC at appropriate level with horizontal and vertical mobility, quality assurance benchmarks, actual employment, and further continuing and lifelong learning. This Indian case may contribute to our further understanding of the operational mechanism of on-demand learning in the TVET sector.

References

Choudhury, P. K., Mallick, H., & Kumar, A. (2025). Vocational education, skill training and self-employment: Evidence from India's non-farm sector. *Journal of Vocational Education and Training, 77*(4), 912–938. https://doi.org/10.1080/13636820.2024.2359369

Ehlers, U., & Eigbrecht, L. (2024). *Creating the university of the future: A global view on future skills and future higher education.* Springer VG.

Fuller, A., & Unwin, L. (2003). Fostering workplace learning: Looking through the lens of apprenticeship. *European Educational Research Journal, 2*(1), 41–55.

GOI. (2020). *National Education Policy 2020*. Ministry of Human Resource Development, Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.Pdf

GoI. (2022). *Lok Sabha unstarred question No 878*. Ministry of Labour and Employment, Government of India.

GOI. (2023). *The national skills qualifications framework-2023*. Ministry of Skill Development and Entrepreneurship, Government of India.

Maitra, S., & Maitra, S. (2021). Training to be entrepreneurial: Examining vocational education programmes for young women in Industrial Training Institutes (ITI) in Kolkata. In P. Eigenmann, P. Gonon, & M. Weil (Eds.), *Opening and extending vocational education* (Vol. 18, pp. 265–290). Peter Lang.

Marr, B. (2022). *The 20 skills and competencies everyone needs to succeed in a digital world*. Wiley.

Mehrotra, S. (2021). *Technical and vocational education and training in India: Lacking vision, strategy and coherence.* Centre for Sustainable Development, Azim Premji University.

MSDE. (2015). *National skills qualification framework*. Ministry of Skill Development and Entrepreneurship, Government of India.

MSDE. (2020). *Annual report 2019–2020*. Ministry of Skilling Development and Entrepreneurship, Government of India.

National Statistical Office. (2019). *Annual report: Periodic labour force survey (PLFS) (July 2017–June 2018)*. Government of India.
National Statistical Office. (2024). *Annual Report: Periodic Labour Force Survey (PLFS), July 2023–June 2024*. Ministry of Statistics and Programme Implementation, Government of India.
NCVET. (2022). *Guidelines for blended learning for vocational education, training and skilling*. National Council for Vocational Education and Training, Government of India.
NCVET. (2023). *Guidelines for Recognition of Prior Learning (RPL)*. National Council for Vocational Education and Training, Government of India.
NCVET. (2024). *Establishment and Operation of Academic Bank of Credits in Vocational Education, Training and Skilling (VETS)) Guidelines, 2024*. National Council for Vocational Education and Training, Government of India.
Neroorkar, S., & Gopinath, P. (2020). An employability framework for vocational education and training graduates in India: Insights from government VET institutes in Mumbai. *TVET@Asia, 15*. http://tvetonline.asia/wp-content/uploads/2021/03/03_Neroorkar-and-Gopinath_2020-07-20_Vorlage-Final-Block-1.pdf
Panda, S. (2011). Continuing education and lifelong learning in the Indian sub-continent: Critical reflections. *International Journal of Continuing Education and Lifelong Learning, 4*(1), 25–48.
PIB. (2025, February). *Measuring the Pulse of Indian Education*. Press Information Bureau, Government of India.
Pilz, M. (2016). A view from the outside: India's school to work transition challenge—Strengths and weakness. In M. Pilz (Ed.), *India: Preparation for the world of work—Education system and school to work transition* (pp. 345–357). Springer.
Pilz, M., & Ramasamy, M. (2022). Attractiveness of vocational education and training in India: Perspectives of different actors with a special focus on employers. In S. Billett (Ed.), *The standing of vocational education and the occupations it serves: Current concerns and strategies for enhancing that standing* (pp. 177–199). Springer.
Pilz, M., & Regel, J. (2021). Vocational education and training in India: Prospects and challenges from an outside perspective. *Margin: The Journal of Applied Economic Research, 15*(1), 101–121. https://doi.org/10.1177/0973801020976606
Schneider, S., Wessels, A., & Pilz, M. (2023). Theory and practice of teaching and learning in the classroom—Lessons from Indian Industrial Training Institutes. *Vocations and Learning, 16*, 99–120. https://doi.org/10.1007/s12186-022-09305-8
Shah, S. Y. (1999). *An encyclopaedia of Indian adult education*. National Literacy Mission, Government of India.
Tilak, J. (2018). *Education and development in India*. Palgrave Macmillan.
UGC (2023). *The National Credits Framework-2023*. University Grants Commission, New Delhi.
UGC. (2024). *Guidelines for the introduction of skill-based courses and micro-credentials in Higher Educational Institutions (HEIs) and SOP for implementation*. University Grants Commission, New Delhi.
UGC. (2025). *Guidelines for implementation of recognition for prior learning (RPL) in higher education*. University Grants Commission, New Delhi.

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Part V
Future Directions

Reimagining Qualifications, ODL and the Future of Work, Opportunities, Risks, Unresolved Tensions

Chapter 15
Vocational Education in Transition: Conceptualizing On-Demand Learning for the Future of Skills and Work



Khalida Parveen and Muhammad Shafiq

Abstract On-demand learning (ODL) is theorized in this chapter as a disruptive model of re-conceptualizing vocational education in a period of automation, platformization, and generative artificial intelligence. It claims that on-demand learning goes beyond the conventional standardized models of skills training by promoting flexibility, personalization, and learner autonomy. Placing on-demand learning in the context of social acceleration, in which technology, time, and labor are converging to redefine competence, the chapter relies on the philosophical perspectives of Barnett (2000, 2023), Rosa (2013), and Kovalchuk et al. (2022) to analyze how vocational education should react to the modern conditions of supercomplexity and accelerated change. The chapter uses a philosophical-conceptual approach based on the traditions of constructivist and critical theory to develop the concept of Vocational On-demand learning (VODL) by hermeneutically analyzing the concept of modularity, micro-credentialing, and digital ecosystems. It suggests a conceptual typology of the shifts between standardization and modularity and institutional and ecosystemic learning paradigms. The chapter ends by providing a framework that can help policymakers and educators to align vocational curricula with on-demand learning principles without compromising human-centered commitments to equity, ethics, and sustainability.

Keywords On-demand learning (ODL) · Vocational Education and Training (VET) · Vocational on-demand learning (VODL) · Generative Artificial Intelligence (GenAI) · Micro-credentialing · Digital ecosystems · Modularity · Employability · Lifelong learning · Social acceleration

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15.1 Introduction: Vocational Education at a Crossroads

Vocational education is at a crossroad in the twenty-first century (OECD, 2023). The intersection of automation, platformization, and the rapid advancement of generative artificial intelligence (GenAI) are fundamentally reorganizing the connection between learning, work, and human development (OECD, 2026). Digital transformation, as the European Commission Joint Research Centre (2025) notes, is not simply introducing new tools to the already existing vocational systems but is radically redefining the epistemological and institutional basis of skills development. On-demand learning (ODL) is theorized in this chapter as a paradigm by which to re-conceptualize the form, philosophy, and social mission of vocational education. Beyond instrumental conceptions of skills training, it explores how on-demand learning can create new alignments between education, work, and human development under the circumstances of radical uncertainty.

The modern crisis of vocational education is fundamentally a crisis of temporality (Kovalchuk et al., 2023). The traditional vocational systems were developed to suit comparatively stable labor markets where skills learned during the initial training remained relevant during a working lifetime (Nakar, 2025). This time supposition has failed in the modern era of rapid developments (Knox, 2024). The theory of social acceleration by Rosa (2013) offers an effective perspective on this change. Rosa claims that the contemporary societies are marked by three interrelated types of acceleration: technological acceleration (the deliberate acceleration of technical processes), social change acceleration (the acceleration of institutional and cultural change), and the acceleration of the pace of life (the compression of action episodes). Vocational education is at the crossroads of these accelerative dynamics. The pedagogical models of industrial modernity are outdated when the half-life of technical skills is reduced not decades, but years, and in certain areas of technology, months.

Barnett (2000) identifies this as a condition of supercomplexity, where the problem is not just information overload but underlying contestability regarding the structures of how we perceive the world. In the case of vocational education, supercomplexity implies that even the notions of skill, competence, and profession are put in a state of flux. Employees have to deal with not only evolving technical demands but also conflicting definitions of what is valuable knowledge and proper practice. Here, according to Barnett (2023), schools need to move beyond a metaphysics of order to a metaphysics of flow, that is, beyond imparting fixed bodies of knowledge to developing the ability to live with ontological uncertainty.

On-demand learning is the symptom and reaction to these accelerative and complexifying dynamics. Kovalchuk et al. (2023) stated the struggles of vocational education systems in Europe to become more responsive, flexible, and individualized. On-demand learning is not, however, a technical adaptation to delivery mechanisms. It is, this chapter claims, a paradigmatic reorganization of the logic of vocational education: the substitution of supply-based curricula with responsive, adaptive ecosystems of skill-formation (Knox, 2024). Learning in this new paradigm is not

a preparation stage before work, but a continuous and integrated aspect of working life.

Nevertheless, the shift to on-demand learning is fraught with philosophical contradictions and practical issues (Atkinson & Flanagan, 2024). The potential of personalization and flexibility should be balanced with the dangers of precaritization and the outsourcing of institutional responsibility to individuals (Fleischmann, 2022). The productivity benefits of modular, just-in-time learning can mask new types of algorithmic management and the loss of educational relationships. The micro-credentialing zeal threatens to divide knowledge into marketable bits and lose sight of the value of basic knowledge and critical thinking. This chapter manages to negotiate these tensions by constructing a conceptually sound description of Vocational On-demand learning (VODL) that is both responsive to technological opportunities and humanistic obligations.

The argument takes three conceptual movements. First, it looks at the shift of standardization to modularity, and how on-demand learning is breaking down one-size-fits-all vocational education by stackable, competency-based pathways. Second, it examines the institution-ecosystem transformation, redefining vocational learning spaces as networks of industries, learners, and technologies that dynamically co-produce knowledge. Third, it questions the shift between employment and employability, critically analyzing how the focus of On-demand learning on constant adaptation erases the distinction between education and work and endangers the further precaritization of labor. The chapter concludes with the expression of Vocational On-demand learning (VODL) as an integrative model that unites philosophical inquiry, socio-technical flexibility, and policy foresight to make sure that skill development is in line with the greater human purposes of work and lifelong learning.

15.2 The Social Acceleration of Learning: A Theoretical Framework

To comprehend On-Demand Learning, it is necessary to place it in the context of more general changes in the time and reality of modern society. This section constructs the theoretical framework on which the chapter will be analyzed, with the main references being the theory of social acceleration by Hartmut Rosa (2013), the theory of supercomplexity by Ronald Barnett (2000), and the critical traditions of vocational education scholarship.

15.2.1 Rosa and the Triple Axes of Acceleration

The book Social Acceleration: A New Theory of Modernity by Hartmut Rosa (2013) provides a systematic explanation of the way modern social life is organized in

terms of temporality. Rosa distinguishes three analytically different yet empirically interrelated types of acceleration with far-reaching consequences on vocational education.

Technological acceleration is the deliberate acceleration of goal-oriented processes. This is reflected in the vocational setting in the accelerated obsolescence of technical expertise, the acceleration of training schedules by digital pedagogies, and the demand that learning outcomes be produced with greater efficiency. Generative AI is an example of the most extreme form of technological acceleration: systems capable of producing text, code, and even curriculum content at speeds that human cognition cannot. Vocational education analyst, large models create, combine, and test knowledge much faster than humans, significantly reducing the shelf life of traditional textbook knowledge systems (Xu & Zhang, 2025).

Acceleration of social change refers to the growing pace of institutional, practice, and expectation change. Where vocational qualifications used to organize whole careers, they now need to be renewed on a regular basis. According to the 2025 Future of Jobs Report by the World Economic Forum, employers believe that almost 40% of core skills will be transformed by 2030, and 86% believe that AI and digital tools will transform organizations (World Economic Forum, 2025). This rapid transformation disrupts the connection between early professional training and later work, and requires pedagogical frameworks that emphasize flexibility over knowledge.

Acceleration of the pace of life is the compression of action episodes, the feeling that we have to do more with less time. To learners, this puts a strain on micro-learning, bite-sized learning, and just-in-time learning of skills that reduce time out of productive activity. This temporal compression is evident in the popularity of micro-credentials: certifications that can be obtained in weeks instead of years, offered on platforms that can be accessed on mobile devices during commutes or breaks (Rosa, 2013; Varadarajan et al., 2023).

The framework by Rosa (2013) shows that On-demand learning is not just a pedagogical innovation but a reaction to profound structural pressures. Vocational education needs to speed up to keep up with technological and social change, but it is the speed that can destroy the conditions of deep learning, critical reflection, and the development of vocational identity. The difficulty, as this chapter will suggest, is not to oppose acceleration in wholesale, which is impossible, but to develop forms of learning that are not only responsive to time but also humanly sustainable.

15.2.2 Barnett and the Ontology of Supercomplexity

Where Rosa (2013) is concerned with temporality, Barnett (2000, 2023) is concerned with epistemology and ontology. Barnett (2000) differentiates between complexity, where the world is complicated and can be known by existing structures, and supercomplexity, where the structures themselves are disputed and unstable. Under supercomplex conditions, professionals encounter not only new problems but also

contradictory definitions of a problem, a solution, and values that should guide practice.

In the case of vocational education, supercomplexity is far-reaching. Conventional competency-based models presuppose that skills are specifiable, teachable, and measurable against fixed standards. However, when the standards themselves are dynamic, such as when the ethics of AI application in a profession are actively debated, or when the sustainability imperative radically changes the nature of professional practice, then competency frameworks become moving targets. Barnett believes that higher education should react by building the ability of students to live with uncertainty, to make judgments without assurances, and to engage in the continuous rebuilding of professional worlds.

The recent work by Barnett (2023) highlights the significance of the concept of connection in the design of educational futures. Under supercomplex conditions, there is no single framework that can be used; learners should be capable of traversing frameworks, synthesizing divergent knowledges, and creating bridges between domains that were once distinct. This connective imperative is close to the On-demand learning focus on modular, stackable learning pathways that enable individuals to construct individual configurations of skills. But Barnett also cautions against strictly instrumental notions of connection: the aim is not to integrate skills effectively but to develop wisdom in negotiating competing knowledge claims and value systems.

15.2.3 Critical Vocational Pedagogy: Kincheloe and the Political Economy of Skill

The critical traditions of vocational education scholarship would not be complete in the theoretical framework. A critical vocational pedagogy was expressed by Kincheloe (1999) and challenges the political and economic interests that define skills and training systems. The author claimed that vocational education has traditionally been used to sort and socialize workers to occupy jobs in hierarchical labor markets, which tends to obscure contingency of skill categories and the potential of alternative work organizations.

On-demand learning seems unclear in this critical view. On the one hand, the focus of On-demand learning on learner autonomy and individualized paths appeals to the progressive critique of inflexible, one-size-fits-all training. Conversely, On-demand learning can be a deepening of neoliberal logics that individualize structural issues. The political economy of labor markets is not examined when workers are held accountable to ongoing upskilling, when employment precarity is resolved by increasingly flexible credentialing. Critical vocational pedagogy asserts that issues of skill cannot be disaggregated with issues of power: who determines valuable skills, whose interests credentialing systems are designed to serve, and how learning can be used to make work more democratic and just.

These are the key issues that have been incorporated into the conceptualization of Vocational On-demand learning in this chapter. As formulated here, VODL is not just a technical model of efficient delivery of skills but a normative model that demands the integration of On-demand learning into human-centered values of equity, ethics, and sustainability. The pace of learning has to be weighed against the consideration of who is accelerated and who is not; the flexibility of modular credentials should be matched by strong quality assurance and recognition systems that ensure that learners are not exploited; the promise of personalization should not be used as an excuse to forego the obligation to provide accessible, high-quality vocational education to everyone.

15.3 Research Design: A Philosophical-Conceptual Approach

The methodology used in this chapter is philosophical-conceptual based on constructivist and critical theory traditions (Kant, 1998). In contrast to empirical research, which produces new data, philosophical-conceptual inquiry challenges existing frameworks, integrates knowledge across fields, and develops theoretical syntheses that explain complex phenomena. This method is especially suitable to analyze On-demand learning that is not yet a fully developed empirical object but a new constellation of practices, technologies, and discourses whose meanings and implications need to be conceptualized.

The methodological approach evolves based on three elements that are interrelated.

15.3.1 Theoretical Interrogation

The former is the systematic interaction with the major philosophical frameworks that shed light on the change of vocational education. The chapter questions the idea of supercomplexity (2000, 2023) by Barnett, the theory of social acceleration (2013) by Rosa, and the critical vocational theory (Kincheloe, 1999) to explore the changing ontology of skills, time, and work. This questioning is not only descriptive but also critical: it aims at determining the explanatory strength as well as the constraints of each framework to understand on-demand learning.

Hermeneutic approaches to competency-based education are also involved in the analysis. Hodge et al. (2020) illustrate how hermeneutic interpretation can help to uncover the meaning-making aspects of vocational learning that competency frameworks tend to hide. Their work guides the attention of the chapter to the way learners perceive and create meaning in on-demand learning settings, as opposed to learning predetermined skills.

15.3.2 Conceptual Integration

The second component combines ideas in various disciplines, such as philosophy of education, AI ethics, labor studies, and vocational pedagogy, to develop the multidimensional concept of Vocational On-demand learning (VODL). This synthesis arises from the understanding that on-demand learning cannot be fully explained by any single disciplinary perspective. The ethical concerns surrounding AI-driven learning platforms include technological issues related to platformization, algorithmic bias, and learner surveillance. Additionally, the labor market implications of platformization, as well as the pedagogical aspects of skill development and credentialing, must be considered. Finally, policy issues such as quality assurance and recognition intersect with philosophical questions about the nature of vocational knowledge and professional identity.

The process of integration continues by finding areas of contact and conflict between these domains. As an illustration, the ethics of AI scholarship on algorithmic fairness sheds light on how micro-credentialing platforms can reproduce or challenge existing disparities in skill recognition. The research on platform work in labor studies indicates that on-demand learning could be used to empower workers or to increase precarity. The chapter creates an integrative paradigm by introducing these views into a conversation, which captures the potentials and contradictions of integrating AI-based, adaptive learning systems into vocational settings.

15.3.3 Hermeneutic Analysis of Vocational Transformations

The third component uses hermeneutic analysis on three major transformations: the standardization to modularity, the institution to ecosystem, and the employment to employability. Hermeneutic analysis, in the footsteps of Hodge et al. (2020), is concerned with the construction, interpretation, and contestation of meanings in educational practices. Instead of assuming that modularity or micro-credentialing is a self-evident technical innovation, hermeneutic analysis looks at how these phenomena restructure the relationship between knowledge, learner agency, and institutional authority.

This interpretive method shows that on-demand learning is not a new method of presenting old material but a radical restructuring of vocational epistemology. Once curricula are modular and stackable, once credentials are granular and portable, once learning is continuous and embedded in work, the meaning of being qualified or being competent changes. Hermeneutic analysis sheds light on these meaning changes and their consequences to learners, teachers, and schools.

15.3.4 Integrated Conceptual Framework for Vocational On-Demand Learning (VODL)

The three research components discussed above are combined into a single analytic lens in the Integrated Conceptual Framework for Vocational On-Demand Learning (VODL) presented in Table 15.1, which is used to guide the rest of this chapter. The framework links the philosophical foundations (supercomplexity, social acceleration, critical vocational theory) to conceptual integration domains such as AI ethics, labor studies, vocational pedagogy, and policy/governance. These domains enable a hermeneutic analysis of transformations, from standardization to modularity, from institution to ecosystem, and from employment to employability, and offer a structured understanding of the interaction between learning, work and institutional systems in a rapidly changing vocational context. The VODL framework communicates key principles, enabling factors, expected outcomes, and normative commitments, which help ensure that modular, adaptive, and on-demand pathways stay grounded in human-centered values like equity, ethics, and sustainability. The cross-cutting values and tensions reveal the difficulties of balancing flexibility, personalization, technological mediation, and social justice. This integrated framework provides a point of reference for the analysis and discussion in the following sections.

