MULTILITERACIES AND SECOND LANGUAGE EDUCATION

ROUTLEDGE

Generative AI Technologies, Multiliteracies, and Language Education

Edited by Gabriela C. Zapata

Generative AI Technologies, Multiliteracies, and Language Education

Generative AI Technologies, Multiliteracies, and Language Education is a comprehensive edited volume that examines the integration of Generative AI (GenAI) technologies within the framework of multiliteracies pedagogies to enhance language teaching and learning.

This collection of chapters offers an in-depth understanding of how GenAI can transform language education through theoretical insights and empirical research. Featuring contributions from leading scholars in the field, this innovative volume provides both foundational concepts and innovative practices alongside evidence-based methodologies and practical strategies for educators, enhancing both teaching effectiveness and student engagement in multiliteracies environments. The book investigates the role that GenAI grounded in multiliteracies can play in language education, providing readers with comprehensive theoretical and pedagogical bases for the use of GenAI technologies in language teaching and learning, empirical evidence from research work, and solid guidelines and recommendations for practice and implementation in the language classroom.

Generative AI Technologies, Multiliteracies, and Language Education will be of interest to those involved in teaching, researching, or developing curriculum that integrates technology and multiliteracies with language learning.

Gabriela C. Zapata is Associate Professor in Education at the University of Nottingham in the United Kingdom. She also serves as the editor of the book series *Multiliteracies and Second Language Education* (Routledge) and co-editor-in-chief of the journal *Diversity & Inclusion Research*. Her main research areas are *Learning by Design* and second and heritage language pedagogy, generative AI in higher education and teacher training, and multimodal social semiotics.

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Contributors

Bill Cope is a Professor in the Department of Education Policy, Organization & Leadership at the University of Illinois, Urbana-Champaign in the United States. His research interests include theories and practices of pedagogy, cultural and linguistic diversity, and new technologies of representation and communication. His and Mary Kalantzis' recent research has focused on the development of digital writing and assessment technologies, with the support of a number of major grants from the US Department of Education, the Bill and Melinda Gates Foundation, and the National Science Foundation. The result has been the *CGScholar* multimodal writing and assessment environment.

Johnathan Cruise is a test development researcher with the English Language Research of the British Council in the United Kingdom, where he works on various projects, primarily dynamic assessment in machine-driven learning and young learner assessment literacy as well as standardization projects. Before moving back to the UK in 2022, Johnathan managed a pool of researchers in China as well as key initiatives in IELTS (International English Language Testing System) and other assessment projects. Johnathan has over 15 years of experience as an examiner manager and trainer and over 20 years' experience as a college teacher in business English, English for Specific Purposes, English language teaching, and language teacher training. He was trained in state school general primary education in the UK and holds a master's degree in applied linguistics and TESOL (Teaching English to Speakers of Other Languages).

Emil Tangham Hazelhurst is an Associate Lecturer of corpus linguistics at Lancaster University in the United Kingdom. He is currently participating in a research project funded by the Economic and Social Research Council in collaboration with the British Council involving language testing and acquisition through the use of corpus techniques. He has published previously in the areas of language acquisition, corpus analysis, and ecocriticism and has written for *The Palgrave Encyclopedia of Computer-Assisted Language Learning*. He is also the co-editor of the upcoming collection *Apocalyptic Ecolinguistics: Language, Landscape, and Ecoanxiety in the Age of Ecological Crisis* with Bloomsbury.

Sandra Healy is a professor at the Kyoto Institute of Technology in Japan. Her research focuses on using technology in education to enhance learning experiences and foster intercultural communication. Specifically, she explores the interplay between creativity, digital literacy, interculturality, and virtual exchange. She is also interested in diversity and the inclusion of minoritized groups in Japan. In addition, she has been involved in extensive reading for two decades, running a large program at a university focusing on STEAM (Science, Technology, Engineering, Arts, and Mathematics). She has received multiple research grants from the Japanese Ministry of Education to advance these areas of study.

Amelia Ijiri is a lecturer at the Kyoto Institute of Technology, Japan, and a doctoral student in the Instructional Systems Technology program at Indiana University, Bloomington, in the United States. Her research focuses on generative artificial intelligence (AI), sociocultural learning, and technology-mediated learning environments, with an emphasis on AI's role in augmenting human intelligence and workforce development. Drawing on educational psychology and the learning sciences, she investigates emerging technology platforms, including augmented and virtual reality, and has worked with Victory XR, Immerse VR, Ovation VR, and Visible AI. She has presented at international conferences and is dedicated to advancing digital fluency, creativity, and innovation in education.

Mary Kalantzis was Dean of the College of Education at the University of Illinois, Urbana-Champaign in the United States from 2006 to 2016. Before this, she was Dean of the Faculty of Education, Language and Community Services at RMIT University, Melbourne, Australia, and President of the Australian Council of Deans of Education. With Bill Cope, she has co-authored or co-edited: *New Learning: Elements of a Science of Education*, Cambridge University Press, 2008 (3rd edition, 2022); *Literacies*, Cambridge University Press 2012 (2nd edition, 2016); *A Pedagogy of Multiliteracies*, Palgrave, 2016; *e-Learning Ecologies*, Routledge, 2017; and the two-volume grammar of multimodal meaning: *Making Sense and Adding Sense*, Cambridge University Press, 2020.

Fei Victor Lim is Associate Professor and Deputy Head (Research), English Language and Literature, at the National Institute of Education, Nanyang Technological University, Singapore. He researches and teaches on multiliteracies, multimodal discourse analyses, and digital learning. He is an editor of *Multimodality and Society* and an associate editor of *Computers and Composition and Designs for Learning*. He is author of *Designing Learning with Embodied Teaching: Perspectives from Multimodality*, lead author of *Designing Learning for Multimodal Literacy: Teaching Viewing and Representing* as well as lead editor of *Designing Learning with Digital Technologies: Perspectives from Multimodality in Education*.

Hala Sun is the Associate Director of Assessment and Evaluation at Michigan State University's (MSU) Evidence Driven Learning Innovation (EDLI) unit in the United States. She oversees the evaluation of digital learning innovations to improve the educational experiences of faculty and students. Her current research focuses on: (1) the effective and ethical use of AI/digital tools in teaching & learning contexts, specifically in curriculum design and assessment (NSF grant PI); (2) research methodologies around/using generative AI, focused on qualitative methods; and (3) multilingual immigrants' diverse language practices. Alongside experts in educational technology, she collaborates cross-departmentally and with MSU IT and Center for Teaching and Learning Innovation to develop training modules, policy guidance, and resources that support educators in adapting to the AI-driven educational landscape. She holds a PhD in Education, with specializations in Applied Linguistics and Writing Studies from the University of California, Santa Barbara, United States.

Anastasia-Olga (Olnancy) Tzirides is a visiting lecturer of Modern Greek at the University of Illinois Chicago and a Research Scientist at the University of Illinois, Urbana-Champaign, in the United States. She previously worked as a User Experience Researcher at Google. She earned her PhD in the Learning Design and Leadership Program at the University of Illinois, Urbana-Champaign. Her research interests include advanced digital technologies, AI, user experience research, learning design, online education, as well as language and culture learning. Her recent research projects focus on exploring the affordances of human-centered AI in educational contexts.

Jordan Weide is an Emerging Researcher with British Council English Language Research (ELR) in the United Kingdom, focusing on employing computational tools to language assessment. Her work lies at the intersection of corpus linguistics and AI. She holds an academic background in Applied Linguistics, Second Language Acquisition, and Psychology. Prior to joining the ELR, Jordan worked in language instruction and research in both the United States and the United Kingdom. These experiences have shaped her approach by blending technical expertise with hands-on experience gained from her time in language education.

Tan Xin Xin is an educator specializing in English and Mathematics at the primary school level in Singapore. She is passionate about sparking curiosity and fostering a love for learning among her students. Her goal is to nurture critical and discerning readers who can engage thoughtfully with the world around them. As a member of her school's Information and Communications Technology department, she seeks to harness the potential of technology to make teaching and learning more engaging, enjoyable, and effective. Tan's dissertation research focuses on investigating how pre-service teachers' perceptions of using Generative Artificial Intelligence in English teaching and learning might vary based on their educational contexts.

Gabriela C. Zapata is Associate Professor in Education at the University of Nottingham in the United Kingdom. She also serves as the editor of the book series *Multiliteracies and Second Language Education* (Routledge) and co-editor-in-chief of the journal *Diversity & Inclusion Research* (Wiley). Her main research areas are *Learning by Design* and second and heritage language pedagogy, generative AI in higher education and teacher training, and multimodal social semiotics. Throughout her career, she has published articles in a variety of peer-reviewed journals and edited volumes, as well as four books on multiliteracies-based second/heritage language education and four textbooks for the teaching of Spanish as a second language. She has also been involved in the development and implementation of inclusive, research-guided methodologies and open educational resources for language teaching. Her latest co-authored book (with Drs. Bill Cope and Mary Kalantzis), *Towards Education Justice: Literacy, Multiliteracies, and the Design of Social Futures*, was published by Routledge in December 2023.