15.4 From Standardization and Modularity: The Epistemological Reorganization of Vocational Knowledge

The initial conceptual dimension explores the way on-demand learning challenges the standardized, one-size-fits-all model of vocational education by introducing modular, stackable, and micro-credentialed learning pathways. This part of the argument holds that modularity is not just an organizational convenience but an epistemological transformation with far-reaching consequences to the way vocational knowledge is conceptualized, learned, and justified.

15.4.1 The Historical Logic of Standardization

The modern vocational education was developed in the context of the need of industrial capitalism to have standardized workers who can do standardized jobs (Avis, 2018). The standardization logic fulfilled several purposes: it allowed quality assurance among training institutions, labor mobility through the legibility of qualifications between employers and regions, and Fordist ideas of efficiency and

Table 15.1 Integrated conceptual framework for VODL (Sect. 15.3.4)

Component	Key elements	Description/application
Philosophical Foundations	Supercomplexity (Barnett, 2000, 2023)	Emphasizes fluidity of knowledge, adaptive capacity, and threshold concepts; prepares learners to navigate uncertain and contested professional environments
	Social Acceleration (Rosa, 2013)	Highlights technological, social, and life-pace acceleration; underlines the temporal pressures on learning and work cycles
	Critical Vocational Theory (Kincheloe, 1999)	Focuses on power, equity, and social justice in vocational education; emphasizes emancipation and democratic participation
Conceptual Integration Domains	AI Ethics	Fairness, transparency, learner privacy, human agency; ensures responsible use of technology in on-demand learning
	Labor Studies	Examines platform work, precarity, and worker empowerment; guides policy and structural adaptation
	Vocational Pedagogy	Skill formation, assessment, credentialing, and learning design; supports modular, stackable pathways
	Policy & Governance	Quality assurance, recognition, regulation, and lifelong learning systems; ensures credibility and equity in VODL
Hermeneutic Analysis of Transformations	Standardization → Modularity	Transition from uniform curricula to personalized, stackable learning pathways; interprets how learners navigate modular content
	Institution → Ecosystem	Shift from bounded institutions to networked learning ecosystems; maps distributed responsibility, co-creation, and stakeholder involvement

(continued)

Table 15.1 (continued)

Component	Key elements	Description/application
	Employment → Employability	From job security to continuous skill and capability development; examines implications for lifelong learning and adaptability
Vocational On-Demand Learning (VODL) Framework	Core Principle	Responsive, learner-centered, lifelong skill development in an era of acceleration
	Enablers	Digital technologies, AI, data ecosystems, micro-credentials, flexible pathways
	Outcomes	Enhanced agility, relevance, inclusion, employability, and human flourishing
	Normative Commitments	Equity, ethics, human dignity, sustainability, democratic participation
Cross-Cutting Values & Tensions	Values	Equity, inclusion, human agency, lifelong learning, sustainability, autonomy, accountability
	Tensions	Flexibility versus precarity, personalization versus surveillance, automation vs human judgment, market logic vs public good

predictability. This industrial logic is manifested in national vocational qualification frameworks, competency-based curricula, and standardized assessments (Lin, 2025).

However, standardization has its own drawbacks. It favors codifiable knowledge over tacit knowledge, measurable results over developmental processes, and standardized progression over personal learning paths. These restrictions were tolerable in comparatively stable occupational areas; the advantages of standardization exceeded its expenses. However, under the circumstances of high technological dynamism and work mobility, standardization is a liability. According to the European Training Foundation, the traditional systems of vocational education and training are not flexible. They are too long and they are too extensive. They are designed to work in the twentieth century, not the twenty-first-century careers (Fleischmann, 2022; Zhang et al., 2026).

15.4.2 Modularity as Epistemological Innovation

Modularity provides a different logic. Instead of prescribing standardized curricula by which every learner has to move through, modular systems break down vocational knowledge into small units that can be assembled in various ways (Zhang et al., 2026). Students create their own tracks by choosing modules that are pertinent to their career objectives, previous studies, and time. Independent updating of modules can be done without the need to redesign whole curricula, and so respond more quickly to technological change.

Modularity has an epistemological meaning that is not limited to flexibility (Zhang et al., 2026). Modular systems suggest an alternative understanding of vocational knowledge itself that knowledge is now understood as a collection of competencies as opposed to a unified body of disciplinary knowledge. This change has its opportunities and threats. The chance is in the understanding that modern employees do not have to master whole professional areas before they can be productive; specific skills can be acquired quickly to enter the labor markets with further learning continuing competence in the long run. The danger is in fragmentation: in case knowledge is modularized, learners can gain discrete skills without the integrative knowledge that allows them to adapt to new circumstances.

This tension is clarified by the hermeneutic analysis of competency-based education by Hodge et al. (2020). They claim that competency frameworks tend to blur the interpretive aspects of professional practice, how practitioners need to read situations, make judgments, and use various sources of knowledge in context. Modular systems have the danger of exacerbating this issue by introducing skills as self-contained units whose interrelationships are not visible. Good modular design should thus not only be concerned with the granular specification of learning outcomes but also with the integrative experiences, projects, workplace applications, reflective practices, in which learners can assemble modular components into coherent vocational capability.

15.4.3 Micro-Credentialing and the New Politics of Recognition

The most obvious form of modularity in modern vocational education is micro-credentials. Micro-credentials have been spread in educational and training settings, defined by the European Commission as the record of learning outcomes after a small amount of learning, measured against transparent standards. An example is the AutoCredify project, which creates micro-credentials in the automotive maintenance industry to workers at EQF levels 3–5 in response to the twin green and digital transitions by creating short, focused courses that improve employability and

career resilience. In the same way, the METASKILLS4TCLF project develops micro-credentials in circular economy and digital fashion in the textile, clothing, and leather industries (Capecchi et al., 2025).

The potential of micro-credentials is that they are responsive, portable, and accessible (Brodolini, 2025). In contrast to the traditional qualifications, which demand long-term time commitment and predetermined routes, micro-credentials enable the targeted, flexible acquisition of knowledge, skills, and competences to address new and emerging needs (European Centre for the Development of Vocational Training, CEDEFOP, 2025a, 2025b). They may be accumulated into bigger credentials as time goes by, allowing learners to accumulate qualifications as they work. They are especially useful with disadvantaged learners, as CEDEFOP observes: "The division into units or modules also contributes to meeting the training requirements of the groups with certain difficulties, including the low-skilled or the unemployed one."

However, the spread of micro-credentials poses immediate concerns regarding quality assurance, recognition, and trust. The reputation of the issuer of the micro-credential is essential to their trust, as the research of CEDEFOP highlights. Accredited or certified VET providers have a greater degree of trust compared to non-accredited or non-certified providers. The disintegration of credentialing among various providers, including educational institutions, companies, online platforms, professional associations, is threatening to establish a situation where learners cannot reliably indicate their capabilities and employers cannot reliably interpret credentials (European Forum of Technical and Vocational Education and Training, EfVET, 2025).

The MICROIDEA project will solve these issues by creating maturity indicators of micro-credential systems. Based on models first created in the context of higher education, MICROIDEA applies maturity criteria to the vocational setting, focusing on strategic alignment, stakeholder co-creation, stackability, and prior learning recognition. The objective of the project, Level 3 maturity, is a strategic, inclusive, and sustainable ecosystem where micro-credentials are not an experiment but a fundamental element of learner journeys and workforce development (Brodolini, 2025).

15.4.4 Generative AI and Curriculum Design Automation

Generative AI adds another layer to modular vocational education. AI systems can now be used to help in curriculum design, course classification and even content generation. The article by Öncü (2024) on the application of ChatGPT-4 to categorize 1,135 open and distance learning courses based on ISCED fields shows that AI can be used to facilitate administrative tasks and analyze the vocational course offerings on a large scale. These applications imply a future where AI systems can be used to keep the currency of modular curricula up-to-date by constantly examining labor market data, new skills requirements, and student performance.

More boldly, AI could facilitate genuinely adaptive learning processes that can change dynamically to the progress of individual learners and evolving work demands. Recent studies on ChatGPT in curriculum planning support this potential for adaptive and scalable planning (Rawas, 2024) Chinese vocational teachers imagine intelligent learning companions that offer 7 × 24-h guidance and resource services, and the metaverse and digital twin technologies that can build immersive practice environments. These opportunities are in line with the promise of personalization and responsiveness of on-demand learning.

Nevertheless, the introduction of AI in the design of vocational curriculum also brings up ethical concerns. Who makes sure that AI-generated curricula are based on different views and do not reproduce bias? What is the level of transparency of the algorithms used to determine recommended learning pathways? What becomes of learner data gathered by adaptive platforms? These questions are to be considered because vocational systems adopt AI-enabled modularity.

15.5 Institution to Ecosystem: Reconceptualizing Vocational Learning Spaces

The second conceptual dimension follows the change in the perception of vocational education as institutionally constrained to the re-conceptualization of vocational education as an ecosystem of distributed learning opportunities. This change disrupts the basic beliefs regarding the location of learning, the person who certifies competence, and the quality of education.

15.5.1 The Institutional Model and Its Limitations

The institutional model of vocational education focuses on specific providers, such as vocational schools, colleges, training centers, which regulate curriculum, teaching, and certification. Students arrive at schools; schools certify students. This model has been known to bring stability, quality assurance and accountability to the people. Institutions amass experience, facilities, and professional teachers who are committed to teaching.

However, the institutional model is increasingly challenged in the environment of high change and mobility of learners. Curricula cannot keep pace with the changes in technologies. Their facilities can be behind the workplace equipments. Their time schedules do not match the time requirements of working students. Most fundamentally, perhaps, the institutional model presupposes that learning is preparation of work, not a continuing aspect of work (OECD, 2024).

15.5.2 The Ecosystem Metaphor

Another conceptualization is the ecosystem metaphor. Various actors in a learning ecosystem, including educational institutions, companies, industry associations, online platforms, professional networks, individual mentors, contribute to the development of skills. Students move through this ecosystem, constructing learning experiences across a variety of providers. There is a continuous flow of knowledge between production and learning sites. The credentials are produced through various sources and the recognition is based on the trust of the employer and acceptance of the industry and not on the institutional monopoly.

This ecosystemic change is clarified by Amiel (2024) in his analysis of platformization in open education. The author states that digital platforms are not only new educational delivery tools but new forms of organization that restructure relationships between learners, educators, and institutions. Platforms facilitate distributed provision, data-driven personalization, and novel credentialing that circumvents traditional institutional gatekeepers. The author, however, also cautions that platformization puts power in the hands of platform owners, which is a cause of concern regarding the governance of data, the control of algorithms, and the commodification of learning.

15.5.3 Co-creation of Stakeholders and Distributed Governance

Ecosystemic vocational education suggests new forms of governance and quality assurance. Instead of having central authorities define curricula and accredit providers, ecosystemic approaches focus on stakeholder co-creation. The EMPASS project is no exception: the EmPass micro-credential was designed by JA Europe, industry partners, such as Zurich Insurance Group and Manpower Group, and educational institutions, with the concept of industry co-creation and buy-in being at the core of its design.

The research of CEDEFOP proves that successful micro-credentialing needs to explore the variety of non-formal micro-credentials and focus on quality assurance and recognition by means of multi-stakeholder dialogue. The European model of micro-credentials underlines that micro-credentials are supported by quality assurance in accordance with accepted standards in the sector or field of operation, and acknowledges that sector-specific communities are often in the best position to establish relevant competencies (CEDEFOP, 2024a, 2024b).

This model of distributed governance has benefits of responsiveness and relevance. When industry players are directly involved in the design of the credentials, the credentials will be more likely to be based on the real needs in the workplace. In cases where learners are involved in the development of credential formats and delivery modes, as in the MICROIDEA project, the resulting products are more responsive

to the needs of learners. The European model of micro-credentials underlines that micro-credentials are supported by quality assurance in accordance with accepted standards in the sector or field of operation (CEDEFOP, 2024a, 2024b). This aligns with OECD analysis highlighting the importance of quality assurance and recognition to support learners' participation and labor market outcomes (OECD, 2024).

15.5.4 Digital Infrastructure and Cross-Border Portability

Ecosystemic vocational learning relies on digital infrastructure that allows credentials to be transferred across contexts. This imperative is reflected in the attempts of the European Union to create common standards of micro-credentials. According to CEDEFOP (2024a, 2024b), the process of credential recognition is further complicated by a fragmented landscape of regulations and tools, and incoherence between developed transparency tools. To overcome this fragmentation, it is necessary to invest in interoperable platforms, common data standards, and mutual recognition agreements.

The ReadSpeaker project is an example of how digital technologies can facilitate cross-border portability (ReadSpeaker, 2026). ReadSpeaker allows learners to access micro-credential content in their native languages, including indigenous African languages like IsiXhosa and SiSwati, by offering text-to-speech technology in more than 50 languages, eliminating language barriers to skill acquisition. These tools help in what the OECD refers to as inclusive environments in which all learners can flourish (OECD, 2024).

Bigger infrastructure projects are envisioned where European Digital Identity wallets are used where learners can store verifiable credentials, which can be instantly verified across borders. Such technical advances should be supported by policy frameworks that create mutual recognition and quality assurance standards. These issues are explicitly covered in the CEDEFOP workshop on "Microcredentials and the Future of Learning" and the breakout sessions on "Building Trust: The Power of Quality Assurance in Microcredentials" and "Global Credentials: Making Microcredentials Recognisable and Portable" (CEDEFOP, 2024a, 2024b).

15.6 Employment to Employability: The Changing Work and Learning

The third conceptual dimension looks at how the focus of on-demand learning on constant adaptation is blurring the line between education and employment, changing the definition of work and the role of workers. This part is a critical analysis of the liberatory possibilities and the exploitative potentials of this transformation.

15.6.1 The Employability Paradigm

The transformation of employment into employability is a radical change in the relationship between people and labor markets. Employment refers to a comparatively stable condition: to be employed is to have a job, to be in a position in an organizational system. Employability refers to a potential: to be employable is to have the skills and qualities that are appealing to prospective employers. The employability paradigm shifts the responsibility of adaptation to individuals, who have to constantly invest in their human capital to be useful in evolving labor markets.

On-demand learning fits the paradigm of employability perfectly. On-demand learning allows workers to react to the new labor market signals, acquiring the necessary skills on-demand, and closing the skills gaps as they occur. Micro-credentials enable employees to indicate their existing skills to potential employers, enabling job and sector mobility. Credential stackability facilitates lifelong learning paths where workers acquire new skills as they progress through their careers.

15.6.2 The Accelerationist Critique

However, critical scholars caution that the employability paradigm, which is enhanced by on-demand learning, can further accelerate the working life. Once learning is integrated into work and made continuous, the distinction between paid work and self-investment is blurred. Employees are under pressure to upskill not only when they are in training but also in the evenings, weekends and during commutes. The flexibility promise masks the precarity reality: when workers are held accountable to remain employable, then unemployment becomes a personal failure and not a structural one.

This dynamic is clarified by the analysis of social acceleration by Rosa (2013). The speeding up of social change, the rapid development of skill needs, is added to the speeding up of the pace of life, the shortening of action episodes, to form the situation when workers have to learn during their working and work during their learning. The period of reflection, of rest, of non-instrumental activity becomes shorter. Instead of being a relief of productive labor, vocational education is incorporated into its aggravation.

15.6.3 Toward Human-Centered Flexibility

An anthropocentric approach to on-demand learning should be able to withstand accelerationist impulses and adopt justifiable flexibility. The vocational On-demand learning (VODL) as formulated here demands a number of principles that moderate the employability paradigm with ethical obligations.

First, VODL underlines that learning must be used to promote human flourishing, rather than just participation in the labor market. Although employability is important, it is not the sole objective of vocational education. Students should also be given a chance to acquire vocational identity, moral judgment, and critical awareness of the social and ecological context of their work. These dimensions take time to reflect on which accelerationist models repress.

Second, VODL acknowledges that flexibility should be a two-way process, not one-sided. When workers are supposed to learn constantly, employers and governments have to offer the same: paid learning time, career advice, income insurance during transitions, and the acknowledgment of learning as valuable work. The focus of the European Commission on the human-centered values of equity, purpose, and ethical responsibility offers a policy direction that is consistent with this principle.

Third, VODL stipulates that micro-credentials and modular pathways should be integrated into larger systems that safeguard learners against fragmentation and exploitation. The experience of micro-credential development in China shows both opportunities and challenges: although micro-certificates are facilitating the shift of the Chinese education system toward a competency-based system rather than a degree-based one, there are still major gaps in quality assurance, cross-provincial recognition, and alignment with national qualification systems. These gaps need to be filled through concerted policy efforts, rather than market-based solutions.

15.7 Vocational On-Demand Learning (VODL): An Integrative Framework

Summarizing the above discussion, this section defines Vocational On-demand learning (VODL) as a synthesizing model that balances on-demand learning principles with human-centered values. VODL is not a technical specification, but a normative orientation—a collection of commitments and design principles that ought to inform the development of on-demand learning in vocational settings.

15.7.1 Core Principles of VODL

VODL is based on four principles that are interrelated:

Epistemological Pluralism: Vocational knowledge is heterogeneous and includes codified technical knowledge, tacit knowledge acquired through practice, ethical judgment, and critical reflection. VODL systems should support this pluralism, and not to diminish all learning to measurable competencies. Modular design must maintain interrelations among modules and facilitate integrative experiences in which learners acquire coherent vocational capability.

Practical Implications: Policymakers should support frameworks that recognize both technical and integrative competencies. QA systems should evaluate not only skill acquisition but also reflective and ethical learning. Accreditation bodies should recognize stackable and modular credentials as equivalent to traditional qualifications when they demonstrate holistic vocational capability.

Temporal Justice: The temporal needs of learning should be shared equally among workers, employers, and the state. VODL is against the individualization of the acceleration pressure and demands structural supports of learning time. It acknowledges that various learners possess varying temporal resources and creates pathways based on them.

Practical Implications: Policy should ensure paid learning time and career guidance support. QA measures should monitor equitable access to learning opportunities. Recognition frameworks should validate learning progress achieved over flexible timelines or part-time learning arrangements.

Democratic Governance: VODL systems should be designed and monitored by those who are affected. Students, employees, teachers, and society must be involved in the determination of valuable skills, the development of credentials, and quality assurance. Stakeholder co-creation is not instrumentally useful in the alignment of provision with demand but inherently useful as a manifestation of democratic citizenship.

Practical Implications: Policies should mandate multi-stakeholder involvement in curriculum design and credentialing. QA frameworks should assess transparency and fairness in governance processes. Accreditation bodies should consider stakeholder validation, including industry and learners, in recognizing credentials.

Ecological Consciousness: Vocational education should equip workers to the great transition to sustainable economies. VODL is more concerned with green skills and helps learners to comprehend the ecological implications of their work. It opposes the narrowing of sustainability to technical competency, demanding ethical involvement in environmental issues.

Practical Implications: Policy should integrate sustainability competencies into vocational frameworks. QA systems should measure outcomes in environmental awareness and practice. Accreditation and recognition standards should formally validate green and ethical competencies as part of vocational qualifications.

15.7.2 A Conceptual Typology of Vocational Transitions

Table 15.2 presents a conceptual typology tracing three transitions in vocational education's evolution toward VODL. This typology illuminates both the direction of change and the contested nature of each transition. The VODL model does not simply extend transitional trends but selectively incorporates elements that preserve human-centered commitments while enabling appropriate flexibility. Table 15.2 illustrates a conceptual typology that maps the evolution of vocational education across three

distinct models: the Traditional Model, the Transitional Model, and the advanced VODL Model (Vocational On-Demand Learning).

This framework given in the Table 15.2 compares the models on six fundamental dimensions, with a clear movement toward more flexible, networked and learner-centered systems.

Knowledge Organization: Traditional systems are based on inflexible, standardized curricula. Modular courses are brought in by transitional models. The VODL model establishes integrative ecosystems that have stackable credentials, which enable learners to accumulate qualifications across providers.

Learning Space: Traditional learning is limited to closed institutions such as schools. Transitional strategies combine the physical and online space. VODL completely disseminates learning through networks of various providers, making it available everywhere.

Temporal Orientation: Traditional models focus on preparation that is front-loaded prior to the commencement of work. Periodic upskilling is facilitated by transitional systems. VODL integrates lifelong learning into the work life, and it has inbuilt safeguards against lifelong learning.

Credentialing: Endpoint validation is provided by traditional diplomas and certificates. Bite-sized skills are provided by transitional micro-credentials. VODL applies stackable credentials within larger qualifications frameworks to allow smooth progression.

Governance: State or professional bodies have traditional control. Transitional models entail stakeholder alliances. VODL creates democratic multi-stakeholder governance, which balances various interests.

Status of Worker: Traditional workers are ordinary employees. Transitional flexibility produces flexible workers. VODL redefines this as safeguarded "learner-workers" who have formal learning rights.

Overall Progression

The typology emphasizes directional change between centralized, time-bound systems and distributed, continuous systems, and observes tensions, VODL does not simply extrapolate trends but selectively maintains human-centered aspects such as protections and entitlements in the face of flexibility.

15.7.3 Policy and Practice Implications

VODL suggests a number of priorities to policymakers. To begin with, the investment in digital infrastructure that facilitates interoperability, portability, and accessibility among various providers and regions. Second, quality assurance frameworks should be developed that can support distributed provision and ensure that learners are not exploited. Third, establishment of learning entitlements, paid time, income support, guidance services, which allow workers to exercise flexibility without having to pay the entire cost. Fourth, micro-credential articulation with national qualification

Table 15.2 Conceptual typology of vocational transitions

Dimension	Traditional model	Transitional model	VODL model
Knowledge Organization	Fixed, standardized curricula; minimal flexibility	Modular courses introduced; learners can mix standard and modular content; allows contextual adaptation depending on sector, region, or institution	Fully modular, integrative ecosystem; stackable credentials; learners accumulate qualifications across multiple providers; supports personalization and rapid reskilling
Learning Space	Physical classrooms and institutions; learning confined	Hybrid physical + online spaces; modular content delivered through multiple channels; allows partial remote and distributed learning	Networked, fully distributed learning across physical, online, and workplace environments; accessible anytime, anywhere
Temporal Orientation	Pre-work front-loaded learning; fixed durations	Periodic upskilling; flexible timing for modules; learners may accelerate or decelerate depending on context	Lifelong learning fully embedded in work life; includes inbuilt safeguards for reflection and temporal equity
Credentialing/ Recognition	Diplomas, certificates issued by institution; high trust but rigid	Micro-credentials introduced; may be recognized by sector-specific or institutional frameworks; transitional recognition requires alignment	Stackable micro-credentials linked to national/regional qualification frameworks; interoperable across providers; ensures both portability and trusted recognition
Governance/ Quality Assurance	Centralized; state or professional bodies control curricula and certification; consistent but inflexible	Multi-stakeholder alliances; governance shared between institutions, employers, and professional bodies; allows context-specific adaptation	Democratic, multi-stakeholder governance; robust QA frameworks to ensure equity, transparency, and recognition; policy-guided oversight; scalable to cross-sectoral and cross-national contexts

(continued)

Table 15.2 (continued)

Dimension	Traditional model	Transitional model	VODL model
Status of Worker/ Learner	Standard employees; limited rights to learning	Flexible workers; learners navigate hybrid system; can customize pathways; transitional spectrum allows adaptation to local regulations or labor market demands	"Learner-workers" with formal learning rights; protected entitlements; active participants in modular ecosystems; lifelong skill development emphasized
Spectrum/ Contextual Function	Fixed	Transitional model spans a spectrum: allows contextualization depending on geopolitical, regulatory, or institutional constraints; acts as bridge from rigid systems to full VODL	Fully flexible, adaptive, human-centered; universal applicability with safeguards for equity and recognition

frameworks to make sure that modular learning can be accumulated to meaningful qualifications.

VODL means new roles and competencies to educators. Teachers are transformed into facilitators of learning, curriculum designers, and quality assurers instead of being the exclusive sources of knowledge. They need to build the ability to work with AI tools, to create integrative experiences that bridge modular components, and to assist learners in navigating complex ecosystems. The Chinese vocational education reform focuses on the fact that teachers should possess good knowledge extraction and reconstruction skills, correctly recognize and develop core principles of strong foundation, and become professionals in the implementation of large models.

VODL means opportunities and responsibilities to learners. The chance is in the increased flexibility, individualization, and attention to personal objectives. It is the task of active navigation of learning ecosystems, informed selection of pathways, and continuous involvement in skill development. To assist learners in fulfilling these roles, it is necessary to have strong guidance services and clear information on the quality of credentials and labor market value.

15.8 Conclusion: Vocational Education and the Human Future of Work

On-demand learning has been theorized in this chapter as a paradigm shift in vocational education in the age of automation, platformization, and generative artificial intelligence. It has used philosophical concepts of social acceleration and supercomplexity to examine the shifts in standardization to modularity, institution to

ecosystem, and employment to employability that define the rise of on-demand learning. It has shed light on the potentials and the paradoxes of implementing AI-based, adaptive learning systems into vocational settings through hermeneutic analysis of modularity, micro-credentialing, and digital ecosystems.

The idea of Vocational On-demand learning (VODL) that was created here provides an integrative approach that accepts the flexibility and responsiveness of On-demand learning but demands human-centered values. VODL does not defend the traditional institutions in a nostalgic way or blindly accept technological acceleration. Rather, it aims to influence the shift to On-demand learning in a manner that maintains equity, ethical commitment, and human flourishing.

There are a number of implications that should be highlighted. To start with, the shift to On-demand learning is not only technical but also philosophical. It demands a reconsideration of basic types of skill, competence, qualification, profession, which have organized vocational education over generations. This reconsideration should not be done in secrecy, but it should involve all the stakeholders who are affected by it.

Second, On-demand learning relies on institutional and policy frameworks that are not yet in place in most settings. Micro-credentials need quality assurance; modular pathways need articulation frameworks; distributed ecosystems need governance mechanisms; learning entitlements need political will. The main challenge of vocational education policy in the next decade is the construction of these frameworks.

Third, the transformation of vocational education should be informed by the vision of human purposes of work. Vocational education is not only a question of matching people to jobs but of helping people to serve the society, to realize their potentials, to get a sense of purpose in productive work. This humanistic orientation is not less significant in the circumstances of the rapid technological change. The university of the future, as Barnett (2023) suggests, should assist students in navigating supercomplexity without losing touch with values and purposes that extend beyond the immediate needs of labor markets. The same applies to vocational education.

15.8.1 Limitations of Study

This chapter is based on a philosophical-conceptual approach and does not present new empirical data. While it provides a rigorous theoretical and normative framework for Vocational On-Demand Learning (VODL), its findings are interpretive and require empirical validation. Context-specific variations, such as local labor markets, institutional capacities, or learner experiences, are not captured. Future research should complement this work with empirical studies to test the practical impact of VODL across diverse settings. Beside there are several questions that needs to be addressed related to vocational education.

15.8.2 Key Questions and Opportunities for Future Research

The future of vocational education will be determined by the way we respond to the basic questions: Who will pay the costs and risks of continuous learning? What is the way to have flexibility and security? What types of knowledge are important when skills are becoming obsolete fast? What can vocational education do to equip workers not only to the economy as it is but to the economy as it ought to be, more just, more sustainable, more democratic? This chapter has provided some conceptual materials to address these questions. However, more researches are needed to fully answer these questions and the responses should be crafted by means of shared thinking, institutional creativity, and continuous critical thinking about the functions and opportunities of vocational learning in the twenty-first century.

References

Amiel, T. (2024). Open education and platformization: Critical perspectives for a new social contract in education. *Prospects, 54*, 341–350. https://doi.org/10.1007/s11125-023-09660-x

Atkinson, P., & Flanagan, T. (2024). Humanities on demand and the demands on the humanities: Between technological and lived time. *Studies in Philosophy and Education, 43*(2), 143–160. https://doi.org/10.1007/s11217-024-09931-w

Avis, J. (2018). Socio-technical imaginary of the fourth industrial revolution and its implications for vocational education and training: A literature review. *Journal of Vocational Education & Training, 70*(3), 337–363. https://doi.org/10.1080/13636820.2018.1498907

Barnett, R. (2000). *Realizing the university in an age of supercomplexity*. Society for Research into Higher Education & Open University Press.

Barnett, R. (2023). Only connect: Designing university futures. *Quality in Higher Education*. Advance online publication. https://doi.org/10.1080/13538322.2022.2100627

Brodolini, F. C. (2025, June 22). *Micro-credentials in Hungary, our role in OECD's project* [Press release]. https://www.fondazionebrodolini.it/en/news-and-events/micro-credentials-hungary-our-role-oecd-project

Capecchi, I., Borghini, T., De Rosa, A., Bernetti, I., & Souto, R. (2025). Metaskills4tclf Erasmus+: Development of a virtual reality technology for skills development in the textile, clothing, leather and footwear industries. In *Proceedings of the International Conferences on Mobile Learning 2025 and Educational Technologies 2025* (pp. 177–184). IADIS Press.

CEDEFOP. (2024a). *Exploring the emergence of microcredentials in vocational education and training (VET)*. Publications Office of the European Union. https://doi.org/10.2801/671358

CEDEFOP. (2024b). *Microcredentials: Striving to combine credibility and agility*. Publications Office of the European Union.

CEDEFOP. (2025a). *Microcredentials for labour market education and training*. Publications Office of the European Union.

CEDEFOP. (2025b). *Microcredentials for lifelong learning and employability*. OECD Publishing. https://doi.org/10.1787/9c4b7b68-en

EfVET. (2025, October 22–25). *Well-being in a digitalised world: Crafting the future of VET 2035* [Conference proceeding]. European Forum of Technical and Vocational Education and Training. https://efvet.org/annual-conference/a-learning-platform-for-vet-wellbeing-in-a-digitalised-world-crafting-the-future-ofvet-2035/

European Commission Joint Research Centre. (2025). *Supporting the digital transformation of vocational education and training*. Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/bitstream/JRC141881/JRC141881_01.pdf

European Commission. (2022). *A European approach to micro-credentials*. Publications Office of the European Union.

Fleischmann, K. (2022). A paradigm shift in studio pedagogy during pandemic times: An international perspective on challenges and opportunities teaching design online. *Journal of Design, Business & Society, 8*(2), 247–272. https://doi.org/10.1386/dbs_00042_1

Hebei Industrial Vocational and Technical University. (2025). AI助推职业本科教学范式创新 [AI promotes innovation in vocational undergraduate teaching paradigms]. *China Education Daily*. https://www.hbcit.edu.cn/info/1006/14131.htm

Hodge, S., Mavin, T., & Kearns, S. (2020). Hermeneutic dimensions of competency-based education and training. *Vocations and Learning, 13*(1), 27–46. https://doi.org/10.1007/s12186-019-09227-y

Kant, I. (1998). *Critique of pure reason* (P. Guyer & A. W. Wood, Trans.). Cambridge University Press (original work published 1781).

Kincheloe, J. L. (1999). Critically considered. *The Post-Formal Reader: Cognition and Education, 20*, 313.

Knox, J. (2024). Postdigital research. In *Encyclopedia of postdigital science and education* (pp. 1–6). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-35469-4_61-1

Kovalchuk, V. I., Maslich, S. V., & Movchan, L. H. (2023). Digitalization of vocational education under crisis conditions. *Educational Technology Quarterly* (1), 1–17. https://doi.org/10.55056/etq.49

Lin, X. (2025). Exploration of the development path for professional teaching resource libraries in vocational education: A case study of the mechanical design, manufacturing, and automation major. *Journal of Modern Educational Theory and Practice, 2*(12).

Nakar, S. (2025). Navigating ethical landscapes: Vocational educators' adaptations through and beyond COVID-19. *International Journal of Lifelong Education*, 1–27. https://doi.org/10.1080/02601370.2025.2577204

OECD. (2023). *Building future-ready vocational education and training systems*. OECD Publishing. Retrieved from https://www.oecd.org/en/publications/building-future-ready-vocational-education-and-training-systems_28551a79-en.html

OECD. (2024). *OECD Economic Outlook*, Volume 2024 Issue 2. OECD Publishing. https://www.oecd.org/en/publications/oecd-economic-outlook-volume-2024-issue-2_d8814e8b-en.html

OECD. (2026). *OECD Digital Education Outlook 2026*. OECD Publishing. Retrieved from https://www.policyedge.in/p/oecd-digital-education-outlook-2026

Öncü, S. E. (2024, November). Harnessing AI for ISCED labelling of ODL courses. In *Proceedings of the International Conference on Education Research*. Academic Conferences and Publishing Limited.

Rawas, S. (2024). ChatGPT: Empowering lifelong learning in the digital age of higher education. *Education and Information Technologies, 29*, 6895–6912. https://doi.org/10.1007/s10639-023-12114-8

ReadSpeaker. (2026). *Text to speech software for eLearning, education & training: Inclusive content and multilingual support*. ReadSpeaker. https://www.readspeaker.com/sectors/education

Rosa, H. (2013). *Social acceleration: A new theory of modernity*. Columbia University Press.

Varadarajan, S., Koh, J. H. L., & Daniel, B. K. (2023). A systematic review of the opportunities and challenges of micro-credentials for multiple stakeholders: Learners, employers, higher education institutions and government. *International Journal of Educational Technology in Higher Education, 20*, 13–27. https://doi.org/10.1186/s41239-023-00381-x

World Economic Forum. (2025). *The future of jobs report 2025*. World Economic Forum. https://www.weforum.org/publications/the-future-of-jobs-report-2025/

Xu, J., & Zhang, J. (2025). Exploration on the innovative development model of digital teaching materials in higher vocational colleges in China under the background of industry-education

integration: Taking digital English teaching materials in higher vocational medical colleges as an example. *The Educational Review, USA*, *9*(7).
Zhang, H., Meng, F., & Wang, Q. (2026). Comprehensive education and flexible learning: Merging Chinese wisdom with contemporary pedagogical practices. *European Journal of Education*, *61*(1), e70382. https://doi.org/10.1111/ejed.70382

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Chapter 16
Microcredentials as Catalysts for Skills Transformation: Trends and Developments in Mauritius and Namibia

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Abstract As workforce demands accelerate and occupational profiles evolve, higher education systems are increasingly challenged to support *on-demand learning*—learning that is timely, modular, flexible, and responsive to immediate skills needs. Microcredentials have emerged as an important instrument to operationalise on-demand learning within regulated education systems, particularly through short, targeted, and credit-bearing learning units. This chapter presents case studies of Mauritius and Namibia, examining how their respective governance frameworks and regulatory arrangements influence the capacity of microcredentials to be developed, delivered, and scaled as flexible, on-demand learning mechanisms. Drawing on policy and document analysis for Mauritius and stakeholder survey evidence and consultations for Namibia, the chapter considers a regulator-led model (Mauritius) and an institution-led model (Namibia). The analysis demonstrates that Mauritius has established the conditions for system-wide on-demand learning through legal authority a nationally approved Microcredentials Blueprint, quality assurance oversight, and a national credit value and transfer system. Namibia shows strong stakeholder demand for microcredentials as on-demand upskilling instruments. The chapter concludes

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by outlining policy and implementation recommendations for embedding microcredentials as credible on-demand learning pathways within African higher education systems, emphasising governance coherence, industry co-design, and credit portability as critical enablers.

Keywords On demand learning · Microcredentials · Mauritius · Namibia · Regulator-led governance · Credit transfer · Industry co-design · Quality assurance · Small island developing state

16.1 Introduction

Education systems globally are being reshaped by rapid technological change and advancements, evolving workforce needs, and the growing policy consensus that learning must be lifelong and responsive. Traditional qualifications remain central to higher education, yet are increasingly complemented by shorter, modular and competency-based learning pathways that support on-demand upskilling and reskilling. On-demand learning has become a critical feature of contemporary education and training systems, particularly in the context of rapid technological change, digitalisation, and globalisation, which are continuously reshaping labour-market demands. Traditional, time-bound models of education are often insufficiently responsive to these shifts, resulting in persistent skills gaps and mismatches. Moreover, the accelerating pace of job transformation and the emergence of new occupational roles underscore the need for education systems that can respond swiftly to evolving skills requirements (World Economic Forum, 2020).

On-demand learning is closely linked to microcredentials, as the latter provide modular, flexible, and verifiable units of learning that can be accessed and accumulated just in time to meet emerging skills needs and support continuous professional development (European Commission, 2022; OECD, 2021; UNESCO, 2022). Microcredentials have gained prominence as one such innovation: they offer targeted opportunities to acquire specific skills and competencies, often delivered digitally, verified through portable credentials, and designed to support recognition by employers and educational institutions (European Commission, 2022). In this context, microcredentials respond to the increasing demand for flexible, rapid, and labour-market-relevant learning that can be accessed throughout the life course. They are particularly relevant in economies facing accelerated technological change, evolving occupational profiles, and the need to continuously update skills in response to digitalisation and globalisation (OECD, 2021).

This chapter focuses on the case of Mauritius and that of Namibia. Mauritius, a Small Island Developing State (SIDS), and Namibia, a geographically large and dispersed country, present different national contexts, and specificities although they present similarities to the development of microcredentials. In both contexts, there is a growing need to support workforce upskilling and reskilling in response to evolving labour-market demands driven by digitalisation, technological change, and economic

diversification (ILO, 2021; World Bank, 2019). Both Mauritius and Namibia also continue to rely significantly on traditional graduate education pathways, which are often not sufficiently flexible or responsive to rapidly changing skills requirements (OECD, 2023a, 2023b; World Bank, 2018). As a result, microcredentials are increasingly viewed in both settings as complementary mechanisms to strengthen lifelong learning systems, enhance employability, and provide more agile and targeted forms of skills development aligned with national development priorities (OECD, 2023a, 2023b; UNESCO-UIL, 2022).

Against this backdrop, this chapter examines how Mauritius and Namibia are developing microcredentials as system-level instruments for on-demand learning, and how governance choices condition their effectiveness for skills development, workforce alignment, and learner mobility.

16.1.1 Setting the Scene—Mauritius

Mauritius is a Small Island Developing State with a population of about 1.25 million and a land area of approximately 2,040 km^2. The country's population includes a substantial working-age cohort, supported by relatively high human capital development. At the tertiary level, the gross enrolment ratio reached around 54.9% in 2024 (Statistics Mauritius, 2025), reflecting broad participation in higher education. Government investment in education remains significant, and Mauritius has achieved upper-middle-income status with a GDP per capita of about USD 11,600–12,000 in 2024, underscoring its relatively advanced economic position within the region. Its economy is diversified across ICT, financial services, manufacturing, tourism, and the blue economy, underpinned by sustained public and private investment in education and skills development.

The Government Programme 2025–2029 places strong and explicit emphasis on higher education, research, science and innovation as central pillars for Mauritius's transformation into a knowledge-driven and innovation-led economy. It recognises higher education institutions as critical engines for human capital development, advanced skills formation, and national competitiveness, while positioning research and innovation as key drivers of productivity, evidence-based policymaking and economic diversification.

Mauritius has a dynamic higher education system, encompassing public and private HEIs. The sector is regulated by multiple bodies that play complementary roles: the Higher Education Commission (HEC) oversees and regulates the higher education sector; the Mauritius Qualifications Authority (MQA) regulates the TVET sector; and the Quality Assurance Authority (QAA) monitors institutional quality processes and compliance. At the forefront of innovation, the HEC has spearheaded transformative initiatives, including the National Credit Value and Transfer System (NCVTS), the expansion of open, distance, and online learning (ODL), and the development of a framework on microcredentials.