Introduction

Generative AI Technologies in Language Education: What We Know So Far

Gabriela C. Zapata

The Transformative Potential of Generative Artificial Intelligence in Language Education

In their recent analysis of the possible impacts of artificial intelligence in education (AIED), Nguyen et al. (2022, pp. 4221 and 4223) characterize AI as "one of the most pivotal developments of the century," positing that it can be "seen as an influential tool to empower new paradigms of instruction." Since the launch of OpenAI's ChatGPT in November 2022, interest in AIED, and, specifically, in large language models (LLMs), has grown exponentially, as educational researchers and practitioners have sought to understand the ways in which new Generative AI (GenAI) technologies might influence teaching and learning, including language education (Cope & Kalantzis, 2024; Kalantzis & Cope, 2024).

As highlighted in recent systematic reviews and commentaries (e.g., Chandel & Lim, 2024; Godwin-Jones, 2023; Law, 2024), GenAI has brought transformative potential to second language (L2) education, sparking discussions on how languages are taught and learned in an increasingly digital and multimodal world. This volume seeks to contribute to these discussions by exploring the implications of GenAI for L2 teaching and learning. Specifically, the chapters in this book examine GenAI's alignment with multiliteracies pedagogies and its capacity to support diverse learners in navigating and contributing to complex, multimodal communication environments. By situating GenAI within the theoretical framework of multiliteracies as articulated by the New London Group (NLG, 1996) and Kalantzis et al. (2005, 2016, 2019), this volume underscores the critical need for integrating these technologies thoughtfully and ethically into educational practices.

In this introduction, we jumpstart this exploration by addressing three key areas: The definition and capabilities of GenAI, current insights into its application in L2 education, and a review of the main tenets of multiliteracies pedagogical approaches. We conclude the chapter outlining the contributions of this volume to advancing the field.

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Defining GenAI

GenAI refers to a class of artificial intelligence capable of creating diverse forms of content, including text, images, audio, video, and multimodal artifacts. Cope and Kalantzis (2024) describe GenAI as a combination of chatbot technologies and LLMs, facilitating user interactions through prompts to generate tailored outputs. Unlike traditional AI applications that rely heavily on rule-based systems, GenAI employs advanced, self-supervised learning techniques to analyze massive datasets, enabling it to predict contextually relevant next words and produce coherent, adaptive responses (for an in-depth discussion of these technologies, see Chapter 1 in this volume). This paradigm shift has implications across numerous domains, with education, and particularly L2 education, emerging as a critical site of application (Chandel & Lim, 2024; Kalantzis & Cope, 2024).

GenAI in L2 Education: Current Insights

Recent compilations on existing research on GenAI and L2 education (e.g., Chandel & Lim, 2024; Galaczi & Luckin, 2024; Law, 2024) have shown that these technologies are transforming L2 teaching and learning, fundamentally reshaping language instruction and literacy development. Tools like OpenAI's *ChatGPT* or Google's *Gemini* leverage advanced conversational capabilities and personalized, multimodal outputs to create tailored learning experiences that address individual personal and linguistic needs. For example, studies have highlighted GenAI's beneficial effects for personalized writing and vocabulary development (e.g., Boudouaia et al., 2024; Crum et al., 2024; Escalante et al., 2023; Hwang et al., 2023; Javier & Moorhouse, 2023; Karataş et al., 2024; Kostka & Toncelli, 2023; Mahapatra, 2024; Pellas, 2023; Xiao & Zhi, 2023), as well as the effective implementation of formative assessment approaches such as dynamic assessment (e.g., Jeon, 2021). Additionally, acting as a non-judgmental interlocutor, GenAI has been reported to alleviate learners' anxiety, particularly in speaking and writing contexts where apprehension often hinders performance (Song & Song, 2023). Moreover, as evinced by Baidoo-Anu and Ansah's (2023) work, GenAI can facilitate the establishment of interactive, immersive scenarios that simulate real-life conversations, enabling learners to develop practical communication skills in diverse contexts. Works that have explored students' perceptions of GenAI-supported L2 learning (e.g., Abdelhalim, 2024; Javier & Moorhouse, 2023; Karataş et al., 2024; Xiao & Zhi, 2023) have also reported generally positive opinions, which appear to translate into higher levels of motivation and overall instructional engagement.

GenAI's contributions extend beyond traditional literacy to supporting multiliteracies, which include the ability to critically engage with and produce multimodal texts. These tools can aid learners in integrating textual, visual,

and auditory elements, enhancing their ability to communicate across varied meaning forms. Interaction with GenAI also cultivates digital literacy by engaging students in activities such as prompt engineering and the evaluation of AI-generated content (Kalantzis & Cope, 2024). These processes can develop critical thinking, problem-solving, and analytical skills, which are essential for navigating the complexities of the digital age (Ng et al., 2021). GenAI's integration into assessment represents another significant advantage, as it allows for ongoing, formative feedback embedded within learning processes. This approach facilitates individualized learning pathways, enabling teachers to focus on higher-order pedagogical tasks (Godwin-Jones, 2023; Kalantzis & Cope, 2024).

Despite these benefits, the adoption of GenAI in L2 education also presents challenges that require thoughtful mitigation. A major concern is the reliability of AI-generated outputs, as inaccuracies and biases can mislead learners and perpetuate stereotypes (Cope & Kalantzis, 2024; Nicoletti & Bass, 2023). The opaque "black box" nature of many AI models further complicates their use, making it difficult for educators and students to understand how outputs are generated (Kalantzis & Cope, 2024). Ethical issues, such as academic misconduct, plagiarism, privacy violations, and over-reliance on AI, highlight the need for robust institutional guidelines and critical AI literacy among users (Chandel & Lim, 2024; Galaczi & Luckin, 2024; Tzirides et al., 2024). Research has also shown that excessive dependence on GenAI can stifle creativity and critical thinking, as learners may prioritize AI outputs over developing their original ideas (Niloy et al., 2023). These risks are particularly pronounced in assessments, where undetectable use of AI-generated content threatens evaluation integrity, necessitating new methods to differentiate human effort from machine output (Cope & Kalantzis, 2024; Kalantzis & Cope, 2024).

The studies previously presented have relied on diverse sources of data, including surveys, interviews, self-study logs, and experimental designs incorporating pre- and post-tests. This range of approaches has contributed to a broad understanding of how L2 learners engage with GenAI tools in language classes. Nevertheless, much of this research has been conducted in an ad-hoc manner, lacking grounding in robust theoretical or pedagogical frameworks. For instance, the predominant reliance on the Technology Acceptance Model (TAM), as seen in studies such as those by Boudouaia et al. (2024) and some of the works discussed in Law's (2024) literature review, has resulted on information primarily connected to students' acceptance and adoption of GenAI, mostly focused on ChatGPT. While TAM provides a useful lens for examining technology adoption, it does not address the nuanced pedagogical or theoretical considerations necessary for effective L2 teaching and learning.

These limitations highlight the need for research that is both theoretically and pedagogically grounded, such as studies informed by the pedagogy of

multiliteracies. Incorporating this framework into GenAI-supported L2 education could provide a more comprehensive understanding of how this technology can support students with diverse linguistic, academic, and personal needs, fostering richer and more meaningful L2 learning experiences. The objective of this volume is to address this need. But before we delve into its contents, let's revisit the pedagogy of multiliteracies.

The Pedagogy of Multiliteracies Revisited

In the mid-1990s, a group of scholars anticipated the profound changes in education and communication that have become especially evident in recent years. This group, known as the New London Group—a collective of ten international educators who, in 1994 convened in New London, New Hampshire, in the United States—focused on redefining literacy (Cope & Kalantzis, 2009; NLG, 1996). These scholars argued that traditional notions of literacy, centered on printed language and standardized forms, were insufficient for a generation increasingly engaged in multimodal and multilingual forms of communication.

Recognizing the influence of globalization and technology, the NLG (1996) thus proposed a broader pedagogy of literacy. This pedagogy would account for not only traditional printed language but also the diverse modalities of communication prevalent in the contemporary world. Moreover, this approach would embrace learners' diverse identities, experiences, and needs (Kalantzis et al., 2005). That is, for the NLG, literacy in a globalized, multimodal world required learners to actively engage with new and complex texts, fostering inclusivity rather than alienation. To address these societal changes and educational needs, the NLG introduced *the pedagogy of multiliteracies*, a framework that reflects the interconnectedness of social and modal dimensions in meaning-making (Cope & Kalantzis, 2015).