While Mauritius has maintained strong public and private investment in higher education and has successfully developed a more diversified economy, significant skills gaps continue to persist. These gaps are particularly pronounced in specialised, technical, and digital competencies, including advanced ICT skills (such as data analytics, artificial intelligence, and cybersecurity), engineering and applied sciences, and industry-relevant digital literacy across sectors. These deficiencies limit the capacity of firms to adopt new technologies, innovate, and improve productivity. They have been consistently identified by businesses and policy reviews as binding constraints on firm performance and as key barriers to growth in technology-intensive and knowledge-driven sectors (OECD, 2024).

Crucially, their formal recognition and alignment with national frameworks ensure that microcredentials are embedded within clear progression and articulation pathways in the HE system. This approach is strongly reinforced by the Ministry of Tertiary Education, Science and Research, which places significant emphasis on the development of coherent and flexible learning pathways as a cornerstone of HE reform. Consequently, the integration of learning pathways, including progression from microcredentials to full qualifications and degree programmes, will be a central consideration in the National Strategy for Higher Education, supporting lifelong learning while strengthening system coherence, widening access, and safeguarding quality and learner protection within the Mauritian higher education landscape.

Mauritius is developing an operational model for industry-led, academia–industry co-designed microcredentials, aimed at ensuring strong alignment between learning outcomes and labour-market needs, particularly in priority sectors. Given the increasing importance of microcredentials in the labour market, there is a clear need for such credentials to be regulated, quality assured, and benchmarked across institutions to ensure employer confidence and workforce adoption (OECD, 2021; UNESCO, 2023).

16.1.2 Setting the Scene—Namibia

Namibia is situated in southwestern Africa with a population size of 3.02 million, consisting of mostly young people with 71.1% under the age of 35 years, and the youth population (15–34 years) constituting 34.1%. With a land area of 824,269 km^2, Namibia remains one of the most sparsely populated countries globally, and the 2023 census findings also indicate a 50:50 balance between urban and rural populations (Namibia Statistics Agency [NSA], 2024).

Namibia's economy is mostly driven through its natural resource sector, with the petroleum and energy sector fast developing. Within the longer-term national policy context, Vision 2030 frames the aspiration for an integrated and high-quality education and training system, while subsequent National Development Plans emphasise closer alignment between the education system and industrial needs.

Namibia's education and training system spans from early childhood education up to tertiary education. In Higher Education, total enrolment in 2023 was 80,196

students in public and private HEIs registered with the Ministry of Higher Education, Technology and Innovation; 54% of these students were enrolled at the two public universities, University of Namibia and Namibia University of Science and Technology, while the International University of Management is the largest private HEI by enrolment.

Namibia is also facing an array of labour-market challenges, including high youth unemployment and significant skills mismatches between education outcomes and industry needs. According to Mukokobi (2025), the country's overall unemployment rate stands at 36.9% and youth unemployment at 44.4%, amid persistent imbalances between the skills supplied by the workforce and those demanded by employers across key sectors. The PoMiSA (2024) report highlights structural gaps in technical and specialised skills, and notes continuing concerns about the relevance of education and training to labour-market needs and challenges that can be turned into opportunities through flexible, targeted upskilling mechanisms such as microcredentials. In this setting, microcredentials are increasingly discussed as a flexible mechanism for targeted upskilling and reskilling, particularly where labour-market requirements shift faster than traditional programme cycles (OECD, 2021).

Namibia follows a more institution-led approach. Microcredentials in Namibia are primarily developed and delivered by Higher Education Institutions (HEIs) and training providers through short courses and unit standards, with ongoing national coordination and stakeholder consultations aimed at formalising and strengthening the system as it continues to evolve. At country level, the evidence base has been developed through stakeholder engagement (including survey-based inputs and consultative workshops), which informs the early-stage formalisation of a national framework to guide recognition, quality assurance, and integration of microcredentials within formal and non-formal learning pathways (Namibia Qualifications Authority, 2023).

This evolution takes place within an established tertiary education quality assurance environment underpinned by legal instruments and institutional arrangements, including statutory bodies with mandates linked to the National Qualifications Framework (NQF), accreditation, programme-level quality processes, and Recognition of Prior Learning (RPL) notably the Namibia Qualifications Authority, the National Council for Higher Education, and the Namibia Training Authority.

A key implication for microcredentials is that stakeholders emphasise formalisation through clear standards and nationally recognised arrangements, including quality assurance policy guidelines and minimum standards for open and distance higher education institutions and programmes, as well as clearer mechanisms for integrating microcredentials within national qualification and credit architectures (Namibia Qualifications Authority, 2016; National Council for Higher Education Namibia, 2018).

This juxtaposition highlights the diversity of approaches in the region and provides valuable insights into how regulatory and institutional mechanisms can shape the adoption and scalability of microcredentials.

16.2 Literature Review

16.2.1 Conceptual Debates on Microcredentials

Microcredentials are widely framed as short, industry-aligned units of learning that can be configured as stackable components alongside conventional qualifications. However, their academic legitimacy as on-demand learning pathways depends on how clearly they are positioned within curricula, quality assurance arrangements, and credit architectures (Msweli, Twinomurinzi, & Ismail, 2022; Wheelahan & Moodie, 2021). Wheelahan and Moodie (2021) observe that governments and universities are increasingly adopting microcredentials to reorient higher education towards preparation for work and more responsive, on-demand forms of provision. This shift raises fundamental questions about how disciplinary coherence and broader educational purposes are sustained when learning is atomised into short units. Complementing this critique, systematic review evidence suggests that while microcredentials support flexibility, stackability, and responsiveness key features of on-demand learning, they may lack the academic rigour required for formal accreditation in some disciplines if not supported by coherent standards and recognition mechanisms within higher education systems (Msweli et al., 2022). A broader systematic review further argues that microcredentials facilitate life-wide and lifelong learning by enabling flexible, modular pathways for upskilling and reskilling on demand, while simultaneously highlighting persistent challenges related to definitional ambiguity, quality assurance, and recognition across systems (Msweli et al., 2022).

These debates indicate that micro credentials are not merely technical innovations in programme design, but reflect deeper tensions between flexibility and coherence, employability and education, and modularisation and academic integrity within higher education systems.

16.2.2 Governance and Quality Assurance Issues

The effectiveness of micro credentials as on-demand learning instruments is closely tied to governance and quality assurance frameworks. Without clearly defined standards, micro credentials risk being perceived as fragmented, inconsistent, or lacking credibility within formal higher education systems. Existing literature highlights persistent governance challenges, including definitional ambiguity, uneven quality assurance practices, and limited alignment with national regulatory frameworks (Msweli et al., 2022). These challenges are particularly pronounced in on-demand learning contexts, where the speed and flexibility of provision may outpace established quality assurance mechanisms. At the same time, emerging approaches demonstrate how governance can be strengthened. Employer interpretation further complicates the governance landscape. This multidimensional interpretation is particularly relevant for microcredentials, as their effectiveness depends not only on formal

quality assurance, but also on their perceived legitimacy and signalling strength in labour markets.

16.2.3 International Examples of Credit and Recognition Architectures

International frameworks illustrate how microcredentials can be embedded within coherent credit and recognition systems to support on-demand learning. These examples demonstrate that the scalability and legitimacy of microcredentials depend on their integration into national qualifications and credit frameworks. Australia's National Microcredentials Framework provides a nationally consistent approach across higher education, vocational education and industry, establishing core elements that support transparency, comparability, and trust in short-cycle, demand-responsive learning (Australian Government Department of Education, 2022). In New Zealand, microcredentials are defined as more than a single course but less than a full qualification, with specified credit sizes. In practice, bundled microcourses can be evaluated against the New Zealand Qualifications Framework (NZQF), allowing levels and credits to be assigned and thereby enabling on-demand learning to be formally recognised and accumulated within higher education pathways (Msweli et al., 2022). New Zealand is frequently cited as one of the earliest systems to formalise this approach. In 2018, the New Zealand Qualifications Authority (NZQA) incorporated microcredentials into the NZQF, defining them as ranging between 5 and 40 credits and requiring evidence that they address skills needs not already met by existing qualifications.

Similarly, India's National Credit Framework explicitly seeks to support creditisation, accumulation, and transfer across education and skills programmes, signalling how national credit systems can provide enabling infrastructure for scalable on-demand learning and recognition pathways that microcredentials are intended to support (Government of India, Ministry of Education, 2022). Together, these examples highlight that well-defined credit and recognition architectures are critical to ensuring that microcredentials move beyond isolated offerings and become integrated components of structured learning pathways.

16.3 Methodology

This chapter adopts a qualitative, policy-oriented research design to examine how microcredentials are being formalised and positioned as instruments of on-demand learning in Mauritius and Namibia. The two national contexts were selected purposively because they represent distinct governance trajectories within African higher

education. Mauritius' legal reform, national policy instruments, and quality assurance mechanisms have been mobilised to formalise microcredentials within the higher education system. Namibia's model reflects stakeholder engagement, institutional practice, and consultative processes which have advanced microcredential development in advance of a fully consolidated national framework. Considered together, these focus areas provide a basis for examining the governance dynamics, institutional readiness, and potential scalability of microcredentials.

The study is primarily qualitative, with quantitative evidence used in a supporting role. Its methodological orientation is grounded in documentary and policy analysis, complemented by survey findings and stakeholder consultation material. This approach is appropriate to the purpose of the chapter, which is to analyse governance developments, policy design, and implementation conditions rather than to test statistical relationships. In policy-oriented research, official documents, legal instruments, strategic frameworks, and implementation guidance provide important evidence for understanding reform trajectories and institutional arrangements (Bowen, 2009).

For Mauritius, the evidence base comprises policy and legislative documents, implementation instruments, institutional survey findings, and documented stakeholder engagement processes. These include the Blueprint on Microcredentials in Higher Education, the Higher Education Act and related reforms, instruments associated with quality assurance and the National Credit Value and Transfer System (NCVTS), and baseline studies and institutional surveys undertaken with UNESCO IIEP. The Mauritian evidence also includes stakeholder consultations and validation meetings conducted as focus group discussions during the development of the national microcredentials framework. The two surveys focused on existing short-course provision, institutional policies and practices, and perceptions regarding future microcredential development. Valid responses were obtained from 24 higher education institutions out of 41 and 154 TVET training centres out of 470, thereby providing an empirical baseline on institutional readiness, existing practice, and system-level constraints.

For Namibia, the evidence base draws on stakeholder survey findings, consultative workshops, project reports, and relevant policy and regulatory materials generated through PoMiSA-related work and associated national engagements. These materials provide evidence on stakeholder demand, institutional perspectives, recognition challenges, and the early development of enabling arrangements for microcredentials. In contrast to Mauritius, the Namibian evidence reflects an earlier stage of policy development and implementation and is therefore interpreted as indicative of an emerging framework environment rather than a fully institutionalised national model.

Document selection was guided by relevance to the chapter's research question. Materials were included where they addressed one or more of the following dimensions: legal and policy recognition of microcredentials; quality assurance arrangements; credit recognition, transfer, and progression mechanisms; and labour-market responsiveness or industry engagement. This purposive selection strategy ensured that the analysis remained focused on sources directly related to the formalisation and governance of microcredentials.

The qualitative material was analysed using framework analysis, an approach well suited to applied policy research because it enables systematic interpretation of bounded datasets through conceptually informed themes while remaining sufficiently flexible to accommodate context-specific findings (Gale et al., 2013). The analysis combined deductive and interpretive coding. Deductively, the material was organised around four analytical dimensions derived from the research question and literature: governance arrangements; support for on-demand learning; system integration through quality assurance, recognition, and progression; and labour-market alignment and employer trust. Interpretively, evidence within each dimension was examined to identify patterns of policy maturity, institutional readiness, implementation gaps, and differences between intended policy design and operational practice. This process allowed the analysis to move beyond description of national developments towards an assessment of how governance choices shape the credibility, portability, and scalability of microcredentials in each context (Table 16.1).

The survey findings were used descriptively and interpretively rather than inferentially. Their purpose was to complement the documentary and policy analysis by illuminating patterns of institutional provision, perceived barriers, stakeholder expectations, and areas of readiness or uncertainty. In the Mauritian context, the survey evidence demonstrates that short-form provision was already present institutionally before the establishment of a formal national framework. In the Namibian context, survey and consultation evidence illustrates strong stakeholder interest alongside continuing gaps in recognition and national coordination. The combination of documentary, survey, and consultation evidence therefore strengthens the analysis by linking formal governance developments with institutional practice and stakeholder perception (Fetters et al., 2013).

Table 16.1 Analytical dimensions

Analytical dimension	How it was applied in the analysis
Governance arrangements	Used to examine legal authority, regulatory leadership, institutional roles, approval mechanisms, and the extent of national coordination
Support for on-demand learning	Used to assess whether microcredentials enable flexible, timely, modular, and skills-responsive learning opportunities
System integration	Used to examine quality assurance, recognition, credit value, transfer, progression, stackability, and alignment with qualifications frameworks
Labour-market alignment and employer trust	Used to analyse industry engagement, employer perceptions, skills relevance, co-design mechanisms, and the signalling value of microcredentials

Some of the materials used in this chapter were generated within ongoing policy and project activities related to microcredentials in Mauritius and Namibia. Analytical transparency is therefore maintained by relying on identifiable documentary, survey, and consultation sources, and by distinguishing between established policy developments and more provisional findings, particularly in the Namibian context. Following the within-case analysis, a cross-case synthesis was undertaken across the same analytical dimensions to identify convergences, divergences, and explanatory patterns between the two national trajectories, while recognising the different stages of policy maturity in Mauritius and Namibia.

16.3.1 Microcredential Ecosystem Model

This model explains that, in Mauritius, microcredentials are being positioned not merely as short units of learning, but as part of a structured national system that converts flexible, just-in-time, on-demand learning into recognised, quality-assured and potentially stackable learning with labour-market relevance and progression value. The model is built on two interconnected layers. The first layer is the approved national microcredentials framework, set out in the Blueprint, which establishes the core principles, quality assurance requirements, integration with the National Qualifications Framework, progression pathways, and expectations for the supporting technical ecosystem. The second layer, still under development, is an industry-led and co-designed operational modality intended to serve as the main implementation pathway for ensuring that microcredentials respond directly to labour-market needs. Within this model, the NCVTS functions as the mobility backbone by enabling credit rating, transfer and accumulation, while alignment with the SADCQF and ACQF strengthens regional interoperability, cross-border recognition and learner mobility. The model is therefore conceived as an end-to-end lifecycle: starting with the identification of skills gaps and priority sectors, moving through co-design of competencies and outcomes with industry, the development of microcredentials with clear learning outcomes and robust assessment, alignment to the NQF and credit rating through NCVTS, HEC approval and quality assurance oversight, issuance of verifiable credentials, transfer into formal qualifications where applicable, and continuous monitoring of employer uptake, learner progression and quality signals to support ongoing improvement (Fig. 16.1).

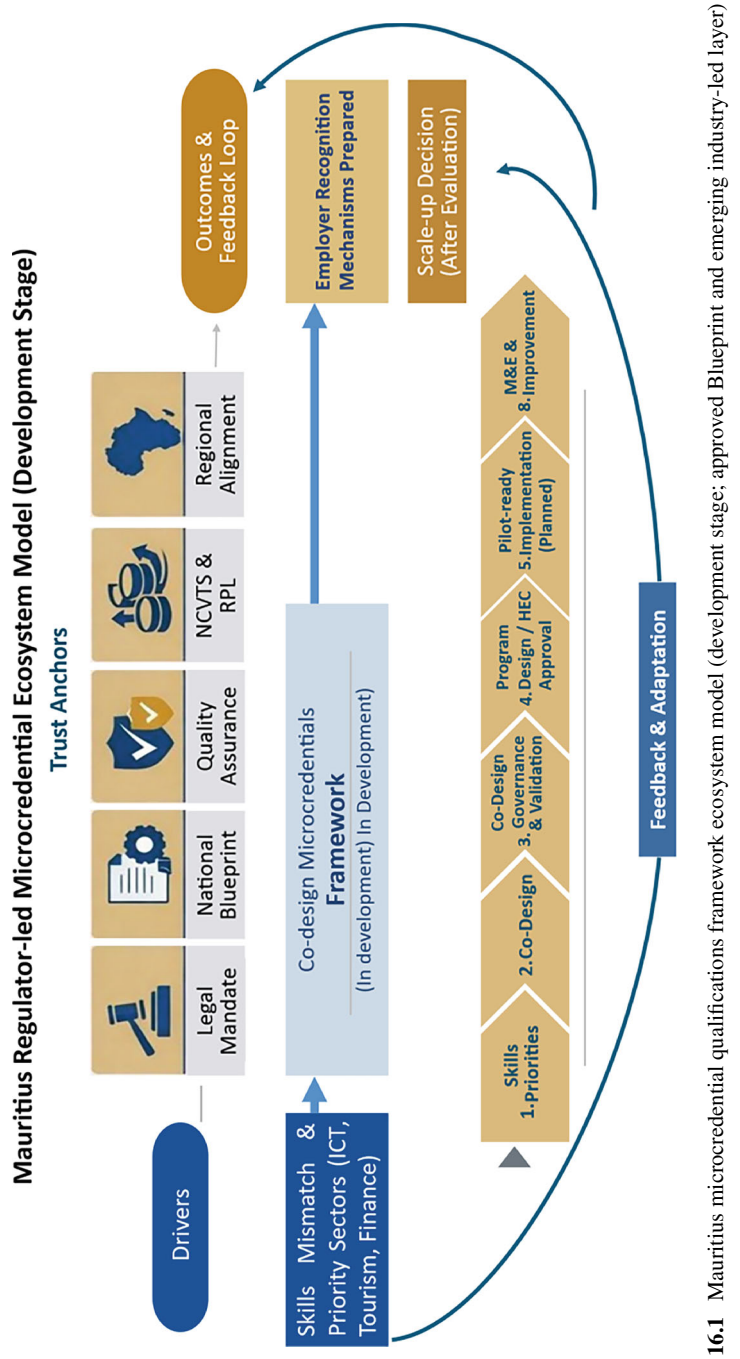


Fig. 16.1 Mauritius microcredential qualifications framework ecosystem model (development stage; approved Blueprint and emerging industry-led layer)

16.4 Findings: Microcredentials as On-demand Learning Instruments

The value of the Mauritius and Namibia cases lies not in institutional symmetry, but in the contrast they provide in terms of system capacity for enabling on-demand learning. Mauritius demonstrates how regulatory infrastructure can formalise and scale microcredentials as complements to traditional provision, while Namibia illustrates how demand-driven innovation, in the absence of consolidated national coordination, remains more fragmented and provisional.

16.4.1 Case of Namibia

The Namibia case is grounded in preliminary national stakeholder consultations, surveys, and interviews conducted as part of preparatory empirical work within the PoMiSA project (January 2024–December 2025). These activities formed part of an iterative evidence-gathering process informing draft analytical outputs and working documents. The methodological approach followed a mixed-method design, incorporating instruments administered to employers, educators, and students, thereby capturing multiple perspectives on awareness, demand, and system readiness for microcredentials.

Within this exploratory phase, key driving factors were identified to inform an emerging conceptual framework for microcredentials in Namibia. These included economic and technological dynamics, particularly labour-market transformation and digitalisation, alongside political and social considerations such as national development priorities, equity, and access to education (PoMiSA, 2024). Together, these factors situate microcredentials within broader skills development and higher education reform agendas.

Initial findings suggest that Namibia is conceptually receptive to microcredentials, supported by strong stakeholder interest. A large majority of employers (87.1%) indicated that microcredentials could address skills mismatches, while just over 50% expressed willingness to employ candidates with such credentials. Similarly, 78.5% of students viewed them positively for career enhancement. However, concerns were raised regarding the absence of formal recognition mechanisms. Overall, Namibia demonstrates strong conceptual demand and stakeholder engagement, indicating clear potential for microcredentials within a national skills development strategy.