The Concept of Multiliteracies

But what exactly did the NLG scholars (1996) have in mind when they coined the term *multiliteracies* in connection with the pedagogy they were proposing? What does the *multi* in *multiliteracies* refer to? Broadly speaking, the term *multiliteracies* makes reference to the multiple ways in which we create and convey meaning. These encompass two dimensions of meaning-making: the *social* (context/function) and the *modal* (form) (Kalantzis et al., 2016, 2019). The first one is connected to the diverse social contexts in which communication takes places, which shape what and how we communicate. The *social multi* might comprise the personal experiences, cultural or "community setting[s], social role[s], interpersonal relations, identit[ies], subject matter, etc." that are "significant to the ways in which we make and participate in meaning" (Kalantzis et al., 2016, pp. 1–2). The second dimension, the *modal*, refers to the variety of communication meaning forms to

which we might resort to create meaning, such as text, image, space, body, object, sound, and/or speech (Cope & Kalantzis, 2020). These forms are directly connected to the new media (and the tools and practices associated with them) which we experience daily, and we have come to rely on in today's world.

In educational contexts, the pedagogy of multiliteracies seeks to prepare learners to navigate and contribute to diverse, multimodal, and socially embedded forms of communication. It emphasizes the integration of multimodal texts and technologies into curricula, reflecting varied social and literate practices (Anstey & Bull, 2006; Cope & Kalantzis, 2015, 2023; Kalantzis et al., 2005, 2016, 2019). Bull and Anstey (2019) outline essential goals for such an approach:

- Encourage learners to think strategically, creatively, and critically
- Equip learners to adapt to different textual purposes, audiences, and contexts
- Foster an understanding of the impact of social and cultural diversity on literacy
- Promote multimodal communicative competence with traditional and new communication technologies
- Cultivate critical literacy, enabling learners to assess power dynamics, inclusivity, and the origins and purposes of texts

These goals align with the NLG's (1996) proposal for a pedagogy of multiliteracies, which revolves around four pedagogical moves: *Situated Practice*, *Overt Instruction*, *Critical Framing*, and *Transformed Practice*. These moves allow educators to connect curricula with learners' diverse life experiences, enabling them to deconstruct and reconstruct meaning through a collaborative process known as *designing*. This process culminates in the *redesigned*, representing new knowledge and perspectives both shaping and shaped by teachers and students.

From Multiliteracies to Learning by Design

In 2000, Mary Kalantzis and Bill Cope built on the NLG's (1996) work, reconceptualizing its ideas into a more accessible framework they named *Learning by Design* (LbyD). This approach integrates informal and formal learning, emphasizing the importance of personal, experiential knowledge alongside structured academic content. For learning to be effective, Kalantzis and her colleagues (Kalantzis et al., 2005) argue, it must create a sense of *belonging* and lead to *transformation*. That is, learners need to feel connected to their educational environment while being guided into new and unfamiliar territories in a safe and intelligible way.

LbyD (Cope & Kalantzis, 2009, 2015, 2023; Kalantzis et al., 2005, 2016, 2019) expands on the NLG's (1996) pedagogical dimensions by introducing eight knowledge processes that mirror informal learning while supporting

formal education. These processes guide students through *experiencing* (the known and the new), *conceptualizing* (by classifying and with theory), *analyzing* (functionally and critically), and *applying* (appropriately and creatively) knowledge in ways that are strategic, innovative, and contextually relevant (Cope & Kalantzis, 2023; Kalantzis & Cope, 2010, 2012; for more on this see Chapter 1 in this volume).

A Transformative Curriculum

Another essential component of LbyD is what Kalantzis and her colleagues (Kalantzis et al., 2005) define as a *transformative curriculum*. This makes reference to pedagogical practices grounded in the principles of belonging and transformation, which foster equity and pluralism by incorporating learners' diverse identities and experiences into instruction. This curriculum integrates dialogical teaching, multimodal content, and tasks that are responsive to learners' liveworlds and needs and involve collaborative work within the knowledge processes (i.e., experiencing, conceptualizing, analyzing, and applying) (Zapata, 2022). By encouraging students to engage critically with varied, multimodal forms of communication and develop their own projects, this curriculum helps them revoice knowledge in ways that are personally meaningful. Kalantzis et al. describe the outcome of such a curriculum as both purposeful and transformative: Learners not only gain knowledge but also broaden their perspectives and develop deeper connections to their communities and the world around them. In Figure 0.1, we offer a summary of LbyD tenets and principles applied to L2 learning and teaching (for an in-depth discussion of L2 education grounded in LbyD, see Zapata, 2022).

Multiliteracies Approaches and L2 Education: Existing Research

In the last fifteen years, both the NLG's (1996) pedagogy of multiliteracies and LbyD (Cope & Kalantzis, 2023) have grounded L2 education in diverse contexts. For instance, studies have focused on L2 teaching in a variety of languages (Allen & Paesani, 2010, 2019; Blyth, 2018; Kumagai et al., 2016; Lütge & Stannard, 2022; Mesa Morales & Zapata, 2024; Paesani et al., 2016; Warner & Dupuy, 2018; Zapata & Mesa-Morales, 2018; Zapata & Ribota, 2021a, 2021b), as well as in diasporic or heritage language learning (Kim & Xing, 2019; Zapata & Lacorte, 2017). Additionally, recent volumes such as Zapata's (2022) and Paesani and Menke's (2023) have offered instructional blueprints for the incorporation of these approaches into L2 classrooms. Yet, the literature on these pedagogies and GenAI-supported L2 teaching and learning remains scarce (see Chandel & Lim, 2024). The chapters in this book, introduced in the following section, seek to fill this gap.

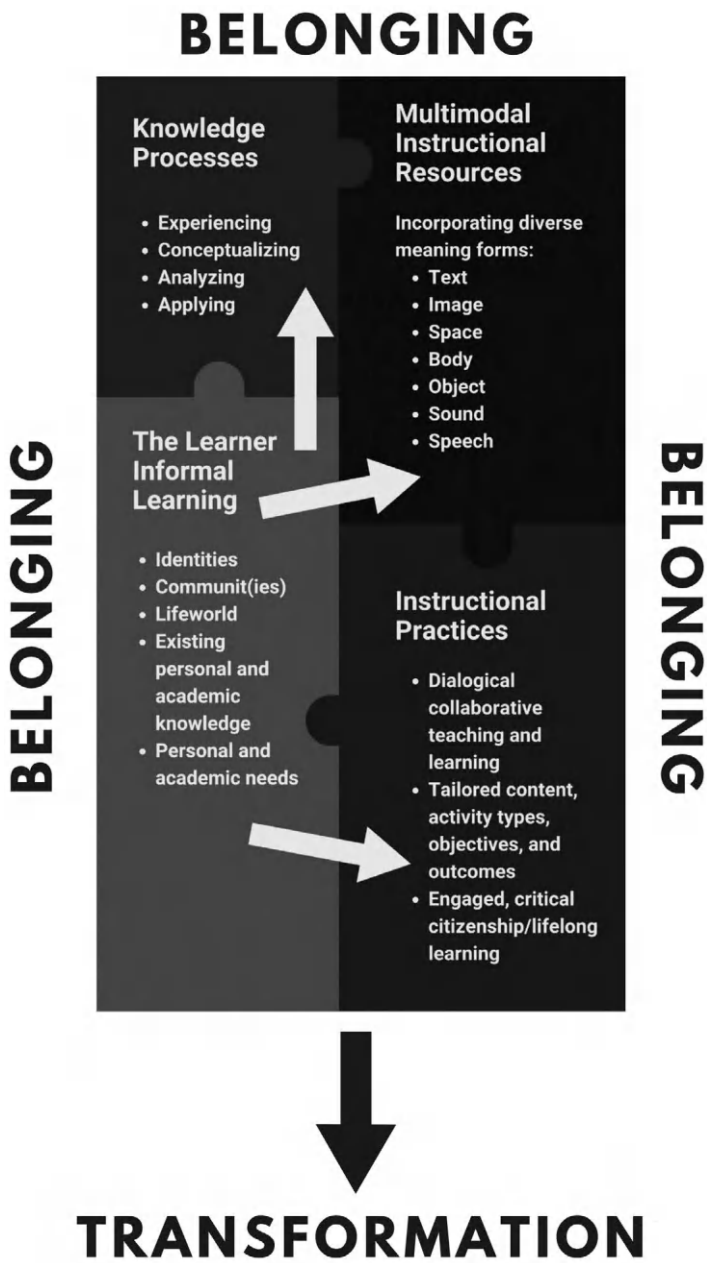

Figure 0.1 L2 learning and teaching grounded in *Learning by Design*

Overview of This Volume's Contents

Each chapter in this volume addresses a specific dimension of the relationship between GenAI and multiliteracies in L2 education, collectively creating a cohesive narrative about the future of language teaching and learning in a digitally mediated world.

In Chapter 1, Bill Cope, Mary Kalantzis, and Gabriela C. Zapata examine the paradigm shift in language learning motivated by GenAI technologies. The authors challenge the traditional motivations for language education by exploring how GenAI can perform linguistic tasks beyond human capabilities, such as real-time translation. They therefore propose reorienting L2 teaching towards cultural and linguistic engagement, rather than functional language learning, by leveraging the LbyD (Cope & Kalantzis, 2023; Zapata, 2022) framework. This foundational chapter sets the stage for understanding the broader implications of GenAI in reshaping the purposes and methods of L2 education.

Chapter 2, written by Anastasia Olga Tzirides, delves into the concepts of translanguaging and transposition within multimodal and digitally mediated environments. Tzirides demonstrates how these frameworks align with GenAI's affordances for enriching language education. This chapter emphasizes the integration of multimodal meaning-making in L2 classrooms and addresses challenges like equitable access and ethical considerations. Building on the theoretical foundation in Chapter 1, this work highlights practical pedagogical strategies for fostering dynamic, inclusive L2 learning environments.

In Chapter 3, Amelia Ijiri and Sandra Healy explore how GenAI can be adapted to support culturally responsive pedagogy within the LbyD framework (Cope & Kalantzis, 2023; Zapata, 2022). Focusing on a Japanese university specializing in STEAM education, they examine how GenAI might foster critical inquiry and creativity while navigating cultural nuances. By investigating students' preferences and work with GenAI, this chapter provides insights into designing curricula that balance innovation with traditional norms. Additionally, this work extends the discussions in Chapter 2 by addressing cultural contexts and the role of GenAI in advancing non-Western educational practices.

Hala Sun, author of Chapter 4, presents a scaffolded writing project within the NLG's (1996) pedagogy of multiliteracies to help students critically engage with AI-generated texts. This chapter illustrates how scaffolded tasks, iterative feedback, and peer reviews enabled learners to analyze genre conventions and address the ethical implications of GenAI in education. By aligning multiliteracies' situated practice with critical framing, Sun highlights the role of teacher agency in navigating GenAI's transformative impact on L2 education. This chapter builds on prior discussions by focusing on empowering educators to adapt their teaching practices effectively in response to technological disruptions.

In Chapter 5, Jordan Weide, Johnathan Cruise, and Emil Tangham Hazelhurst investigate the application of tools like DALL·E 2 in L2 education. The authors unveil the affordances and limitations of these technologies and provide actionable recommendations for building AI literacy among teachers and students grounded in the LbyD framework (Cope & Kalantzis, 2023; Zapata, 2022). By exploring text-to-visual applications, this chapter showcases how GenAI can enhance creative and multimodal learning experiences, and it bridges theoretical discussions from earlier chapters with practical insights, offering a roadmap for integrating GenAI into classroom activities while fostering critical engagement with AI tools.

Chapter 6, written by Fei Victor Lim and Tan Xin Xin, examines the ways in which pre-service teachers from Singapore, Denmark, and Switzerland perceive GenAI's role in L2 education. By focusing on factors such as school policies, social networks, and personal experiences, this work reveals the complexities shaping educators' attitudes toward GenAI. The authors discuss implications for teacher education and professional development, emphasizing the need to equip educators with multiliteracies for critical engagement with AI technologies. This chapter addresses the human element in GenAI's integration into education, tying together themes of cultural responsiveness, creativity, and ethical considerations.

In the final chapter of the volume, Chapter 7, Gabriela C. Zapata, the book's editor, synthesizes the key insights from the preceding chapters and reflects on the implications of GenAI in L2 education. By examining the emergent challenges and opportunities presented throughout the volume, she provides a holistic perspective on the transformative potential of GenAI. Central to the discussion is the LbyD framework (Cope & Kalantzis, 2023; Zapata, 2022), which, she posits, offers a robust pedagogical structure for addressing the complexities of integrating GenAI into educational practices. The chapter highlights the need for teacher education programs to build AI literacy and emphasizes the importance of culturally responsive pedagogy and equitable access to technology. By connecting learners' identities, sociocultural contexts, and academic content, this work underscores the potential of GenAI to empower educators and learners in navigating the dynamic semiotic landscapes of the 21st century. Recommendations for future research and practical strategies for classroom implementation further enrich this final chapter, solidifying the volume's contribution to advancing language education in a digitally mediated world.

Conclusion

GenAI technologies hold immense potential to advance L2 education by enabling personalized, multimodal, and critical learning experiences. This volume bridges theoretical and practical dimensions, contributing to a deeper understanding of how AI can redefine L2 education. By addressing the intersections

of technology, culture, and pedagogy, it empowers educators and learners to navigate the complexities of a digitally mediated world and design their social futures with confidence.

Note on Generative AI use in this volume: Some of the chapters in this volume include GenAI-generated images. The authors and/or participants in these works generated the images for research/pedagogical purposes, and they adhered to their chosen tools' sharing and publication policies. These images are crucial for our understanding of GenAI's affordances and limitations in educational contexts.

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1 Language Learning after Generative AI

Bill Cope, Mary Kalantzis, and Gabriela C. Zapata

The Language Turn in Artificial Intelligence

Disrupting Language Teaching and Learning

There have been a variety of reasons for learning another language. One was for the sake of cultural edification and mental exercise. This is why Latin was so widely taught until recent decades. These were also reasons why in Anglophone countries the "better" students would learn prestige European languages. Then, there were functional reasons—to learn for instance the language of a place where you were going to live, work, or visit; or to access its literature; or as an immigrant, to learn the national language of the place of settlement, and in so doing to assimilate; or as our terminology became less imperialistic, to integrate, or stretching the welcome still further, to join the multilingual cosmopolis.

Now we have Generative AI (GenAI), and with the currently emerging technologies, the following has become possible, even if still in technologically awkward ways: With wearable device mediation and without knowing a word of Chinese, I can speak Chinese to a conversational partner who knows no English, with no trace of accent and in the precise timbre of my natural voice. And they, though knowing no English, can speak back to me in accent-less English in the precise timbre of theirs.

We still need a new-generation hardware to do this in real time, but wireless hearables and smart glasses point to what will soon be possible. Voice cloning is already with us, though for the scenario we just mentioned, there is still some latency in the software. But much of this we can do already on a phone with the minor awkwardness of consecutive rather than simultaneous interpreting. Of course, reading and writing text translated from one language to another is easy already, with minimal loss of meaning. If this is the case, what functional reasons do we still have to learn language?

With the rapid emergence of GenAI, machine-mediated translingual performance in some respects is likely soon to be better than any unmediated efforts. Turing (1950) may well have had the wrong measure of machine intelligence in his allegorical test, and Searle (1980) might be just as wrong

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about his Chinese room. The Turing test proposed that a machine would pass the test of machine intelligence when, in screened dialogue alternately with a person and a machine, a conversationalist could not distinguish the machine from the human. Searle debunked the Turing thesis with his Chinese room thought experiment. In it, a person is challenged to tell the difference between a machine given Chinese words translated into English and a human. The difference is that a machine can give the impression of competence in Chinese because it looks up the translation of any word, but the Chinese speaker actually knows Chinese in a way a mechanical dictionary does not.

In both Turing (1950) and Searle's (1980) cases, the gold standard is equivalence to human competence. But to take our new scenario, the Chinese I can "speak" with AI mediation may be better Chinese than I can ever realistically learn. And more than this, it could be better than any human can speak because the AI "knows" more about the English and Chinese languages, including its range of dialects, registers, and genres, than even the most competent speaker. And hearing their own voice speaking the other language for long enough may in time even help the conversationalist learn some of the other language, not that they would need to.

As we reach this point, we must measure AI on an entirely different scale than either Turing (1950) or Searle (1980)—with greater competence and performative capacity than any human, though of course without linguistic understanding. That is still with the human interlocutors, and whatever the machine does is only ever at their prompting. Of course, neither Turing nor Searle suggested that the machine do anything more than trick the human into thinking it was equivalent to a human. But with GenAI, the trick has become a pretty good one. In the context of multilingual interaction, the job of understanding remains exclusively with the humans. The AI has become for them a linguistic prosthesis. What are the consequences for Another Language Learning (ALL)?