Despite this readiness, Namibia faces structural and governance constraints. The system appears conceptually prepared but structurally underdeveloped, particularly in relation to regulatory coherence, quality assurance, and credit recognition. The governance landscape is characterised by multiple policy instruments, including Vision 2030, the National Skills Development Strategy II (2011–2030), the Higher Education Act (2003), the Namibia Qualifications Authority Act (1996), and the Vocational Education and Training Act (2008), alongside institutional frameworks

such as the National Council for Higher Education (NCHE), the Namibia Qualifications Authority (NQA), and the Namibia Training Authority (NTA). While these provide a strong policy foundation, they do not yet explicitly accommodate microcredentials within a coherent national framework.

Stakeholders emphasised that quality assurance is a critical precondition for implementation, highlighting the need for nationally approved standards. Recognition remains a key gap, with concerns that without formal endorsement, labour-market value will be limited. Although Namibia has mechanisms for Recognition of Prior Learning (RPL) and articulation between qualifications, specific credit accumulation and transfer systems for microcredentials are not yet developed, in contrast to more advanced systems such as Mauritius. This represents a significant structural gap.

Implementation readiness remains at an early stage. Namibia is still developing foundational governance and operational structures, with industry engagement emerging but not yet institutionalised. While employer interest is evident, formal mechanisms for sustained collaboration are limited, although the establishment of a national industry working group under the NQA represents a positive development. Stakeholders consistently stressed that regulatory recognition is essential for building trust.

Digital credentialing was identified as an important consideration, with interest in tools such as digital badges and blockchain to enhance portability and verification. However, concerns persist regarding equity and access, particularly in relation to digital infrastructure. Namibia has not yet reached a pilot or scaling phase; the current stage is characterised by conceptual development, stakeholder alignment, and policy groundwork. Regional experiences, particularly Mauritius, are viewed as important reference points for structured implementation. The PoMiSA project reinforces this positioning, noting that its focus is on assessing awareness, perceived value, system readiness, and challenges related to integrating microcredentials into the National Qualifications Framework (PoMiSA, 2024).

16.4.2 Case of Mauritius

1. **Mauritius Microcredentials' Journey in Mauritius**

The Microcredentials Journey in Mauritius outlines a phased approach from research to implementation. Phase 1 (2023) established the evidence base through baseline studies and surveys, supported by the IIEP UNESCO project. Phase 2 (2024) engaged stakeholders via validation webinars, national consultations, and drafting of the National Microcredentials Framework (Blueprint on Microcredentials). Phase 3 (2025–2026) operationalised the framework through the Blueprint validation and pilot implementation in industry, demonstrating a systematic, consultative, and evidence-informed pathway to a national microcredential ecosystem (Fig. 16.2).

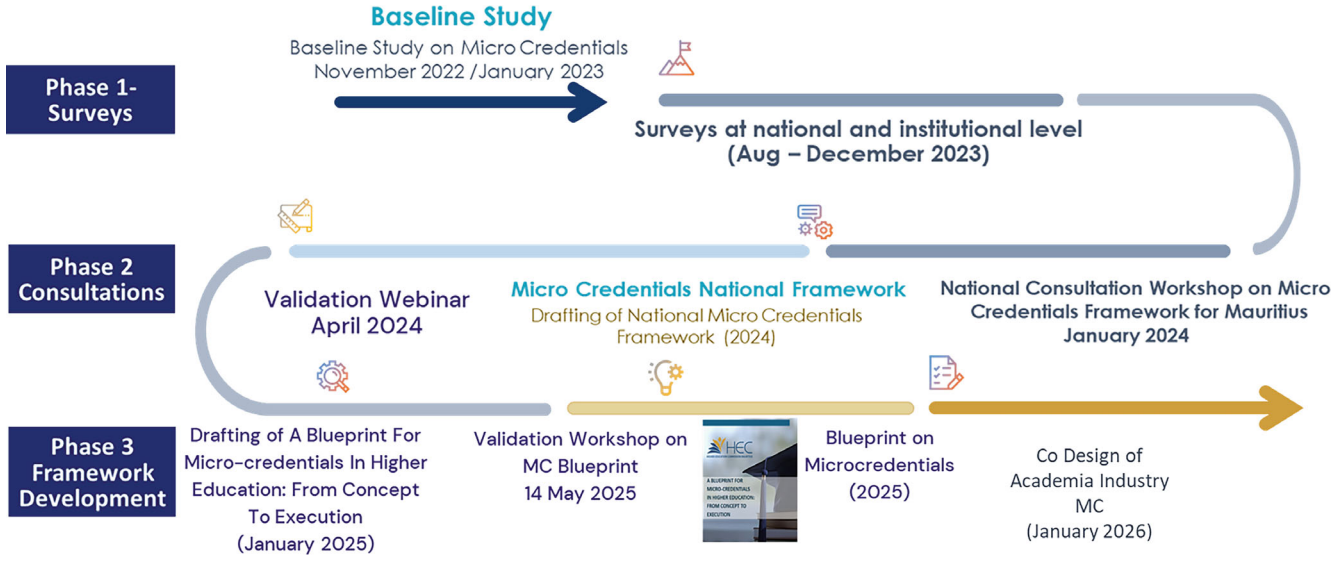


Fig. 16.2 Mauritius microcredentials journey

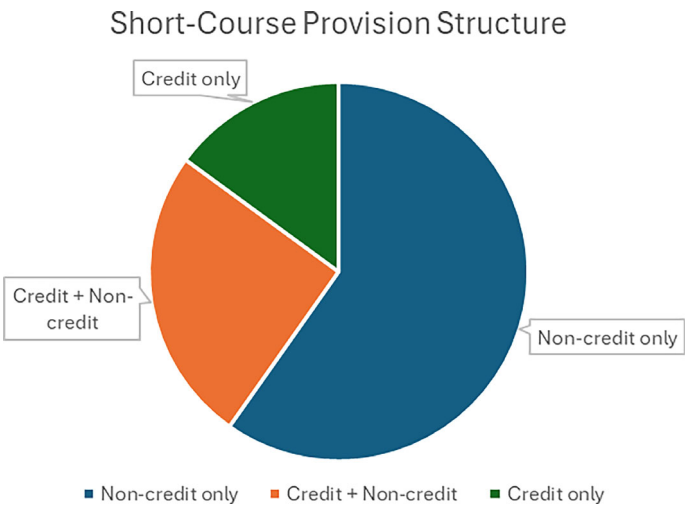


Fig. 16.3 Short course provision structure

2. UNESCO IIEP-HEC Survey

In 2022/2023, the HEC initiated baseline studies and surveys at national and institutional level in collaboration with UNESCO IIEP. The UNESCO IIEP–HEC institutional benchmarking survey provided a critical empirical baseline for guiding the development of Mauritius Blueprint for microcredentials. More than half of institutions (52%) reported delivering short courses exclusively on a non-credit basis, while 22% combined credit and non-credit formats; by contrast, only 13% confined short-course provision to credit-bearing arrangements (Fig. 16.3).

The findings revealed a distribution that was significant, as it pointed to a system in which pedagogical capacity and institutional experience with short-form learning were well established, but where the regulatory and academic architecture required for systematic credit articulation, accumulation, and recognition had not yet evolved in parallel. In effect, flexible provision was institutionally normalised, while its formal status within the qualification system remained marginal.

(1) Institutional Perceptions and Positive Attitudinal Orientation

Attitudinal indicators suggested that institutions largely perceived microcredentials as an extension of existing educational missions rather than as a disruptive challenge to degree-based provision. A substantial majority agreed that microcredentials enhanced access to technical higher education (78%) and complemented undergraduate (83%) and postgraduate programmes (78%). These responses indicated a broad acceptance of microcredentials as instruments for widening participation, lifelong learning, and skills responsiveness, rather than as substitutes for traditional qualifications.

(2) **Demand Dynamics and Emerging Convergence**

Demand signals reinforced this interpretation. Around 61% of institutions reported increased learner demand over the preceding five years, while 78% identified growing demand from industry and civil society. Taken together, these figures pointed to a convergence between institutional readiness and labour-market expectations.

Collaboration with external partners, while emerging, remained uneven. Co-development and co-delivery with industry or social partners were reported by 35% of institutions in each case, indicating growing engagement with employers in curriculum design and delivery. However, collaboration in assessment was reported by only 22%, highlighting unresolved questions about shared responsibility for standards, evaluation, and credential validity. This imbalance suggested that while industry involvement was valued, it had not yet been fully integrated into formal quality assurance processes.

(3) **Policy Integration and Systemic Misalignment**

Yet this convergence was not matched by an equivalent level of policy integration. Only 35% of institutions considered microcredentials to be embedded within the prevailing higher education policy framework, while 44% explicitly disagreed. This divergence revealed a structural lag in which institutional and market dynamics were advancing more rapidly than nationally established definitions, regulatory instruments, and recognition mechanisms, creating uncertainty around the formal status and long-term value of microcredentials.

Difficulties associated with recognition were reported by 83% of institutions, while 74% identified challenges related to integration within existing accreditation systems and 74% cited constraints linked to public funding. These figures did not merely reflect operational inconveniences; they pointed to a systemic misalignment between emerging modes of provision and legacy governance frameworks designed around full programmes and awards.

The modular, flexible design of microcredentials challenged qualification systems predicated on duration-based learning and programme coherence, raising unresolved questions about credit equivalence, National Qualifications Framework (NQF) alignment, and accumulation pathways. In the absence of clear national rules addressing these issues, institutions faced elevated regulatory and reputational risks when seeking to expand microcredential provision, particularly in relation to academic standards, learner protection, and employer trust.

(4) **Operational Readiness and Institutional Transition**

Operational readiness indicators further confirmed that the system was in a transitional stage of development. Only 9% of institutions had already adjusted academic or teaching policies to accommodate microcredentials, while 46% indicated that such adjustments were planned, suggesting that regulatory and academic adaptation was still largely prospective rather than embedded.

Formal alignment with the NQF had been implemented by 23% of institutions, with a further 32% planning such alignment, while 45% reported no mechanisms for

stacking microcredentials into larger awards. This absence of accumulation pathways limited the potential of microcredentials to function as building blocks within lifelong learning trajectories.

Moreover, microcredential learners fell outside existing student-status categories in 67% of institutions, and dedicated learner-support services were absent in 57%, reinforcing the marginal positioning of microcredentials within institutional systems.

(5) **System-Level Implication and the Need for a Framework**

Collectively, these findings illustrated that the establishment of a national framework was not simply a regulatory response, but a necessary enabling architecture. By addressing recognition, funding logic, quality assurance, credit alignment, and partnership models at system level, the framework was essential to translate fragmented institutional experimentation into a coherent, scalable, and trusted component of the Mauritian HE ecosystem (IIEP-UNESCO, 2023; Martin & Nic Giolla Mhichíl, 2025).

3. Blueprint for Micro Credential in Higher Education in Mauritius

Building on the foundation and findings of the survey, a national Blueprint was drafted, subjected to expert review and broad validation, and subsequently approved at national level following the legal recognition of microcredentials. This progression reflects a structured consolidation of policy intent into a national framework capable of operationalisation through guidance instruments, pilot implementation, and embedded quality assurance mechanisms that support scalable on-demand learning provision. Its design was prompted by stakeholder engagement, particularly the mismatch between rapidly growing institutional experimentation with microcredentials and the absence of a coherent national framework for recognition, credit articulation, and quality assurance. Consultations with higher education institutions, regulatory bodies, and industry stakeholders consistently highlighted concerns related to credibility, portability, and learner progression, as well as uncertainty regarding the integration of microcredentials within existing qualifications structures. These findings underscored the need for a nationally coordinated approach that could move beyond fragmented provision and provide a structured basis for trust, comparability, and system-wide alignment.

It is within this context that the Blueprint was developed as a policy response to consolidate emerging practices and translate them into a regulated and scalable framework. The Blueprint is grounded in the needs and priorities of learners, institutions, and the labour market, and explicitly seeks to enable flexible, timely, and learner-centred forms of provision. In this respect, microcredentials are positioned not merely as short courses, but as institutionalised pathways for on-demand learning, reinforcing their relevance, legitimacy, and practical applicability within a regulated higher education environment.

Substantively, the Blueprint articulates a comprehensive framework structured around clearly defined elements that translate policy into practice. Central to this framework is a nationally harmonised definition of microcredentials, whereby a microcredential is defined as a record of learning outcomes acquired through a smaller

volume of learning, assessed against transparent and clearly defined criteria, certifying specific knowledge, skills, and competences that respond to social, personal, cultural, or labour-market needs. These credentials are learner-owned, portable, and may be offered as stand-alone learning opportunities or stacked to form larger qualifications, thereby enabling learners to engage in on-demand learning while retaining access to formal progression pathways underpinned by established quality assurance standards (Higher Education Commission, 2025).

The framework further sets out unifying principles including quality, transparency, relevance, valid assessment, stackability, recognition, industry collaboration, portability, learner-centred design, authenticity, information and guidance, and lifelong learning alongside critical requirements for approval, recognition, and alignment with the NCVTS and the National Qualifications Framework. Collectively, these principles provide the governance architecture necessary to support microcredentials as credible and trusted on-demand learning pathways within the national system.

The alignment of microcredentials with the NCVTS ensures that learning undertaken on demand can be accumulated, paused, resumed, and transferred over time, transforming episodic upskilling into structured learning pathways. In this way, the Blueprint operationalises on-demand learning not as an ad hoc response to labour-market demand, but as a regulated and trusted mode of provision embedded within the national higher education system.

4. From Regulatory Reform to Ecosystem Implementation

The amendment of the Higher Education Act provides the legal basis for the Higher Education Commission (HEC) to recognise and approve credit-bearing microcredentials in 2025, thereby formally integrating them into the higher education system of Mauritius. This development, enabled by the August 2025 amendment to the HE Act Mauritius., 2017, amended 2025 and the subsequent approval of the National Blueprint on Microcredentials by the Cabinet of Ministers in September 2025, represents a significant shift from exploratory policy discourse to institutionalised governance. Building on this mandate, the HEC Blueprint establishes a coherent framework for the development and implementation of microcredentials, positioning them as flexible and targeted learning opportunities that respond to evolving labour-market demands and lifelong learning needs.

These reforms position the Higher Education Commission (HEC) as the statutory authority mandated to approve, quality assure, and recognise credit-bearing microcredentials, including those co-designed with industry. Crucially, this regulatory shift establishes the conditions under which microcredentials can function as credible and trusted on-demand learning pathways, enabling learners to access short, skills-focused learning opportunities with formal recognition and progression potential.

5. Industry-Led Microcredentials in Mauritius

A further step in the development of microcredentials in Mauritius is the adoption of an industry-led co-design model, formally launched in December 2025. This

model reflects a "skills ecosystem" approach, in which higher education institutions (HEIs), employers, regulators, and learners interact within structured governance arrangements to co-produce workforce-relevant learning (Cedefop, 2023). Within this modality, sector-specific skills gaps are identified collaboratively with industry actors, enabling microcredentials to respond directly to emerging workforce needs. Employers articulate priority competencies particularly in sectors aligned with national economic strategies while HEIs translate these needs into explicit learning outcomes that complement existing academic programmes. This approach allows microcredentials to function as responsive on-demand learning interventions, rather than static curriculum additions.

Industry engagement is framed as a defining feature of the Mauritian model, intended to strengthen alignment between learning outcomes and labour-market needs. Assessment design mirrors authentic workplace tasks, reinforcing alignment between demonstrated competencies and occupational practice. This emphasis on authentic assessment aligns with employer expectations that credentials should evidence demonstrable capability rather than solely theoretical knowledge (Cedefop, 2023). Quality assurance oversight by the HEC ensures that such microcredentials remain transparent, credit-rated, and portable within the National Credit Value and Transfer System (NCVTS), thereby strengthening national coherence and enabling learning undertaken on demand to be accumulated, transferred, or stacked over time. This structured co-design approach aligns with international benchmarks, where microcredentials are increasingly embedded within regulated credit architectures to enhance comparability, transferability, and trust in short-cycle, demand-responsive learning (Australian Government Department of Education, 2022). The development of credit-bearing microcredentials plays a critical role in this positioning, as it ensures that learning accessed on demand is integrated within institutional strategies and national policy priorities, supporting systemic coherence and cross-sectoral recognition (OECD, 2023a, 2023b). Furthermore, embedding microcredentials within formal frameworks enables institutions to pursue multiple objectives simultaneously, whether through stand-alone provision or integration within existing programmes, and across face-to-face, online, and blended delivery modes (Zain, 2023).

6. National Credit Value and Transfer System as an Enabler

For these on-demand learning pathways to contribute meaningfully to qualification frameworks, credit recognition is contingent upon learners demonstrating achievement of clearly defined learning outcomes that are equivalent in standard and rigour to corresponding units within formal degree programmes (Desmarchelier & Cary, 2022). The National Credit Value and Transfer System (NCVTS) has been developed in 2025 as a foundational framework to enable flexible learning pathways, credit accumulation, and the integration of microcredentials within Mauritius' education and training landscape.

The development of the Guidelines for the Implementation of the NCVTS Framework for Mauritius has been led by the Higher Education Commission (HEC). It supports the transfer of microcredentials towards formal qualifications, the integration of short-form learning with traditional degree pathways, and the accumulation

of credits over time. For implementation, nationally recognised microcredentials must therefore be credit-rated and described in ways that enable transfer decisions (credit value, level alignment, learning outcomes and assessment evidence). Credit transfer guidelines between degree programmes are being developed. It will include microcredentials as well.

7. Pilot Microcredentials as Proof-of-Concept

To translate policy into practice, six pilot microcredentials were selected for co-design and phased implementation in the sectors of Finance, Artificial Intelligence and Automation, Information Technology, Human Resource Management, Nursing, and Tourism. These sectors reflect areas of strategic national importance and labour-market dynamism, where rapid upskilling and reskilling are required. Rather than being isolated short courses, these pilots are conceptualised as proof-of-concept interventions within a broader regulatory framework. Their purpose is not merely delivery, but system learning of testing co-design methodologies, refining quality assurance processes, validating credit rating mechanisms under NCVTS and generating evidence on employer uptake and learner progression. The phased implementation pathway includes refinement, external quality assurance review, formal HEC approval, monitored rollout, and evaluation. This iterative cycle reflects governance principles found in international micro-credential ecosystems, where scaling is preceded by structured piloting and feedback loops to mitigate fragmentation and maintain trust (OECD, 2021; UNESCO, 2023).

8. Beyond Pilots: System-Level Implications

The Mauritius model illustrates how microcredentials can be embedded within a regulated higher education architecture while preserving flexibility. This regulatory foundation provides the necessary conditions for implementation, making it possible to examine how the framework operates in practice through pilot initiatives that test design assumptions, institutional readiness, and quality assurance mechanisms in real-world settings. By situating industry-led microcredentials within a formal credit transfer backbone and statutory quality assurance regime, the approach attempts to reconcile two tensions widely identified in the literature that is flexibility versus system coherence and labour-market responsiveness versus academic integrity. If successful, this model may offer an alternative pathway for Small Island Developing States seeking to balance rapid skills transformation with institutional stability. It demonstrates that microcredentials need not operate at the margins of higher education but can instead function as formally recognised, stackable learning units within a national qualifications ecosystem.

16.5 Delivery Models and Verification Mechanisms

In both Mauritius and Namibia, emerging approaches point towards a combination of institutional provision, industry collaboration, and digitally enabled verification systems, although these remain at different stages of development.

In terms of delivery models, Mauritius is advancing a blended and modular approach, where microcredentials are offered as short, credit-bearing units delivered through flexible modalities, including online, face-to-face, and hybrid formats. Microcredentials may be offered as standalone learning units or embedded within existing degree programmes, with the possibility of stacking towards larger qualifications through the National Credit Value and Transfer System (NCVTS). In Namibia, delivery models are still conceptual, but a similar direction is envisaged, with institutions expected to provide short, skills-focused learning opportunities, potentially in partnership with employers, once a regulatory framework is established.