A note here on our terminology: Our acronym ALL refers to a wide range of purposes and scenarios in language learning. By way of prologue to this chapter, we want to mention briefly our previous work. One teaching and learning scenario is immigrants acquiring the dominant language of a place of settlement (Kalantzis et al., 1989). Another is to learn a global language such as English, Spanish, Chinese, or Arabic—global by virtue of its spread across countries or diasporas (Kalantzis & Cope, 2000). Still another is the maintenance of "heritage" immigrant languages notwithstanding that dominance (Arvanitis et al., 2014). Yet another is the revival of small national and Indigenous languages (Cope, 1998; Kalantzis & Cope, 2006). And of course, there is good old-fashioned "foreign" language learning for the virtue of appreciating the high or vernacular cultures of others. All manner of language learning pedagogies have been applied across all these scenarios, ranging from didactic teaching of language forms (Kalantzis et al., 2016), to immersion models, and more recently to literacies-based (Paesani & Menke, 2023; Zapata, 2022) and "translanguaging" approaches (Cope et al., 2024; Tzirides et al., in press).

Now, GenAI arrives to unsettle all these scenarios and pedagogies. But paradoxically, as we will argue in this chapter, GenAI also offers new possibilities for non-dominant languages in the global scene, including languages with small populations of native speakers and writers. And for ALL of any kind, it opens out new pedagogical possibilities.

In a broader context, ALL was already reaching a crisis point before the arrival of GenAI, in Anglophone countries at least, and probably because of what seemed at the time to be the inexorable rise to dominance of global English as a lingua franca. Enrollments in languages other than English in US Higher Education dropped by 16.6% between 2016 and 2021 (Lusin et al., 2023). There are no reliable data for language enrollments in K-12 education in the US, but the Joint National Committee for Languages points to a "language education crisis in K-12 schools" (https://www.languagemagazine.com/2024/09/24/languages-caucus-addresses-crisis-in-k-12-schools/).

On the other side of the new cold war divide, English proficiency and teaching in China have declined in the 2020s (https://opportunities-insight.britishcouncil.org/news/news/chinas-increasing-language-gap-0). The seemingly inexorable trend to learn English as the lingua franca of global interaction and education may now have moved into reverse. In a broad ideological sweep, we may be able to put some of this down to the rise of ethnonationalism as a reaction to neoliberalism (Steger & James, 2019). However, GenAI could make this situation worse—or perhaps better. But before we get to the better, what are the peculiar connections between GenAI, language, and multimodal meanings?

Computers Come to the Languaging Mind

The term "artificial intelligence" was coined by John McCarthy as a hook in a proposal to attract funding for a small expert seminar held at Dartmouth College in 1956 (McCarthy et al., 1955). The idea itself was not new, a restatement of Alan Turing's notion of "Intelligent Machinery" in his report, so titled, for Britain's National Physical Laboratory (Turing, 1948). Turing was working at a laboratory directed at the time by Sir Charles Darwin, grandson of the naturalist. Darwin said the report was "a schoolboy's essay… not suitable for publication" (Cope & Kalantzis, 2020, pp. 165–166).

McCarthy's definition of artificial intelligence was "making a machine behave in ways that would be called intelligent if a human were so behaving" (McCarthy et al., 1955, p. 11). This is a measure we want to resist in this chapter because it assumes we are dealing with things that are similar and for this reason can be evaluated on the same scale. The conflation goes both ways—not only are machines considered to be human-like in their capacities, but brains are construed as machine-like. Today, we are burdened with the connotations that accompany the acronym "AI" with its relentless anthropomorphization of the machine and mechanization of the human. As a consequence, we have embedded in the notion of AI the idea that computing machines can to some

degree replicate human capacities, to the extent perhaps of acquiring at some point a notional "artificial general intelligence," a point at which computer intelligence has reached the threshold of human intelligence, or even "artificial superintelligence" where computers have exceeded human intelligence.

Challenging these by now well-worn assumptions, we want to explore the ways in which, when they handle language (or any other human meanings, for that matter), machines and humans of necessity do this in fundamentally different ways and on fundamentally different scales of performance. Rather than AI, we propose "cyber-social relations of meaning" in general, and for education in particular, "cyber-social learning" (Cope & Kalantzis, 2024). When it comes to the intricacies of language, we want to highlight the vast differences between the cyber and the social. The social is always entangled in the cyber, and the cyber remains inert except in a feedback relation with humans. Reduced to an acronym and hashtag, "AI" implies a dangerously wrong parallelism. We do not particularly like the acronym or the idea it expresses, but to the extent that we want to talk about the same things as so many other people, we are stuck with it. But we do want to come back periodically to our point that AI is not a very good idea.

For a long time, computers have been able to do things that humans cannot, creating thus the illusion of being smart. In 1949, *The Times* of London announced that Turing's "mechanical brain"—Turing's Manchester 1 computer—had discovered some extremely large prime numbers, something that was practically impossible for humans to do on paper (Turing, 2015). This achievement was not to imitate human intelligence, as Turing might have it in his test. Rather it was, from the very start of computing, to far exceed human capacities albeit in some distinctive but nevertheless limited ways.

As for the intelligence of a machine, computers are only an extension of our species' proclivities as a tool-making animal. Tools respond only on command. A stick can be used to knock an apple out of a tree. GenAI will only "speak" to a prompt.

In the history of technology, the moment of the seemingly minded machine is much earlier than the computer. A paradigm away from the proponents of AI, the cyberneticians made a distinction between trivial and non-trivial machines (von Foerster, 1971/2003). Trivial machines do as commanded. Non-trivial machines have servo-mechanisms which allow a degree of self-command in which the relationship of the human to the machine is mediated by programming.

The paradigmatic first such machine, arguably, is the "governor" in Bolton and Watt's 1784 Double Acting Engine. This was a pair of spinning weights which regulated the amount of steam going into the machine—too much steam and the weights spun wide from the axle, reducing the steam input; too little and they spun close, increasing the steam input. In its highly specialized way, the governor has been delegated a kind of mindedness, to keep an eye on steam pressure and act on its observations. This is rudimentary programming. The machine is in part self-governing. It issues its own commands, "more!" or

"less!"—on behalf of the human programmer of course, though with a level of autonomy whose form and limits have been prescribed by humans. The machine is delegated by the human to act on behalf of the human within the frame of reference designed by humans. In a multimodal grammar, the agency written into the machine are transpositions from words that would, in the case of a trivial machine, have been the embodied activity of a person—that is, "more!" and "less!" The basis of the working of the governor is a transpositional functional grammar.

To this extent at least, Bolton and Watt's governor is on the path toward being, in the terminology of that other foundational computer genius, John von Neumann, a self-reproducing automaton (von Neumann, 1949–1952/1966). Programming is the way in which humans grant the machine a degree of autonomy in its capacity to act. In GenAI, the self-governing automaton has reached its most recent and to date most elaborate form—though as we will now argue, this self-governance is entirely different from human agency.

From the very start, there was an inclination in the development of computing to want computers to model themselves on the human brain (von Neumann, 1958). The beginning of this idea was in an obscure article by Warren McCulloch and Walter Pitts, "A Logical Calculus of the Ideas Immanent in Nervous Activity" (McCulloch & Pitts, 1943/1990), which had been brought to von Neumann's attention by Norbert Weiner, initiator of the idea of cybernetics (Wiener, 1948/1961). In it, McCulloch and Pitts suggested a heuristic for understanding the elemental workings of the brain, that neurons alternated across on-off states. This gave von Neumann the idea for the design of a computer that named things and calculated them in binary notation—the Electronic Discrete Variable Automatic Computer (EDVAC) (von Neumann, 1945). McCulloch and Pitts, however, were from the start at pains to point out that brains were much more complicated than the on-off binary (Cope & Kalantzis, 2022). Neuroscientists today know all-too-well that brains are much more than binary. Brain scientists have recently mapped the brain of the humble fruit fly, the first such full brain mapping of any brain. In a mere 139,000 cells (humans have billions), they found thousands of different kinds of neurons and connections among them (Lin et al., 2024).

But computers are no more complicated than binary notation will allow. They can name things nowadays using the universal digital symbology of Unicode—version 5.1 catalogues 149,813 encoded characters from every human language as well as standardizing thousands of ideographs, including emojis and icons widely used in text. Every character is represented in a unique string of zeros and ones (on-and-off in electrical circuits). Grouped into morphemes, computers offer a super-human capacity to name the trillions of unique things in the world, including URLs, serial numbers, and personal IDs. In our multimodal transpositional grammar, we call these "instances." In text, they are proper nouns. Then, there are common nouns and their multimodal equivalents—we call these "concepts" in our multimodal grammar. In the era of computer mediation of meanings, these encompass concepts standardized

in database field names, textual markup, and technical ontologies (Cope & Kalantzis, 2020; Cope et al., 2022). "Name" is a concept. "Mary Kalantzis" is an instance, definitively disambiguated by her semantic alignment with her phone number, email address, and a handful of other unique identifiers. On top of this is the capacity to work expansively with a rigorously specified world of nouns, and computers can calculate their relations. Connected in a cyber-social relation to our networked computing machines, we have acquired a super-human capacity to "noun" the cosmos (Cope & Kalantzis, 2023b).