With regard to digital verification, both systems recognise the importance of secure, portable, and verifiable credentials. Mauritius is exploring the use of digital badges and credentialing platforms, which would allow learners to store and share verified records of achievement. Such systems typically rely on metadata standards that include information on learning outcomes, credit value, level, awarding institution, and assessment methods. While blockchain-based solutions have been discussed, implementation is likely to prioritise interoperable digital credential systems that can integrate with institutional and national databases. In Namibia, digital verification remains at an exploratory stage, with stakeholders acknowledging its importance but with limited infrastructure currently in place.

The question of platform governance is central to ensuring trust and system coherence. In Mauritius, the HEC plays a central coordinating and regulatory role, overseeing approval, quality assurance, and alignment with national frameworks. A national digital repository will be setup by the HEC. In Namibia, governance arrangements are still evolving, but it is anticipated that bodies such as the Namibia Qualifications Authority (NQA) and the National Council for Higher Education (NCHE) would play key roles in regulating standards and overseeing implementation.

In terms of standards, both contexts highlight the importance of aligning microcredentials with existing National Qualifications Frameworks (NQFs) and, in the case of Mauritius, with the NCVTS. This includes defining credit values based on student workload, ensuring clear learning outcomes, and establishing robust assessment and quality assurance mechanisms. Internationally recognised standards for digital credentials (e.g. structured metadata, verifiability, and portability) are also likely to inform system design to ensure credibility and comparability.

Finally, interoperability remains a critical challenge. In Mauritius, the NCVTS provides a foundation for credit transfer and accumulation, which can facilitate interoperability across institutions nationally. However, ensuring compatibility with regional and international systems, such as emerging African frameworks, will require alignment of credit definitions, levels, and quality assurance practices. In Namibia, the absence of an established credit transfer system presents a more

significant constraint, requiring the development of foundational mechanisms before interoperability can be achieved.

16.6 Cross-Case Analytical Synthesis

Before drawing broader lessons for the African context, it is useful to synthesise the two cases across a common set of analytical dimensions. These dimensions are derived from the framework analysis approach adopted in the methodology, where qualitative material is organised through conceptually informed themes while allowing for contextual variation. In this chapter, the relevant dimensions are governance maturity, quality assurance, credit and progression, labour-market alignment, learner value, and implementation capacity. The purpose of this cross-case synthesis is not to treat Mauritius and Namibia as equivalent cases, but to identify what their contrasting trajectories reveal about the conditions under which microcredentials can become credible, quality-assured instruments of on-demand learning (Table 16.2).

The cross-case synthesis shows that microcredentials cannot be understood simply as short, flexible learning opportunities. Their effectiveness depends on whether flexibility is supported by a wider system of recognition, quality assurance, credit portability, and labour-market trust. Mauritius demonstrates how a more formalised governance pathway can create the conditions for microcredentials to move towards recognised on-demand learning provision. Namibia, by contrast, shows that strong stakeholder interest may create demand, but demand alone does not guarantee credibility, portability, or scalability. Responsiveness enables institutions to address immediate skills needs, while structure ensures that the resulting learning is trusted, transferable, and useful to learners beyond a single course or provider. Across both cases, three enabling conditions emerge as particularly important: regulatory legitimacy, credit portability, and labour-market signalling. Where these conditions are aligned, microcredentials are more likely to support lifelong learning, employability, and progression. Where they remain underdeveloped, microcredentials may remain useful but fragmented forms of short-course provision.

16.7 Limitation

This chapter is based primarily on policy documents, institutional reports, project-generated materials, and descriptive survey evidence. As such, it is better suited to analysing governance developments, policy maturity, and system readiness than to demonstrating long-term causal effects. The evidence base is also uneven across the two cases, with Mauritius reflecting a more advanced stage of policy and implementation than Namibia. In addition, the absence of longitudinal evidence on learner progression, employability, and employer recognition means that the long-term impact of microcredentials cannot yet be fully assessed.

Table 16.2 Cross-case analytical synthesis of Mauritius and Namibia

Analytical dimension	Mauritius	Namibia	Cross-case analytical insight
Policy and system maturity	Shows a more consolidated transition from framework development towards operationalisation	Shows an earlier stage of framework formation, where consultation and stakeholder interest are still being translated into system arrangements	Microcredential development is shaped by policy maturity. Demand and interest may create momentum, but system credibility depends on the ability to move from intention to implementation
Governance	A more clearly anchored governance model provides common expectations for recognition, approval, and institutional alignment	Governance remains more distributed, with several relevant bodies but less consolidated coordination around microcredentials	Governance determines whether microcredentials develop as isolated initiatives or as part of a coherent national learning architecture
Quality assurance and trust	Quality assurance is positioned as a mechanism for legitimacy, comparability, and learner protection	Quality assurance is recognised as necessary, but its application to microcredentials remains less fully formalised	Quality assurance is not only a regulatory requirement; it is the mechanism through which short learning experiences acquire public, institutional, and labour-market trust
Credit, portability, and progression	Credit recognition is being used to connect microcredentials to wider progression and lifelong learning pathways	Credit accumulation and transfer arrangements for microcredentials remain a key area for future development	Microcredentials gain durable educational value when they can be accumulated, transferred, or used for progression. Without this, they risk remaining short certificates with limited mobility value
Industry alignment and signalling value	Industry engagement is being structured through co-design and alignment with identified skills needs	Employer interest is evident, but formal mechanisms for sustained co-design and recognition are still emerging	Labour-market relevance requires more than employer demand. It depends on structured involvement in design, validation, assessment, and recognition

(continued)

Table 16.2 (continued)

Analytical dimension	Mauritius	Namibia	Cross-case analytical insight
Learner value and mobility	Learner value is strengthened where microcredentials are linked to formal recognition, credit, and progression routes	Learner value remains more dependent on future recognition arrangements and employer acceptance	The value of on-demand learning lies not only in flexible access, but in whether learners can use the credential for further study, career mobility, or professional recognition
Implementation risk	The main risk lies in translating formal instruments into consistent institutional practice, learner support, employer uptake, and measurable outcomes	The main risk lies in fragmentation if stakeholder interest is not converted into a recognised national framework	Both cases show that microcredentials require operational capacity, not only policy ambition. The risks differ by stage: mature systems must prove implementation effectiveness, while emerging systems must first secure coherence and recognition

16.8 Conclusion

This chapter has examined the emergence of microcredentials in Mauritius and Namibia, demonstrating how these systems represent different stages along a shared policy and implementation trajectory. Mauritius illustrates a transition from policy development to system-level implementation, supported by legislative reform, a national Blueprint, and enabling instruments such as the National Credit Value and Transfer System (NCVTS). Namibia, by contrast, reflects an earlier, exploratory phase characterised by strong stakeholder interest but limited regulatory and operational structures. The two case studies highlight that the development of microcredentials is not linear but context-dependent, shaped by institutional capacity, governance maturity, and policy alignment.

The core contribution of this chapter lies in demonstrating that microcredentials are not merely short-form credentials, but foundational components of an emerging on-demand learning paradigm. In this model, learning is accessed flexibly, in response to immediate skills needs, and accumulated over time through recognised and portable units. However, the analysis shows that microcredentials can only function effectively as on-demand learning pathways when embedded within a coherent governance, quality assurance, and credit recognition ecosystem. Without this, they risk remaining fragmented, institution-specific offerings with limited credibility and progression value.

Looking ahead, the way forward requires a shift from policy articulation to structured and scalable implementation of on-demand learning systems. In Mauritius, this involves consolidating the existing framework through pilot microcredentials,

strengthening industry co-design, and fully operationalising the NCVTS as a mechanism for credit accumulation and transfer. In Namibia, priority should be given to establishing a coherent national framework, supported by regulatory clarity, quality assurance standards, and the development of credit systems to enable progression and portability.

In both contexts, sustained collaboration between regulators, higher education institutions, employers, and regional bodies will be essential to build trust and ensure relevance. Equally important is the development of evidence systems that capture learner progression, employer recognition, and labour-market outcomes, enabling continuous refinement of on-demand learning models. Regional alignment and knowledge-sharing will further support scalability and coherence across systems.

Appendix

See Table 16.3.

Table 16.3 Mauritius trust anchors and associated instruments

Trust anchor	National instrument	Function in the ecosystem
Legal recognition	Higher Education Act (2017, as amended)	Establishes legitimacy and basis for recognition/approval
National framework	HEC Blueprint on Microcredentials in Higher Education (2025)—nationally approved	Defines national principles, guidelines and conditions for recognition
Quality assurance	QA expectations within the Blueprint; HEC oversight	Protects credibility: outcomes clarity, robust assessment, relevance
Mobility layer	NCVTS framework and guidelines; RPL guidelines (HEC)	Enables portability, stackability, and recognition of prior/informal learning
Regional interoperability	Alignment intent with SADCQF and ACQF	Supports cross-border recognition and mobility

References

African Union Commission. (2023). *African Continental Qualifications Framework (ACQF): Policy document for validation and implementation* (pp. 549–560). AUC (developed under AU–EU Skills for Youth Employability/SIFA initiative). https://doi.org/10.1016/j.cie.2016.08.023

Australian Government, Department of Education, Skills and Employment. (2022). *National microcredentials framework.*

Barrioluego, M. S. (2025). Micro-credentials in higher education: Are they boosting digital and green skills for the twin transition? In F. Biagi & G. Di Pietro (Eds.), *Publications Office of the European Union, Luxembourg.*

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27–40. Available at: https://doi.org/10.3316/QRJ0902027

Cedefop. (2023). Microcredentials for labour market education and training: Microcredentials and evolving qualifications systems (Cedefop research paper No. 89). Publications Office of the European Union. https://doi.org/10.2801/566352

Desmarchelier, R., & Cary, L. J. (2022). Toward just and equitable micro-credentials: An Australian perspective. *International Journal of Educational Technology in Higher Education.* Springer.

European Commission. (2022). *Council Recommendation on a European approach to micro-credentials for lifelong learning and employability*. Official Journal of the European Union.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs principles and practices. *Health Services Research, 48*(6 Pt 2), pp. 2134–2156. Available at: https://doi.org/10.1111/1475-6773.12117

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology, 13*, 117. Available at: https://doi.org/10.1186/1471-2288-13-117

Government of India, Ministry of Education. (2022). *National Credit Framework (NCrF): Report of the High-Level Inter-Ministerial Committee on National Credit Accumulation and Transfer Framework*. https://www.education.gov.in/sites/upload_files/mhrd/files/National_Credit_Framework.pdf

Higher Education Commission (Mauritius). (2025). *Blueprint on microcredentials in higher education.* Higher Education Commission.

Hotaling, L. (2021). *Preparing the workforce for the new blue economy*. Elsevier.

ILO. (2021). *World Employment and Social Outlook 2021: The role of digitalization in shaping the labour market.* International Labour Organization.

Martin, M., & Nic Giolla Mhichíl, M. (2025). *Micro-credentials in Mauritius: Towards a national framework for TVET and higher education.* UNESCO IIEP.

Mauritius. (2017, amended 2025). *Higher Education Act*. Government of Mauritius.

Msweli, N. T., Twinomurinzi, H., & Ismail, M. (2022). The international case for micro-credentials for life-wide and life-long learning: A systematic literature review. *Interdisciplinary Journal of Information, Knowledge, and Management, 17*, 151–190. https://doi.org/10.28945/4954

Mukokobi, P. (2025, November 25). *Namibia state of skills demand and supply report launched*. New Era. Retrieved from https://neweralive.na/namibia-state-of-skills-and-demand-report-launched

Namibia Qualifications Authority (NQA). (2016). *Regulations for the Namibia Qualifications Framework.*

Namibia Qualifications Authority (NQA). (2023). *Consultative processes on qualifications and emerging micro-credentials in Namibia.*

Namibia Statistics Agency. (2024). *Namibia 2023 population and housing census: Main report*. Namibia Statistics Agency.

National Council for Higher Education (NCHE). (2018). *Quality assurance system for higher education in Namibia* (including provisions for programme accreditation and distance education).

Nguyen Thi Ngoc Ha, Van Dyke, N., Spittle, M., Watt, A., & Smallridge, A. (2024). *Micro-credentials through the eyes of employers: Benefits, challenges and enablers of effectiveness.* Emerald Publishing.

Organisation for Economic Co-operation and Development. (2021). *Micro-credentials for lifelong learning and employability*. OECD Publishing.

Organisation for Economic Co-operation and Development. (2024). *OECD investment policy reviews: Mauritius 2024.* OECD Publishing. https://doi.org/10.1787/442d4c99-en

OECD. (2023a). *Micro-credentials for lifelong learning and employability: Uses and possibilities.* OECD Publishing.

OECD. (2023b). *Public policies for effective micro-credential learning.* OECD Publishing.
Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university–industry relations. *Research Policy, 42*(2), 423–442. https://doi.org/10.1016/j.respol.2012.09.007
PoMiSA. (2024). *The state of play of microcredentials: Namibia.* Potential of Microcredentials in Southern Africa project. PoMiSA Country Report Namibia 2024.pdf.
Statistics Mauritius. (2025). Education statistics 2025. Ministry of Finance, Economic Planning and Development, Government of Mauritius.
Southern African Development Community. (2017). *SADC Qualifications Framework (SADCQF): Level descriptors and quality assurance guidelines.* SADC Secretariat. https://www.sadc.int
UNESCO. (2022). Towards a common definition of micro-credentials. United Nations Educational, Scientific and Cultural Organization.
UNESCO. (2023). *Micro-credentials.* UNESCO.
UNESCO Institute for Lifelong Learning (UNESCO-UIL). (2022). *Micro-credentials for lifelong learning and employability: A global perspective.* UNESCO-UIL.
Wheelahan, L., & Moodie, G. (2021). Analysing micro-credentials in higher education: A Bernsteinian analysis. *Journal of Curriculum Studies, 53*(2), 212–228. https://doi.org/10.1080/00220272.2021.1887358
World Bank. (2018). *World Development Report 2018: Learning to realize education's promise.* World Bank.
World Bank. (2019). *The changing nature of work* (World Development Report 2019). Washington, DC: World Bank.
World Economic Forum. (2020). *The Future of Jobs Report 2020.* World Economic Forum.
Zain, S. (2023). Micro-credentials: Need to be benchmarked across institutions. In *New strategic choices in challenging times* (Chapter 20). Elsevier Chandos Publishing.

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Chapter 17
Concluding Chapter: On-Demand Learning



Paul Prinsloo, Asha Singh Kanwar, Usama Kalim, Yifan Zhang, and Joe Chen

Abstract Education and forms of educational delivery have always been entangled in and responsive to one or a combination of political, economic, social, legal, technological or environmental changes. The chapters in the Book provide rich and diverse glimpses of changes in the way knowledge is produced, shared and validated in response to, inter alia, advances in technology, and concerns that the conventional paradigms of degree-based, time-constrained learning, are becoming out of step with the fast-changing requirements of workplaces and societies. This concluding chapter critically considers On-Demand Learning as heralding large-scale, systemic change by revisiting four distinct moments in the evolution of educational delivery namely distance education, Massive Open Online Courses (MOOCs), the impact of the Covid-19 Pandemic, and current developments in Artificial Intelligence (AI) and specifically Large Language Models (LLMs) as a part of Generative AI (GenAI). Though the current transformation and dramatic reconfiguration of the educational landscape is not the 'first',—we have reason to believe that the impact of various, often mutually constitutive factors, result in uncharted territory, where 'everything is new.' The chapter concludes with pointing to a number of indicators of an unbundling or rebundling of education and training and their implications for On-Demand Learning.

Keywords Distance education · Massive Open Online Courses (MOOCs) · Covid-19 · Generative Artificial Intelligence (GenAI) · Transformation

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17.1 Introduction

The collection of chapters in this book is not the final word on the notion of On-Demand Learning, and in many respects, it was not the "first" word in the ongoing evolution of forms and purposes of educational delivery.

Faced with a fast-changing educational landscape due to a range of developments can leave us mesmerised whether in referring to, inter alia, increasing varieties in and demands for different "forms" of delivery, the increasing role of the private sector and industry, as well as coalitions between public and private sector, the role of advances in technology such as Generative Artificial Intelligence (GenAI) and in particular Large Language Models (LLMs), and critiques against "traditional" forms of educational delivery as "slow", "out-of-touch", and even possibly "dying". To be "mesmerised" implies a sense of being captivated, to be enchanted or spellbound, implying a sense of uncertainty not only how to respond, but also whether responding is, inherently, possible with so much uncertainty and fluidity.

Being mesmerised by the potential of the current moment invites us to be open for unfolding futures without being blind or uncritical.

In the Call for Submission, the Editorial Team introduced the Call with referring to "a transformation in education like never before, not only in the way knowledge is produced, shared and consumed but also in the way it is datafied, platformitised, valued and legitimized". We mentioned concerns that "conventional paradigms of degree-based, time-constrained learning, based on standardized curricula and institutionalized organizational frameworks, are becoming more and more out of step with the fast-changing requirements of workplaces and societies that are being transformed by accelerated technological innovation and changing labour markets". The Call further emphasised that what is at stake is "much more than a delivery mode: it is a reorganization of the knowledge-learner-work relationship".

Looking back at the chapters that were carefully selected to be included in the Book, the richness of these chapters illustrates that our initial "hunch" or our assessment that something indeed was happening that called for critical, scholarly engagement and exploration, was correct. The purpose of this concluding chapter is not to summarise the chapters or to provide additional insights on the themes that arose from these chapters. The Introductory chapter sufficiently situated the chapters in the context of the initial Call, as well as clustered the chapters based on broad themes that arose from these chapters.

Rather than summarising the contributions, this conclusion aims to provide some tentative and careful reflections on not only the "so what?" but also "what now?".

17.2 Nothing Is New/Everything Is New

It is firstly important to consider, with this collection of chapters, whether we have found evidence of the "new" and of "a transformation in education like never before". To what extent do the sixteen chapters in this book provide us with evidence that "conventional paradigms of degree-based, time-constrained learning, based on standardized curricula and institutionalized organizational frameworks, are becoming more and more out of step with the fast-changing requirements of workplaces and societies that are being transformed by accelerated technological innovation and changing labour markets"?

In terms of the evidence of "a transformation in education like never before", it is sobering to acknowledge that there have been many claims, in the past, of how a particular form of educational delivery, or a technology, will "revolutionise" education, or change educational provision "forever" have often, somehow, not been realised.

Let us briefly consider four such claims of *large-scale*, *systemic change* (one of which is very recent), in response to one or a combination of political, economic, social, legal, technological or environmental changes.

Possibly the first such "revolutionary change" that comes to mind was the emergence of Distance Education and the later evolution of Open, Distance Learning. Reflecting on the impact of the emergence of distance education on the very nature of the provision of educational opportunities, Otto Peters claimed:

> *There is no other form of teaching and learning that has broken away from tradition so sharply,* that is so flexible and conducive to further societal changes of the post-industrial *knowledge society*. Distance education achieved a *first significant breakthrough* in the reform of higher education. (Peters, 2010, p. 56; italics added)

The "revolution" of distance education focused on providing access through a "back door" (Wedemeyer, 2010) to the marginalised, those who, inter alia, did not meet the admission requirements of brick-and-mortar institutions, or who could not afford the financial costs.

Looking at how *normalised* distance education has become and at the millions of individuals who have completed their educational journeys through distance education (e.g. Mishra & Panda, 2025; Zawacki-Richter & Jung, 2023), one may agree with Peters (2010) that (open) distance education dramatically changed the provision of educational opportunities and permanently transformed education. It is, however, crucial to consider the fact that at no stage in the evolution of distance education has this form of delivery claimed that it would replace (more) traditional forms of education provision.