The Three Ages of AI

As a variant of the trivial non-trivial machine, there are three ages of AI, each a quite fundamental shift of paradigm: symbolic, data-driven, and now text-semantic GenAI. The common denominator across all three ages is that, since EDVAC, computers have only been able to process binary notation.

In the first age of AI, machines were programmed with symbolic logic, capturing and enacting generalizable patterns of human meaning and action. These were expert and rules-based systems of AI. In education, the first such system was the PLATO computer learning system of 1949–1976 (Cope & Kalantzis, 2023a; Dear, 2017). The general processes of learner interaction with subject matter were built into an abstract system, and within this frame of reference, particular course content and learning sequences were programmed into the machine. In language translation, systems of machine translation were designed to leverage systematically mapped syntactic and lexical parallels across different languages. Translating symbolic AI into practice in education, "intelligent tutor systems" (Graesser et al., 2001) had no more than minimal impact. Across wider expanses of human cognitive capacities, there were attempts to build logical formalizations of elementary human experience (Sowa, 2000).

The project to develop a computerized system of machine translation based on syntax and lexicons was abandoned by the mid-1960s (Kalantzis & Cope, 2020). Whether with regard to language, education, or the broad compass of human experience, symbolic AI was not able to address the empirical complexities of the world. The long years of "AI winter" followed (Nilsson, 2009).

As an aside, in a broader philosophical sense, all computer programming has always in a sense been AI. As tools, since their inception, computers have served us as cognitive and performative prostheses. From the moment a computer could mimic a human, or do something faster than a human, or even do it more reliably and better, it had in that sense become an AI. In education, consider the example of learning analytics. Frequently, this is just the most pedestrian recording, counting, and calculating of patterns of student activity. But the computer does a humanly impossible amount of it and in real time. This was evident as early as PLATO. Also, symbolic AI is far from dead, ranging from computer programming itself to the "semantic web" (Cope, Kalantzis, & Magee, 2011).

The second age was data-driven AI. In the case of language, this era saw the rise of statistical language processing. Language was too unfathomably varied and complex to capture in a general theory, so the best we could do was to trace quantifiable patterns in words. In an apocryphal story, one of the lead programmers working on machine translation at IBM in the 1980s said, "Whenever I fire a linguist, the system gets better" (Jelinek, 2005). At first, this leveraged human-translated language pairs. Google Translate became best at this for the simple reason that their corpus of texts in parallel translation was the largest. The effectiveness of this technology was enhanced when it was made more efficient by the statistical processes of neural nets (Rumelhart et al., 1986).

In language education, one example of data-driven AI was automated essay assessment where a sample of student texts is graded by expert human examiners, and new texts are graded by machines on the basis of their similarities, statistically determined by Natural Language Processing (NLP) (Cope et al., 2011; Shermis, 2014; Warschauer & Grimes, 2008). Between the statistics and their meanings, there are two mechanisms: supervised or unsupervised machine learning. This essay is worth 3 on a scale of 4, but this one is only worth 2, according to a human examiner's annotation. Then, having been "trained" by humans on a statistically significant number of examples, the machine can identify similar texts and label them 2 or 3 according to the similarities in their words. Or unsupervised machine learning: The machine finds statistically significant clusters to which the human applies a label.

GenAI is another paradigm shift. This third age in AI development retains the statistical bent of the second generation, but now uses a technique called "self-supervised learning," measuring the proximity of words in massive corpora of human text, thereby creating a "Large Language Model" (LLM). The machine trains itself by blanking out the next word in a sentence then checking whether its guess was right (reinforcement) or wrong (Christian, 2020). Layered over this is Reinforcement Learning from Human Feedback (RLHF), where humans fine-tune a self-supervised system so that it aligns with publicly acceptable norms and values (Ouyang et al., 2022).

The big difference in GenAI is that, in a way quite different from the earlier AI technologies, it leverages the semantics of written text. GenAI is a language machine. To contrast this with data-driven AI, we would characterize GenAI as text-semantic AI. And in an ironical twist, GenAI treats computer code as text-semantic too—textual because it is represented in Unicode, and semantic in the strict ordering of its constituent components.

The Paradoxes of Generative AI

Parsing Generative AI

GenAI works at the level of morphemes, combining Unicode characters into objects it calls tokens. Or more to the point, tokens have been hand-crafted

by humans who in the course of their writing practice have inserted spaces between words. Or they have been "stemmed" in the case of words that contain two morphemes. For example, "walk/ed" and "walk/ing" are stemmed into two tokens to differentiate two different kinds of "walking," one in the present and the other in the past. The machine has no capacity to create tokens or in any sense comprehend their meaning.

Notwithstanding AI's disavowal of any theory of language, its elemental ways of managing language can be traced deep into the history of linguistics—"stemming" to the work of Michael Halliday and colleagues in the 1950s (Richens & Halliday, 1957), and the idea that there was a distributional structure in "bag of words" to Noam Chomsky's dissertation supervisor, Zelig Harris. The proponents of statistical language processing have taken up Harris's "bag of words" idea as if words were for the purposes of analysis meaningless. Yet, the irony of the source text is that Harris said, "Language is *not merely* a bag of words" (Harris, 1954, p. 156, our emphasis). Words have a distributional structure that is syntactic and semantic in nature.

A morpheme may be distinguished by its distinctiveness and replicability, but viewed in a "distributional structure," its meaning-function can vary a great deal. For instance, "walking to work" is destination-directed. "Walking the dog" is walking for its own sake and in cases, some perhaps, the dog is walking its human. "Walking a prisoner to their cell" is a certain kind of forced walking. The distributional structure will identify different kinds of "walking" in each instance.

GenAI will, on the basis of distributional structure, apply weights to each kind of "walk." In our transpositional grammar, the weights attributable to different kinds of "walk" reflect different kinds of agency, so pointing to deep and finely nuanced grammatical differences. In conventional linguistics, such nuances of agency might be captured across the span of many morphemes in notions of transitivity, mood, voice, case, and more. Even when we do not have precise technical words for these differences, our grammatically oriented unconscious minds know and feel these subtleties of meaning as soon as we encounter them.

A 2017 article by Vaswani et al. at Google Brain was the key technical breakthrough in the development of the capacity of GenAI to process a statistically identifiable distributional structure across large spans of tokens. The weightings that differentiate thousands of different distributional structures for any one token, they said, could be determined by looking around at surrounding tokens in a context window and "paying attention," not to every surrounding token because that would be too much calculation even for today's computers, but tokens that appear to be statistically salient (Vaswani et al., 2017/2023). And statistically salient for the machine frequently happens to be semantically salient for the human.

Some say LLMs have captured the subtleties and complexities of language in far greater depth than would be possible for any linguistic theory. Piantadosi (2024) concludes, "there is nothing comparable in all of linguistic theory

to the power of large language models in both syntax and semantics—much less discourse coherence, style, pragmatics, translation" (p. 382). The problem with any theory of language, say Ambridge and Blything (2024, p. 33), is to "insist, in the service of intuitive interpretability, on simple yet empirically inadequate (over)generalizations." The problem is that theories must, of necessity, "vastly oversimplify the picture… precisely because they strive for intuitive interpretability. …Large language models, in contrast, just work" (Ambridge & Blything, 2024, pp. 42 and 38). This, these authors conclude, makes them better at theoretical linguistics than theoretical linguistics itself.

If LLMs "just work," it is on the basis of the associations of billions of words with billions of words, an empirical achievement impossible for humans. This is how LLMs build with a great deal of depth and nuance their actionable maps of language. It is how they handle the infinite combinatorial possibilities of language—by mimicking billions or even trillions of such patterns (parameters) in legacy textual corpora. This mechanism of learning is the source of their generative capacities. Responding to Ambridge and Blything (2024), Müller (2024) says, LLMs "are neuronal nets that have been organized and trained in a certain way. Nodes of such nets can be examined and we can even find certain information in them, but it is not a theory" (p. 2).

Humans also exploit the generative capacity of language, but the processes of their learning and enactment are completely different from LLMs. Chomsky (1966/2009) speaks to the "creative source of language use." The bases of human creativity in language are compositional productivity (using grammatical rules to generate novel meanings) and systematicity (a capacity to understand novel meanings). In a revealing analysis of several widely used LLMs, Ismayilzada et al. (2024) tested language understandings in Turkish and Finnish, reporting that, notwithstanding high performance in these languages in a range of tasks, there was "a systematic gap in LLM's ability compared to humans concerning morphological generalization" (p. 2). LLMs might work effectively with grammar, but they do not "know" grammar.

The Latent Grammar of Generative AI

We want to define grammar as broadly as Halliday: "A grammar is a resource for meaning, the critical functioning semiotic by means of which we pursue our everyday life. It therefore embodies a theory of everyday life; otherwise, it cannot function in this way… A grammar is a theory of human experience" (Halliday, 2000/2002, pp. 369–370). In his systemic-functional view of language, grammar tracks semantics.

Chomsky disavowed semantics in his grammar, wanting to limit the analysis to syntactic formalisms. However, even in his seminal *Syntactic Structures*, Chomsky (1957) was forced to admit that in the final analysis, "the fact that correspondences between formal and semantic features exist… cannot be ignored" (p. 102). Functionally and semantically, his noun phrases (in our terms, "reference") do different things from verb phrases (our "agency").

In our transpositional grammar (Cope & Kalantzis, 2020; Kalantzis & Cope, 2020), the semantic patterns of textual and spoken meanings can transpose into their equivalents in other forms of meaning or in multimodal combination. And rather than stable relations, our attentions continuously shift, transposing alternative functions in order to supplement and complement our meanings. For instance, through processes Halliday calls "nominalization" and "grammatical metaphor," we make meaning by shifting attention across functions. For example, I can transpose reference (e.g., *Google*) into agency (e.g., *I am Googling*).

GenAI, by contrast, is not grammatical by design, but it is circumstantially grammatical. Herein lies the profound difference between GenAI and human meaning. The human experience of meaning is figured *theoretically* and *grammatically*. We live in a world ordered by the functional classification of morphemes. Meaning is achieved by the application of a small repertoire of metalinguistic semantic primitives. These are layered across levels in multidimensional and multifunctional networks. This is the cognitive and experiential system for transposing *Google* and *Googling*, linking the search engine to my search. Into the same system, we can substitute *shovels* (reference) and *shoveling* (agency).

Unlike humans, GenAI is *empirical* and *statistical*. Its semantics are only latent, coincident with empirical word order. It is a flat world of one-to-one relations of tokens, where the sole difference is weighting of mutual relations across vectors. Meaningful text can only be generated by brute statistical force.

Although both humans and now GenAI make coherent meaning from the endless combinatorial possibilities of language, they have fundamentally different mechanisms for taming these infinities. And whereas the limits of GenAI are the limits of written text scraped from the web, human meanings extend into embodied experience and are immanent in the material world—embodied persons who create web pages and use shovels. Even textual meaning is pragmatically dependent on transpositions between the written word and meanings that are immanent in the embodied and material world.

The Scope and Limits of Generative AI

How do we make conceptual sense of the distributional structures of multimodal meaning, as distinct from statistical sense? Building on Halliday's systemic-functional linguistics (Halliday & Matthiessen, 2004) and then extending this into multimodal meanings (Kress, 2009), we have mapped what we have termed *a transpositional grammar* (Cope & Kalantzis, 2020; Kalantzis & Cope, 2020). By *transpositional*, we mean a grammar, not simply of fixed places in stable structural relation, but in constant movement. Meanings, we propose, are construed through wavering attention according to their *reference* (in Halliday, ideational), *agency* (interpersonal), *structure* (mode, cohesion), *context* (situation), and *interest* (purpose, motivation). Following

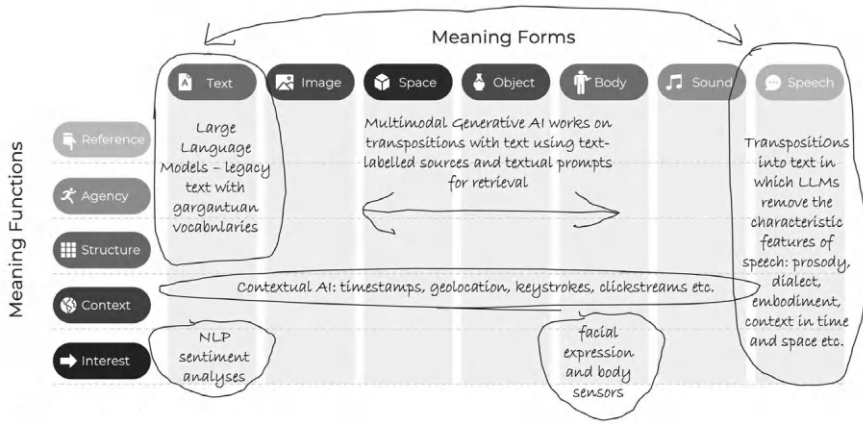

Figure 1.1 Scope and limits of Generative AI

Halliday, we call these "functions." There is an endless range of such potential shifts of attention.

Then, every function can be expressed in a variety or combination of forms, that is, multimodally: *text*, *image*, *space*, *object*, *body*, *sound*, or *speech*. These track the human sensorium, from practices of meaning that can be purely visual (*text* and *image*), to meanings that can be purely audio (*speech* and *sound*), with a panoply of multimodal experiences of meaning in between (*space*, *object*, and *body*). In our practice of meaning-making, we constantly move across and between these forms. In text, an instance may be represented in a proper noun ("Fido"), in image by a realistic depiction (his photograph). In text, a common noun may be represented by a common noun ("dog"), in image by an icon (a dog in silhouette). Using this heuristic, Figure 1.1 maps the scope and limits of GenAI.

To the extent that GenAI works language for us, it is entirely derivative of legacy patterns of meaning in written text. These are some of its strengths and limitations in its applications to text:

- **Reference:** Good at common nouns (concepts) and connected adjectives and adverbs (properties), but not good at instances (proper nouns) on account of their relative sparseness—hence "hallucinations." Older computational procedures (such as databases and textual markup) name instances and connect them to concepts with greater rigor than is possible in GenAI. Using Retrieval Augmented Generation (RAG), GenAI can be made better at reference when supplemented with texts specific to an empirical domain (specifying instances) or theoretical practices through formal ontologies (specifying concepts).

- **Agency:** GenAI may at some point and to some extent drive autonomous agents (Liu et al., 2023), but not yet with the precision of context-specific computer programming.
- **Structure:** GenAI is very good at textual structure. It has picked up the subtle difference between different discourses. Above all, it is a genre machine. Its AI agent technology is able to generate text according to alternative perspectives—"speak this object like a technical specialist" or "speak this object to a naive consumer," for instance.
- **Context:** GenAI operates purely with legacy text and is unable to account for context beyond the scope of exophoric reference in its corpus. Contextual AI is very good at context with its on-the-fly capture of timestamps, geolocations, keystrokes, clickstreams, and such like. In personal life and learning, there are enormous potentials (and great dangers) in linking these two very different kinds of AI, Generative and Contextual.
- **Interest:** Gen AI is good at textual genres and registers that reflect different kinds of interest. But it still benefits from hand annotation of the kinds developed in older paradigms of sentiment analysis in NLP—this effectively what the human fine-tuners do with RLHF.

Moving across the other forms of meaning, speech-to-text and text-to-speech technologies appear to make this transposition easily, and in the case of text-to-speech, even the timbre of a particular person's voice. Speech, however, is deceptively different from text in its grammatical structure (Halliday, 1987/2002; Kalantzis & Cope, 2022). Text is carefully arrayed in two-dimensional space. It is organized concisely, without unnecessary redundancy. Because writer and reader are separated across time and place, text must be explicit about its own situatedness. Its basic unit of construction is the sentence.

Speech, by contrast, unfolds across time. It is redundant, circuitous, and relies on contextual self-evidence. Its basic unit of construction is the clause. Meaning in speech is supplemented with prosody, dialect, and gesture. Today, AI supports speech-to-text transposition, but much is lost in translation, and the transposed text is not as useable by the GenAI as natively written text. Talking back, text-to-speech GenAI speaks the grammar of writing in much the same way as a newsreader or a knowledgeable lecturer does.

Across the other forms of meaning, everything else is text-dependent, too. GenAI can create still images and videos, but on the basis of the textual labels applied to image corpora (Deng et al., 2009). Then, the creation of new images or videos requires textual prompting. The power of the technology lies in the transposability of textual meanings into other forms, and this circumscribes its limits as well. Moreover, GenAI can only deal with legacy text collected up to the point of its last training session. Its scope is almost every published text up until the date when the corpus was last processed and assigned. As a consequence, its knowledge of text is strictly historical.