The *second* example that comes to mind is the hype, claims and realities surrounding Massive Open Online Courses (MOOCs). When MOOCs emerged in late 2011, there were claims that MOOCs heralded the end of brick-and-mortar institutions and that they would democratise education forever. For example, in 2012 the *New York Times* responded to the emergence of MOOCs by claiming 2012 to be "The year of the MOOC" (Pappano, 2012). There were claims that MOOCs

heralded the "end of universities as we know it" (Harden, 2012), and how MOOCs were an example of the "unbundling" and the end of the university (McCowan, 2017). As evidence has shown, this "revolution" did not last long, and did not deliver on its promises of democratising access to educational opportunity (see, for example, Chopra et al., 2022; Zawacki-Richter et al., 2018) and of ending traditional forms of education provision such as residential campus-based education. Looking however at the forces that were at play when MOOCs emerged and that pointed to an apparent "unbundling" (McCowan, 2017) many of these forces are still at play, and signal a fluidity in how learning is accredited, who provides learning and how do providers respond to, inter alia, advances in technology, demands from industry and other stakeholders, to mention but two.

The *third* example of claims of unprecedented change in educational delivery was the response to the Covid-19 pandemic. The pandemic disrupted educational provision at a scale never seen before, and there was hope that the pandemic would be, in the words of Arundhati Roy, a "portal" (Roy, 2020). The pandemic and the lockdowns, "worked like a chemical experiment that suddenly illuminated hidden things" (Roy, 2020). Reflecting on the Pandemic, early in its unfolding, Roy wrote: "Historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different. It is a portal, a gateway between one world and the next". As education systems pivoted to Emergency Remote Teaching (ERT), the Pandemic laid bare many "hidden things", inter alia, the scope and depth of the digital divides, not only in low and medium-income countries but also in so-called resource rich countries and contexts. It also illustrated the potential of online learning to be an effective and appropriate form of educational provision but laid bare the drastic need for teachers to have institutional and infrastructural support (e.g. Bartolic et al., 2022; Tesar, 2020). The pandemic allowed us to see teaching and learning not as isolated to classrooms and institutional locations, and laid bare and enlarged, in many respects, the whole ecosystem of learning by bringing in parents, extended families, siblings and peers in very socio-material entanglements of context, technology, culture, politics, economics, environmental and legal factors. While technological infrastructures made teaching and learning possible, it was the *teachers* who embodied care and the potential of learning in drastically reconfigured constellations of hope amid crises.

The pandemic foregrounded the importance of *human* well-being—of staff, teachers and learners—and how fragile the present and the future can be. It created spaces for us to imagine *alternatives*, to reconsider some of the assumptions we had about learning and teaching, and to a large extent, made us see teaching and learning, and the potential of technology, through different eyes.

And yet, when the last lockdowns were lifted and the world returned to normal, though online learning has become (to some extent) normalised, most institutions and providers went back to what was considered "normal" before the pandemic (e.g. Zhao & Watterston, 2021).

Fourthly, there is possibly no one who would deny that the launch of ChatGPT in November 2022 *fundamentally* reconfigured knowledge, coming-to-know, validating knowledge claims and being human. In 2023, Kissinger, Schmidt and Huttenlocher

said that Generative Artificial Intelligence (GenAI) "*presents a philosophical and practical challenge on a scale not experienced since the start of the Enlightenment"* and will "redefine human knowledge, accelerate changes in the fabric of our reality, and reorganise politics and society" (Kissinger et al., 2023; italics in the original). Though no one may disagree that AI and in particular, GenAI is at present (at least) a major disruptor of current education provision and praxis, the Call made it clear that the impact of GenAI *intersects* with other factors already present when McCowan (2017) mapped the unbundling of higher education as we know it. AI and GenAI not only amplify the questions McCowan (2017) raised about, inter alia, the value and function of existing systems and programmes, the demand for more individual choice and increasing access to knowledge, but also raise *new* opportunities and challenges, in particular regarding the validation, integrity and inherent fragility of knowledge claims and competencies.

The four examples, discussed above, are illustrative and not intended to present a comprehensive overview of the failures or successes, of sector-wide changes in education. Despite this limitation, the four examples do allow us to get a sense of an initial mapping of how different forms of On-Demand Learning, as illustrated in this book, may be compared to distance education, MOOCs, and educational changes in response to Covid-19. Table 17.1 provides a tentative mapping of the lessons On-Demand Learning can learn from these four illustrations of educational change.

Therefore, though the current transformation and dramatic reconfiguration of the educational landscape is not the "first"—as illustrated in the examples—we have reason to believe that the impact of various, often mutually constitutive factors as mapped in the Call for the book, result in unchartered territory, where "everything is new".

17.3 A Transformation in Education Like Never Before

Every chapter in the Book provided snapshots or glimpses of philosophical (e.g. the work of Hannah Arendt, Fraser, and others) and pragmatic considerations and practices that herald in new dispensations or configurations, including examples of changes at national (e.g. Mauritius and Namibia) institutional levels (e.g. the Open University of the Philippines), sectors (e.g. the Health Sector in Brazil, the TVET sector or Workforce development) or in specific contexts (e.g. firefighting training and drone programmes for females in the context of South Africa), specific technologies (e.g. Smart Glasses), collective interventions (e.g. Equity Unbound), or individual practices (AI-guided reflection). There were also considerations of the policy implications of On-Demand Learning whether at national or institutional levels.

We are also convinced that the extremely dynamic nature and impact of multiple factors, for example advances in GenAI, create a ripple effect throughout the whole landscape of learning and learning provision that, when combined with political,

Table 17.1 A tentative overview of the implications for on-demand learning

Example of a promised redefinition of education	Scope of impact on traditional forms of educational delivery	Lessons for on-demand learning
Distance Education (about 1873 onwards)	There is ample evidence how distance education throughout its evolution, has changed access to education for millions of individuals who would otherwise have been excluded Distance education, and later, open, distance learning have also become normalised, but exist together with traditional residential education—often, in one institution as illustrated in the many traditional higher education institutions with distance learning centres (e.g. Mishra & Panda, 2025; Zawacki-Richter & Jung, 2023)	There are claims that, for example, microcredentials and other shorter forms of educational provision herald the radical transformation if not end of formal and longer forms of educational accreditation such as diplomas and degrees. The evolution of distance education show that transformation of one particular element in educational provision (e.g. form of delivery) does not, necessarily, replace existing arrangements but exist alongside these
MOOCs (2012 onwards)	Not only did the so-called "end of brick-and-mortar higher education" not realise, MOOCs did not deliver on its main claims of democratising access, educational opportunity to those excluded from traditional forms of educational delivery (Chopra et al., 2022; Zawacki-Richter et al., 2018)	There are many reasons why MOOCs were not the "end" of brick-and-mortar education, but the history of MOOCs warn against hype and overestimation of the impact of an innovation while ignoring structural, legacy, accreditation and recognition concerns

(continued)

Table 17.1 (continued)

Example of a promised redefinition of education	Scope of impact on traditional forms of educational delivery	Lessons for on-demand learning
COVID-19 (±2020-2022_	Emergency Remote Teaching and Learning was an emergency response, and while online teaching and learning became more accepted after the Pandemic, most educational provision reverted to pre-Pandemic norms once the Pandemic ended	While this example illustrates that portals close without intentional change, it also illustrates that such events do highlight what is normally not seen or hidden. On-Demand Learning illustrates, inter alia, frustration with the slow response of traditional forms of education provision to needs in broader society and industry, and the impact of national qualification frameworks and accreditation
GenAI (2022–present)	While the impact of GenAI and in particular LLMs is still unfolding, there is a sense of a *radical* reconfiguration of being human, what is regarded as knowledge and how knowledge is produced, verified and disseminated	There is evidence of the impact of GenAI and in particular LLMs on instructional design, curriculum development, pedagogy and assessment. As such, the affordances of LLMs creates opportunities for not only different forms of learning, different temporalities and hybrid systems that do not fit in current quality assurance, accreditation and recognition systems/networks. While LLMs do open up spaces for thinking differently, there are also many concerns. As many of the chapters illustrate, On-Demand Learning is, to a large extent, entangled, if not dependent on GenAI and LLMs. There is therefore a need for a critical interrogation and ethical integration of GenAI and LLMs into On-Demand Learning

social, economic, legal and environmental factors, *heralds unchartered territory*, on a scale that we have not seen before.

17.4 What We (Don't) Know (Yet)

While there are several indicators that the emergence of the phenomenon and praxis of On-Demand Learning as is an essential part of an (increasing?) unbundling or rebundling of education and training, there are also indicators of the inherent instability and fluidness in the broader context of education and training.

Microcredentials: While some of the chapters provide snapshots of institutions to be more flexible and responsive to just-in-time learning and assessment opportunities, outside of evidence of the increasing acceptance of microcredentials, there is still

very little sign of an "unbundling" or the disappearance of three-year or four-year degree programmes, the end of higher education and a reconfiguration of quality assurance and accreditation at scale, whether in particular sectors or national contexts. Current evidence pertaining to microcredentials suggests that acceptance is uneven and dependent on context, and that there still remain several questions and challenges. There is, for example, a real danger of market saturation, concerns about quality and accreditation and linkages with formal professional development and qualifications (e.g. Dang & Tang, 2026; EDUCAUSE, 2026; UNESCO, 2025; Zou et al., 2024).

The EDUCAUSE Horizon Report® Teaching and Learning Edition (2026) refers to the redefinition of the Return on Investment (ROI) integral to credentialing forms of education provision. Higher education institutions in particular are under pressure to provide evidence of the ROI of programmes and qualifications. There is a need for "more flexible credentials such as certificates, badges, bootcamps, and microcredentials that can build toward larger credentials over time" (p. 15). Without disregarding the value of longer and more traditional forms of credentialing such as degrees, institutions "need to be clearer about what students will learn and be able to do, use stronger assessments so credentials actually signal real skills, and help students understand what ROI data do and do not mean" (p. 15).

Some issues to consider regarding microcredentials as a form of On-Demand Learning:

- What are the enabling conditions that make the design, development and delivery of microcredentials a success *in particular contexts*?
- How are the private and industry sectors embracing not only microcredentials developed by higher education, but designing, developing and delivering microcredentials for specific needs in the market and/or industry?
- What is the evidence that microcredentials and specifically their features of flexibility and stackability are preferable for which students rather than traditional diplomas and degree programmes?
- How do microcredentials as a form of On-Demand Learning, benefit populations that are currently outside of the traditional forms of educational delivery?
- How do we measure the ROI of On-Demand Learning and what other benefits are there in On-Demand Learning that do not necessarily fall under the current definitions of ROI?

The future and forms of accreditation, quality assurance and portability

Already in 2000, Ronald Barnett pointed to a reconfiguration of education provision and he highlighted not only the changing nature of knowledge but also changes in the legitimacy of higher education as the provider of knowledge that *matters*, both to society and industry. Not only is the university "no longer the sole or even the main source of production of knowledge […] the forms of knowledge that the university has prized are being challenged by new forms of knowledge valued in the wider world" (p. 410). He adds that the "criteria for validating knowledge claims are widening" with implications for quality assurance, accreditation and portability of competencies—"knowledge has given way to knowledges" (p. 410). The new frameworks for how we understand the world, and the role of education and training,

compete with one another placing new forms of learning such as those emerging as On-Demand Learning, under scrutiny. In the light of the fact that accreditation is the backbone of quality assurance (Kumar et al., 2025), not only in higher education but also in education and training provision; forms of On-The EDUCAUSE Report® (2026) makes it clear that "Higher education faces continued pressure to prove its value" (p. 8) and states:

> Shifts are accelerating toward new delivery models and learning pathways, including stackable and microcredentials, experiential and skills-based learning, competency-focused assessments, and alternatives outside traditional higher education, such as trade schools. (p. 8)

On-Demand Learning therefore necessitates rethinking national qualification frameworks, quality assurance and the portability of providers, competencies and forms of recognition. (Also see Duarte & Vardasca, 2023; Haolader & Shimu, 2024; Hou et al., 2026).

Considering the notion of lifelong learning (and the critiques against lifelong learning) (e.g. Romö, 2024) and how AI reconfigures lifelong learning, we are in unchartered territory and we may have to rethink notions and practices pertaining to accreditation, quality assurance and portability (Pachler, 2023; Palenski et al., 2024; Regmi, 2015).

Some issues to consider regarding future and forms of accreditation, quality assurance and portability in/of On-Demand Learning:

- What can we learn about the formalisation of the accreditation and portability of microcredentials that may be helpful in providing pointers for the accreditation and recognition of other forms of formal and informal learning?
- Workplace and informal learning as a form of On-Demand Learning often fall *outside* of formal regulation and recognition despite the implementation of the Recognition of Prior Learning (RPL) in some sectors, e.g. higher education. How can workplace and informal learning as a form of On-Demand Learning become (more) recognised, accredited and portable?
- Processes involved in the regulation, quality assurance, recognition and accreditation (whether of institutions or of forms of learning) often dampen, jeopardise or even prevent initiatives to embrace the potential of On-Demand Learning. What forms of regulation, quality assurance, recognition and accreditation will be responsive and yet ensure the integrity of the form and outcomes of On-Demand Learning?
- It is increasingly evident that advances in AI and especially LLMs provide impetus for new forms of On-Demand Learning that currently fall outside of the traditional roles of having a dedicated (and recognised) training provider which is also part of an "official" sector such as TVET, or higher education. Currently such forms of On-Demand Learning fall outside any regulation, quality assurance, recognition and accreditation. While it may be impossible, even unfeasible to attempt to regulate these new forms of On-Demand Learning, how do we create pathways that would recognise and "accredit" these forms of On-Demand Learning?

- Despite the fact that the notion of lifelong learning is thoroughly embedded in our understandings of what it means to be human in the twenty-first century (and beyond), our systems and processes for recognising and accrediting the many different forms of lifelong learning, have not lived up to accepting the challenges these forms of learning raise. What are our options?

Privatisation, commercialisation and collaboration: With increasing evidence of education institutions facing funding constraints, and governments revisiting the funding regimes of higher education, there is also evidence of the increasing privatisation and commercialisation of educational opportunities (Winton & Mockler, 2025). There is, however, also a wide variety of private/public partnerships where, for example, a commercial entity would provide tools or platforms for hybrid forms of partnerships in the provision, accreditation and recognition of learning (EcoFin, 2026; Tanveer et al., 2025; Upadhyay et al., 2024).

Recent developments in not only LLMs but also the increasing influence of AI companies such as OpenAI, Anthropic, Mistral, Deepseek and others in education, also raise interesting and urgent questions regarding *their* role in what kind of education and training are provided whether in terms of providing the epistemic infrastructures or tools.

Some issues to consider regarding privatisation, commercialisation and collaboration in the context of On-Demand Learning:

- What are the features of successful collaboration between private and public sectors in the design, development and provision of On-Demand Learning?
- How do the power differentials between public, private and industry collaborations shape the design, development and provision of On-Demand Learning?
- How does the cost in the design, development and provision of On-Demand Learning effect its pricing, its sustainability and its impact?
- How do the privatisation, commercialisation and potential for collaboration benefit populations that are currently outside of the traditional forms of educational delivery?
- What are the challenges and opportunities inherent in these different forms of collaboration for quality assurance, accreditation and recognition?

Vocational education and training: While one of the challenges traditional higher education institutions face in the context of On-Demand Learning is the *slow* pace of change and innovation, On-Demand Learning faces different challenges in the context of vocational education and training, e.g. the increasing impact of digitalisation of teaching and learning (Diao et al., 2025), and harnessing the potential of AI (Prasetya et al., 2025). (Also see EDUCAUSE, 2026).

Some issues to consider vocational education and training in the context of On-Demand Learning:

- How do new technologies such as AI, Robotics, and the digitalisation of learning impact on the responsiveness, effectiveness, and quality of vocational education and training?

- How does On-Demand Learning with its characteristics of flexibility, stackability and responsive ("just-in-time") requirements impact traditional vocational education and training?
- While traditional vocational education and training may be less dependent on digital platforms and digital learning, how will the increasing digitalisation of learning and learning resources impact on vocational education as a form of On-Demand Learning?
- Should vocational education embrace the potential of On-Demand Learning, how will it benefit populations that are currently outside of the formal vocational education and training systems?

Advancements in Artificial Intelligence: While advances in technology have always shaped the design, development and provision of educational opportunities, a crucial element in On-Demand Learning is the appropriate and responsible use of AI.

For example, there is consensus that *scaling* in Large Language Models (LLMs) will not necessarily resolve the persistence of untruths (also called "hallucinations") or result in Artificial General Intelligence (AGI) (Marcus, 2025; Singh, 2026). There is also an increasing backlash and concerns regarding the impact of AI on employment (Barnes, 2026; Shroff, 2026), and in education (Forsler et al., 2025; Pi et al, 2026), the environmental impact of AI and the increasing number of data centres (Hosseini et al., 2025; Wang et al., 2026), the political economy of AI (Egan, 2025; Luitse, 2024), privacy, security and surveillance (Devineni, 2024; Solove, 2025), and concerns about the tensions between cognitive enhancement and erosion regarding AI in learning (Jose et al., 2025; Li et al., 2026). Despite or amid claims of the democratisation of knowledge through these LLMs (and the contestation of these claims), there are valid concerns regarding the reality of the fact that the training data for these LLMs privilege ontologies and epistemologies of the Anglo-Saxon world or high-income countries, to the exclusion of other forms of knowing and being (Hila, 2026; Mollema, 2025). AI systems, per se, make certain worlds possible and exclude the potentiality of alternatives.

This list is anything but exhaustive but does point to AI in education provision to be a dynamic and contested field, amid evidence of its impact on provision, forms of provision, quality assurance, relationships, qualification structures and accreditation and recognition (EDUCAUSE, 2026).

Education and training providers are still figuring out the impact of AI on graduate competencies, the implications for assessment in terms of format, integrity and graduate and institutional reputation, as well as the implications for programme design, quality assurance and the duration of programmes and qualifications.

Some issues to consider regarding the design, development and deployment of AI in the context of On-Demand Learning:

- One of the aspects that prevent traditional education and training provision from responding *faster* is, inter alia, the need for and impact of regulation, accreditation and recognition. How do we ensure that while embracing AI to realise the potential

of On-Demand Learning, that we do so ethically, responsibly and with care (e.g. Chatzichristofis, 2026; Xiao & Lim, 2026)?

- The design, development and deployment of AI in realising the potential of On-Demand Learning, may involve the automation of (aspects of) the learning trajectory. As such, it will sanction a particular choice (whether by students, designers or the institution) to the exclusion of other choices. What are the risks and ethical challenges in the personalisation of learning in AI-enabled On-Demand Learning (e.g. Prinsloo, 2025)?
- Optimising AI in the design, development and provision of On-Demand Learning requires, inter alia, substantial human expertise and capacity, and digital infrastructure. Many education providers will not have either the in-house expertise and/or capacity and/or the digital infrastructure and will rely on collaboration with other providers and/or sectors and/or commercial providers. What would be the enabling conditions for successful integration of AI as infrastructure in the provision of On-Demand Learning (e.g. Adam et al., 2026; Timcke & Makumbirofa, 2024; Upadhyay et al., 2024).?

On-Demand Learning and its planetary entanglements: It would be unthinkable, if not also irresponsible to close these concluding thoughts without reflecting on how On-Demand Learning links to humanity's entanglement with Planet Earth—which has sustained the evolution of humankind for thousands of years. There is a real danger that On-Demand Learning will be just the latest form of educational delivery in service of extractive capitalism (Fraser, 2023), moved by "market demand" (Mezzadra & Neilson, 2017; Rowe, 2019) and feeding the exploitation of workers in the ever-increasing precarity workers globally face (Shin et al., 2023). It would be disingenuous to ignore how commercial models of AI are impacting on labour, and employment (Doshi et al., 2026), the planetary cost of AI (Crawford, 2021; Galaz et al., 2025) and the human labour sustaining LLMs, especially in the Global South (Hao, 2025).

Some issues to consider regarding the planetary entanglement of On-Demand Learning:

- We simply cannot go on and act as if nothing has changed or that nothing is changing. While *all* education and training, in one form or another, should address the reality of Climate Change and the reality of multiple crises, curricula in formal education contexts are slower to respond to the increasing intensity and multifold crises humanity is facing. On-Demand Learning can play a crucial role in assisting individuals and communities to adapt to their new realities without ignoring the fact that they are on the receiving end of dominant expansionist and extractive practices in well-resourced contexts. What kinds of On-Demand Learning, provided by whom, can assist individuals and communities to redefine human flourishing in their contexts?
- On-Demand Learning can, however, go further and provide opportunities for individuals and communities to critically engage with their contexts and identify political, economic, social, technical, and legal factors impacting on their ability to flourish in the light of the potential of planetary collapse, and find ways to

frame and enact alternative ways of being. How can On-Demand Learning create spaces for critical agency?

- There are already many community organisations and agencies responding to Climate Change, the refugee crises, increasing migrations and increasing vulnerabilities among marginalised individuals and communities. How can we build alliances and networks providing On-Demand Learning that will be, at its core, responsive to the planetary challenges we face?
- We simply cannot ignore the cost—planetary and human—of the growth of AI and specifically, the need for ever-more data centres. While LLMs and future advances in AI may support forms of On-Demand Learning or contribute to increasing the responsiveness of existing forms of education and training, we have to count the planetary and human cost of AI. How can we optimise Small Language Models, local enterprise-based or AI initiatives from Indigenous communities to optimise the potential of AI without the planetary and human costs?

17.5 Conclusion: The Promise and Challenge of On-Demand Learning

In the Introduction to the book, we acknowledged that

> the future of On-Demand Learning will depend less on technological advancement alone than on the values, governance structures, and social visions that shape its development. Whether it evolves into a system that expands opportunity, supports diverse forms of knowledge, and fosters reflective and responsible agency remains unresolved. The challenge is therefore not only technical or institutional, but fundamentally ethical and political.

In this concluding chapter, we briefly alluded to three examples of instances where there were claims and/or glimpses of what a large-scale, systemic transformation of education provision (could) look like. The chapters in this book provide glimpses, some bigger than others, some more permanent than others, of transformations in education and training provision that we think present a case for taking seriously the potential of On-Demand Learning.

Considering the many intersecting and often mutually constitutive challenges humanity currently face, On-Demand Learning may be a "portal" through which we can imagine and enact a kinder, more responsible humanity, recognising our debt to this amazing blue planet who has sustained us for thousands of years.

The book and its contents do not claim that On-Demand Learning is a new form of educational provision, but in many ways a lens on the continuation of intersecting factors and influences whether technological, political, economic, social, legal and/or environmental. And yet, there is something new in the air—another potential to realise a dream of a more just, equitable and fair human-planetary constellation.

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References

Adam, T., Dube, G., & Prinsloo, P. (2026). *The influence of private sector AI in public education: Benefits and pitfalls*. EdTech Hub. https://doi.org/10.53832/edtechhub.1194.

Barnes, L. (2026, April 24). The AI industry is discovering that the public hates it. *The New Republic*. https://newrepublic.com/article/209163/ai-industry-discovering-public-backlash

Barnett, R. (2000). University knowledge in an age of supercomplexity. *Higher Education,40*(4), 409–422. https://doi.org/10.1023/a:1004159513741.pdf

Bartolic, S. K., Boud, D., Agapito, J., Verpoorten, D., Williams, S., Lutze-Mann, L., Matzat, U., Moreno, M. M., Polly, P., Tai, J., Marsh, H. L., Lin, L., Burgess, J. L., Habtu, S., Rodrigo, M. M. M., Roth, M., Heap, T., & Guppy, N. (2022). A multi-institutional assessment of changes in higher education teaching and learning in the face of COVID-19. *Educational Review, 74*(3), 517–533. https://doi.org/10.1080/00131911.2021.1955830

Chatzichristofis, S. A. (2026). Reframing AI in education: A pedagogical opportunity, not a technocratic threat. *Journal of Research in Science Teaching, 63*(1), 97–103. https://doi.org/10.1002/tea.70024

Chopra, N., Sindwani, R., & Goel, M. (2022). A systematic mapping of empirical MOOC studies: Research methods, perspectives, themes and trends. *International Journal of Management in Education, 16*(3), 235–258. https://doi.org/10.1504/IJMIE.2022.122625

Crawford, K. (2021). *The Atlas of AI*. Yale University Press.

Dang, B. Y. Y., & Tang, H. H. H. (2026). Micro-credentials and the unbundling of higher education: Democratization of learning across the lifespan. *Journal of Applied Research in Higher Education*, 1–15. https://doi.org/10.1108/JARHE-04-2025-0273

Devineni, S. K. (2024). AI in data privacy and security. *International Journal of Artificial Intelligence & Machine Learning (IJAIML),3*(1), 35–49. https://openlibindex.com/index.php/IJAIML/article/view/IJAIML_03_01_004

Diao, J., Tang, X., & Ding, X. (2025). How do nations around the world navigate the digitalization of vocational education policies? *Education and Information Technologies, 30*(14), 19803–19831. https://doi.org/10.1007/s10639-025-13567-9

Doshi, V., Segarra, P., & Śliwa, M. (2026). Precarious work: A critical review and a proposal for future research. *Human Relations, 79*(2), 215–245. https://doi.org/10.1177/00187267251394583

Duarte, N., & Vardasca, R. (2023). Literature review of accreditation systems in higher education. *Education Sciences, 13*(6), 582. https://doi.org/10.3390/educsci13060582

Ecofin Agency. (2026). *Ghana partners with Google to expand AI-Driven education in local languages*. Ecofin Agency. https://www.ecofinagency.com/news-services/2601-52257-ghana-partners-with-google-to-expand-ai-driven-education-in-local-languages

EDUCAUSE. (2026). *EDUCAUSE Horizon Report® Teaching and Learning Edition*. https://library.educause.edu/resources/2026/5/2026-educause-horizon-report-teaching-and-learning-edition

Egan, M. (2025). Towards a political economy of algorithmic capitalism. *Capital & Class, 50*(2), 199–211. https://doi.org/10.1177/03098168251326189

Forsler, I., Hayes, S., Jandrić, P., Macgilchrist, F., Selwyn, N., & Hansén, S. (2025). Hijacking the digital backlash in education. *Postdigital Science and Education, 8*(2), 600–620. https://doi.org/10.1007/s42438-025-00601-9

Fraser, N. (2023). *Cannibal capitalism: How our system is devouring democracy, care, and the planet and what we can do about it*. Verso Books.

Galaz, V., Schewenius, M., Donges, J. F., Fetzer, I., Zhivkoplias, E., Barfuss, W., Delannoy, L., Wang-Erlandsson, L., Gelbrecht, M., Heitzig, J., Hentati-Sundberg, J., Kennedy, C., Knecht, N., Lotcheris, R., Mahecha, M., Merrie, A., Montero, D., McPhearson, T., Mustafa, A., … Vadrot, A. (2025). AI for a planet under pressure. *arXiv preprint*arXiv:2510.24373. Retrieved from https://arxiv.org/pdf/2510.24373

Hao, K. (2025). *Empire of AI: Dreams and nightmares in Sam Altman's OpenAI*. Penguin Group.

Haolader, F. A., & Shimu, S. S. (2024). A comparison of national qualifications frameworks and recognition, validation, and accreditation mechanism of informal learning in vocational education and training among selected countries. In M. Pilz (Ed.), *Informal learning in vocational education and training. internationale berufsbildungsforschung*. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-44341-2_17

Harden, N. (2012, December 12). The end of the university as we know it. *American Interest*. https://www.the-american-interest.com/2012/12/11/the-end-of-the-university-as-we-know-it/

Hila, A. (2026). The epistemological consequences of large language models: rethinking collective intelligence and institutional knowledge. *AI & SOCIETY,41*(1), 79–97. https://doi.org/10.1007/s00146-025-02426-3

Hosseini, M., Gao, P., & Vivas-Valencia, C. (2025). A social-environmental impact perspective of generative artificial intelligence. *Environmental Science and Ecotechnology, 23*, Article 100520. https://doi.org/10.1016/j.ese.2024.100520

Hou, A. Y. C., Tao, C. H. Y., Su, E. H. C., Zhou, K. Z. W., Chen, Y., Lin, A. F. Y., & Hill, C. (2026). Does quality assurance matter for micro-credentials in higher education? Legitimacy, regulatory framework, and challenges in four Asian contexts. *Studies in Higher Education, 51*(3), 592–608. https://doi.org/10.1080/03075079.2025.2482833

Jose, B., Cherian, J., Verghis, A. M., Varghise, S. M., & Joseph, S. (2025). The cognitive paradox of AI in education: Between enhancement and erosion. *Frontiers in Psychology,16*, 1550621. https://doi.org/10.3389/fpsyg.2025.1550621

Kissinger, H.A., Schmidt, E., & Huttenlocher, D. (2023, February 24). ChatGPT Heralds an Intellectual Revolution. *The Wall Street Journal.* https://www.henryakissinger.com/articles/chatgpt-heralds-an-intellectual-revolution/

Kumar, A., Paliwal, J., Singh, M., Pendse, V., Gade, R., Palav, M., & Raibagkar, S. (2025). Focused literature review on accreditation and quality assurance: Insights and future research agenda. *Quality Assurance in Education, 33*(3), 376–392. https://doi.org/10.1108/QAE-08-2024-0170

Li, C., Cui, H., & Hagedorn, L. S. (2026). The cognitive impact of ChatGPT in higher education: A systematic review of critical and creative thinking outcomes. *Computers and Education: Artificial Intelligence*, 100571. https://doi.org/10.1016/j.caeai.2026.100571

Luitse, D. (2024). Platform power in AI: The evolution of cloud infrastructures in the political economy of artificial intelligence. *Internet Policy Review*, *13*(2), 1–44. https://doi.org/10.14763/2024.2.1768

Marcus, G. (2025, February 19). *The most underreported and important story in AI right now is that pure scaling has failed to produce AG*. Fortune. https://fortune.com/2025/02/19/generative-ai-scaling-agi-deep-learning/

McCowan, T. (2017). Higher education, unbundling, and the end of the university as we know it. *Oxford Review of Education, 43*(6), 733–748. https://doi.org/10.1080/03054985.2017.1343712

Mezzadra, S., & Neilson, B. (2017). On the multiple frontiers of extraction: Excavating contemporary capitalism. *Cultural Studies, 31*(2–3), 185–204. https://doi.org/10.1080/09502386.2017.1303425

Mishra, S., & Panda, S. (Eds.). (2025). *Handbook of open universities around the world*. Taylor & Francis.

Mollema, W. J. T. (2025). A taxonomy of epistemic injustice in the context of AI and the case for generative hermeneutical erasure. *AI and Ethics, 5*(5), 5535–5555. https://doi.org/10.1007/s43681-025-00801-w

Pachler, N. (2023). Unbundling and aggregation: Adapting higher education for lifelong learning to the new skills agenda and to digital transformation. In K. Evans, W. O. Lee, J. Markowitsch, & M. Zukas (Eds.), *Third international handbook of lifelong learning* (pp. 801–820). Springer International Publishing.

Palenski, T., Hills, L., Unnikrishnan, S., & Eynon, R. (2024). How AI works: Reconfiguring lifelong learning. *Postdigital Science and Education, 6*(4), 1216–1239. https://doi.org/10.1007/s42438-024-00496-y

Pappano, L. (2012, November 2). The year of the MOOC. *New York Times.* https://classes.cs.uchicago.edu/archive/2021/fall/20900-1/lecs/NYTMooc.pdf

Peters, O. (2010). *Distance education in transition: Developments and issues.* BIS-Verlag der Carl-von-Ossietzky-University.

Pi, Y., Lichner, L., Lee, J. W., Xiao, S., Zhang, R., & Singh, J. (2026). *Push and pushback in contesting AI: Demands for and resistance to accountability. arXiv preprint*arXiv:2605.09793. https://doi.org/10.48550/arXiv.2605.09793

Prasetya, F., Fortuna, A., Samala, A. D., Latifa, D. K., Andriani, W., Gusti, U. A., Raihan, M., Criollo-C, S., Kaya, D., & García, J. L. C. (2025). Harnessing artificial intelligence to revolutionize vocational education: Emerging trends, challenges, and contributions to SDGs 2030. *Social Sciences & Humanities Open, 11*, Article 101401. https://doi.org/10.1016/j.ssaho.2025.101401

Prinsloo, P. (2025). Infantilizing, echo chamber, filter bubble or the dawn of a new enlightenment: Some (critical) thoughts about adaptive and personalized learning. In UNESCO. (Ed.), *AI and the future of education: Disruptions, dilemmas and directions* (pp. 65–75). https://doi.org/10.54675/KECK1261

Regmi, K. D. (2015). Lifelong learning: Foundational models, underlying assumptions and critiques. *International Review of Education,61*(2), 133–151. https://doi.org/10.1007/s11159-015-9480-2

Romö, M. B. (2024). Untangling ideologies in lifelong learning discourse. *Journal of Education and Work, 37*(5–6), 309–324. https://doi.org/10.1080/13639080.2024.2407764

Rowe, E. (2019). Capitalism without capital: The intangible economy of education reform. *Discourse: Studies in the Cultural Politics of Education,40*(2), 271–279. https://doi.org/10.1080/01596306.2019.1569883

Roy, A. (2020, April 3). The pandemic is a portal. *Financial Times.* https://www.ft.com/content/10d8f5e8-74eb-11ea-95fe-fcd274e920ca

Shin, K. Y., Kalleberg, A. L., & Hewison, K. (2023). Precarious work: A global perspective. *Sociology Compass, 17*(12), Article e13136. https://doi.org/10.1111/soc4.13136

Shroff, L. (2026, May 13). The AI backlash could get very ugly. *The Atlantic.* https://www.theatlantic.com/technology/2026/05/ai-backlash-data-centers-political-violence/687151/

Singh, H. (2026, April 6). *Why scaling is not enough: The structural limits of modern AI systems.* Medium. https://medium.com/architectural-intelligence/why-scaling-is-not-enough-2077925cb6ec

Solove, D. J. (2025). Artificial intelligence and privacy. *Florida Law Review, 77*, 1. https://scholarship.law.ufl.edu/flr/vol77/iss1/1

Tanveer, U., Hoang, T. G., Ishaq, S., & Khalid, R. U. (2025). Public-private partnerships as catalysts for digital transformation and circular economy: Insights from developing countries. *Technological Forecasting and Social Change, 219*, Article 124270. https://doi.org/10.1016/j.techfore.2025.124270

Tesar, M. (2020). Towards a post-Covid-19 'new normality?': Physical and social distancing, the move to online and higher education. *Policy Futures in Education, 18*(5), 556–559. https://doi.org/10.1177/1478210320935671

Timcke, S., & Makumbirofa, S. (2024, May 22). Five things to know about the political economy of AI. *Research ICT Africa.* https://researchictafrica.net/2024/05/22/five-things-to-know-about-the-political-economy-of-ai/

UNESCO. (2025). *Mapping micro-credentials in Latin America and the Caribbean: Towards a common framework*. https://unesdoc.unesco.org/ark:/48223/pf0000393794.locale=en

Upadhyay, P., Kumar, A., & Mukerji, M. (2024). Evolving role of public-private stakeholders in technology mediated teaching. *Digital Policy, Regulation and Governance, 27*(1), 56–73. https://doi.org/10.1108/DPRG-09-2023-0130)

Wang, Q., Liu, T., & Li, R. (2026). Artificial intelligence and environmental sustainability: Investigating the AI-EKC nexus for SDG 7 and SDG 13. *Sustainable Development, 34*(1), 1141–1166. https://doi.org/10.1002/sd.70294

Wedemeyer, C. A. (2010). *Learning at the back door: Reflections on non-traditional learning in the lifespan*. IAP.
Winton, S., & Mockler, N. (2025). Introduction to the special issue: Education privatisation and commercialisation in the context and aftermath of the COVID-19 pandemic. *Education Policy Analysis Archives*, *33*. https://doi.org/10.14507/epaa.33.9781
Xiao, J., & Lim, D. C. (2026). Is AI the solution to the problems that make higher education "ill" in the first place?: Towards a technology-agnostic, future-proof approach. *Journal of Applied Learning & Teaching,9*(1), 1–18. https://doi.org/10.37074/jalt.2026.9.1.14
Zawacki-Richter, O., Bozkurt, A., Alturki, U., & Aldraiweesh, A. (2018). What research says about MOOCs–An explorative content analysis. *The International Review of Research in Open and Distributed Learning,19*(1). https://doi.org/10.19173/irrodl.v19i1.3356
Zawacki-Richter, O., & Jung, I. (Eds.). (2023). *Handbook of open, distance and digital education*. Springer.
Zhao, Y., & Watterston, J. (2021). The changes we need: Education post COVID-19. *Journal of Educational Change, 22*(1), 3–12. https://doi.org/10.1007/s10833-021-09417-3
Zou, H., Ullah, A., Qazi, Z., Naeem, A., & Rehan, S. (2024). Impact of micro-credential learning on students' perceived employability: The mediating role of human capital. *International Journal of Educational Management, 38*(4), 897–915. https://doi.org/10.1108/IJEM-01-2023-0002

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Afterword: Extending the Horizons of On-Demand Learning

Since the initial conception of this book, On-Demand Learning has continued to evolve as both a conceptual lens and a lived reality across education systems, workplaces, and digital platforms. The chapters in this book reflect a moment of transition where learning is becoming increasingly modular, AI-mediated, and closely intertwined with shifting configurations of work, knowledge production, and institutional governance. At the same time, this transition is also shaped by social inequality, public policy, infrastructure, culture, and local conditions that influence how learning is accessed and valued. Yet as these contributions demonstrate, On-Demand Learning remains an open and unfinished idea, shaped just as much by emerging practices as by theoretical articulation.

One of the most important insights from this book is that On-Demand Learning is no longer simply about accessing knowledge at the point of need. Rather, it increasingly involves the reconfiguration of how learning itself is organized, distributed, and enacted across human and technological systems. Across diverse contexts, from vocational education and micro-credentials to AI-supported workplace learning and platform-based ecosystems, we see a gradual shift toward learning environments that are continuous, embedded, and operationally integrated with professional activity. In this sense, On-Demand Learning is not a fixed model, but a moving target that is constantly redefined by technological affordances and socio-economic demands.

At the same time, recent developments in AI invite further reflection on the conceptual boundaries of On-Demand Learning itself. If learning is increasingly mediated, structured, or even executed through AI systems, then the meaning of "learning on demand" may be undergoing a deeper transformation. Rather than referring solely to human-led processes of knowledge acquisition, it may increasingly describe hybrid systems in which learning is distributed across human intention, algorithmic systems, and automated capability generation. In such configurations, the learner's role may shift from direct participant in learning processes to orchestrator of learning environments, designing, guiding, and validating outcomes produced through socio-technical assemblages. This possibility also brings risks, including dependency on AI systems, deskilling, loss of autonomy, weakened foundational knowledge, and new forms of surveillance or exclusion.

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This emerging perspective does not replace the foundations of On-Demand Learning developed in this book, but rather extends them. The concept has moved through three phases: first, access to knowledge; second, flexible capability development; and now, a third phase characterized by human–AI collaboration. As this form of collaboration becomes more common, learning systems can be designed to widen participation, strengthen professional practice, and support responsible human development, but only if they remain attentive to governance, context, equity, and human agency.

Importantly, this evolution also reopens fundamental questions about education itself. If learning becomes increasingly externalized, continuous, and embedded within intelligent systems, what remains the distinctive role of educational institutions? How should we understand knowledge, competence, and expertise when they are no longer solely located within individuals but co-produced through human–AI interaction? And how might societies ensure that such transformations expand rather than diminish opportunities for meaningful participation, critical reflection, and social inclusion?

These questions do not seek definitive answers. Instead, they point toward the next phase of research and discussion. The chapters in this volume provide a strong foundation, but they also show that On-Demand Learning is still developing. As education systems continue to evolve under conditions of rapid technological and social change, On-Demand Learning will remain a space of experimentation, negotiation, and reinterpretation.

It is in this spirit that this book concludes not as an endpoint but as an opening. The future of On-Demand Learning will depend on how scholars, practitioners, policymakers, and learners collectively shape its next iterations, and how we continue to balance innovation with responsibility and efficiency with the deeper purposes of education in human society.

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