Dangers in Generative AI

For better or for worse, GenAI will likely have powerful impacts on across-language communication, education, and human experience in general. Adding to the worse, GenAI also comes with grave dangers. From the point of view of language and language teaching, the first might be the threat to employment of trained language teachers—populist opponents of humanities education may be tempted to ask, what's the use of learning another language when, from a functional point of view, machines can translate so well? This is but one site in a larger labor market context in which AI automation eliminates labor-intensive knowledge economy jobs at all levels of employment, from customer service to the professions (Eloundou et al., 2023; OECD, 2023). Questions also arise about a potential AI divide. LLMs are built by private companies, and their free versions serve as an enticement to purchase the more powerful versions. There is the traditional issue around affordability and potentially differential access to AI that could add another dimension to social inequality.

This takes us next to the problem of private ownership of intellectual property. The corpora that GenAI accesses have been scraped from the web and repurposed by a few controllers of AI platforms and apps. Previous breakthrough technologies such as the internet itself were built in the quasi-public site of the university. LLMs have been built with the massive investment of private capital, well beyond the scope of possibility for universities or public research funding. Much of the cost is in hardware and electricity consumption. Ironically, GenAI is a heavy industry, with environmental externalities no different in their effect from the smoke-belching factories of the industrial revolution. With this private capital, these companies have trained corpora acquired through the illegal appropriation for the private profit of copyrighted material and unjust appropriation of content from the public domain. This is theft of language itself, the culture and knowledge embedded in that language, and with this, the whole of human experience as expressed in written text.

Then, there are the intrinsic characteristics of the technology. The human textual legacy captures ideologies and practices that are offensive nowadays to liberal sensitivities, including racism, sexism, and homophobia. This produces a problem of "alignment" (Hristova et al., 2023). The companies address these forms of AI bias by applying Reinforcement Learning Using Human Feedback, expunging at their discretion now-unacceptable aspects of the human experience. This produces a new kind of bias in which LLMs reflect the ideologies of their owners and their developers (Buyl et al., 2024). In addition to this, there is a bias toward the English language for the simple reason that there is more text in English than other languages (for more on linguistic biases, see Chapter 5 in this volume). A handful of so-called "high resource languages" such as Spanish, Chinese, and Arabic fare reasonably well, but the remaining languages of the world, not-so-well—for the moment at least (Nicholas & Bhatia, 2023).

Finally, there are questions of false facts and fake news ("hallucinations"), privacy (the chatbot tunes its responses by learning about you), impersonations (of voice or face), and "explainability" (where the specifics of a generated response and its connections to antecedent human texts are lost in the convolutions of the machine, and the machine is positioned as creator rather than the humans it has but echoed). And in education, perhaps the greatest anxiety of all arises around the question of "cheating"—it is impossible to know whether a written language performance has been generated by the student or the machine.

All of this means that, given the ubiquitous availability and widespread use of Gen AI, we can no longer do language education without a carefully designed program of critical AI literacy. It is imperative to retrain educators to engage productively and ethically with AI, sharing experiences and tools that are genuinely effective for language learning.

Language Opportunities in Generative AI

Nevertheless, paradoxical new opportunities for language use and learning open up with GenAI. One is its application in low-resource languages. For example, Nicholas and Bhatia (2023) lay out a scale of resourcing for languages based on the scale of their textual corpora, from: extremely high resource (just one language, English); to high resource (six languages: Arabic, French, Japanese, German, Mandarin, and Spanish); medium resource (dozens of languages, such as Hindi and Dutch); low resource (hundreds of languages, including Burmese and Maltese); and extremely low resource (thousands of languages, many without traditions of writing, including Warlpiri and Bora).

Most LLMs are based on multilingual corpora. They use the lexicogrammar of other languages as a resource for the generation of text in the target language. GenAI will work better in Hindi with a multilingual LLM that includes other languages as well as Hindi than a Hindi-only LLM. This is for the simple reason that language-exclusive LLMs have less data on which to train. To the extent that LLMs happen to map human identifiable patterns of meaning, they are able to transfer that meaning from one language to another. In this way, they can bootstrap higher resource to lower resource languages.[1]

Let's have a look at some examples. Faetar, a Franco-Provençal language spoken in two small communities in Italy, has less than 1000 speakers. There are few field recordings and only five hours of transcribed speech. A team of researchers is using this language to develop a benchmark, evaluating the capacity of GenAI for automatic speech recognition in extremely low-resource languages (Ong et al., 2024). Kinyarwanda and Kirundi are Bantu languages with about 13 and 15 million speakers, respectively, but with relatively small presence on the web in their written forms. Researchers have shown the power of cross-lingual transfer into text generated in these languages despite the relative paucity of source text (Thangaraj et al., 2024). Kalamang, spoken on a

small island in Indonesian Papua, has only 200 speakers, almost no presence on the web, and no fluent new speakers since the 1980s. Trained with one grammar book, the LLM performed creditable translations, though still below the performance of a bilingual human. Based on these results, the researchers in charge of this work concluded that with specialized training and fine-tuning human-level performance is within reach (Tanzer et al., 2024). It may be possible to tune multilingual LLMs so that they exploit shared structures across languages while remaining sensitive to language differences (Zhang et al., 2024).

The paradox of these developments is that there will be fewer disadvantages in knowing smaller languages and not knowing national or imperial languages. As a universalizing technology, GenAI can support linguistic pluralism. Globalizing universalism can nurture localized particularity. Dare we hope that, in this historic moment, we can reverse the tide of "linguistic imperialism" (Phillipson, 1992)?

LLMs can also be tuned to serve language diversity across specialized and particularistic discourse domains or registers. For instance, in domains where knowledge recorded in English dominates, such as medicine (Le-Duc et al., 2024) or finance (Xue et al., 2024), with GenAI translation support, it will be possible to operate in any other language with equal epistemic power. This removes another reason to learn English, this longtime language of epistemological colonialism. Students will not have to know English to be educated even at the highest levels in powerful domains of knowledge and expertise in leading areas of science and economy.

Language Teaching with Generative AI

A Pedagogy of ALL—Another Language Learning

Learning another language has a variety of purposes depending upon context. The learner may be an immigrant who does not speak the national language of their place of settlement. They might be wanting to learn a world language in a country where that is not the main language. They may be learning a heritage language in the context of diaspora to maintain cultural, family, or community connections. They may be learning an endangered Indigenous language for the sake of its preservation. They might be learning a language for its own aesthetic sake or for cultural appreciation. In each case, the purposes are different, and the politics are different.

In this chapter, we have bracketed all these scenarios into the category ALL because, notwithstanding their significant differences, GenAI will likely affect them in similar ways. Our educational responses should also transcend these differences. GenAI prompts us to question these old distinctions between different kinds of language teaching and learning.

There is no wishing away of GenAI or banning it from the language classroom, and this for the simple reason that it is such a powerful language

technology. Not only does it do language work for us effectively, but as we have discussed earlier in the chapter, its very essence is to leverage language itself as a technology, and in ways that are quite unlike even the older AI technologies. As language educators, we need to think hard about this, and so do our learners.

In the wider context of education, GenAI prompts a fundamental rethinking of pedagogy in general. When we have a machine that, by virtue of its capacities to process language, can do cognitive and representational work for humans, how do we incorporate such a machine into the learning process?

Our starting point in this chapter has been to reflect on the profound differences between GenAI and human language activity. Although powered by language, AI is not an artificial version of human intelligence. It may seem that way because it can on command perform cognitive and language tasks in support of humans. It even has a degree of autonomy as an agent, interacting with us in ways that seemingly give it a life of its own. But these appearances deceive, as indeed does the very moniker "AI." GenAI can do much more than humans, and much less. Its capacities and incapacities are so different they can hardly be measured on the same scale as human capacities. It does not even act until prompted by a human, and the response is in dialogue with the prompt. This in a sense is a dialogue we can have with legacy human text in which the machine is no better than a thoughtless mediator.

This means that when we move into the question of pedagogy, we would rather understand the question in terms of cyber-social learning, a sometimes productive and at other times highly problematic relation between the learner and their linguistic and social inheritance, now packaged into the vector database that is the LLM.

In this spirit, we offer suggestions for language teaching and learning after GenAI. Our proposals are grounded in the tenets and knowledge processes of the multiliteracies framework *Learning by Design* (Cope & Kalantzis, 2015, 2023c; Kalantzis et al., 2016). This pedagogy proposes a repertoire of knowledge processes, where learners and teachers orchestrate strategic moves between one kind of knowledge activity and another, though in no necessary order. Pedagogical designs may lead learners along variable learning paths, depending on their needs and the nature of the learning, weaving between the knowledge processes of *experiencing*, *conceptualizing*, *analyzing*, and *applying*. The order and combination of these processes may vary, depending on learning goals and expected outcomes. Each of these processes has its origins in older pedagogical practices: *experiencing* in the traditions of progressive or authentic pedagogy; *conceptualizing* in the tradition of clearly articulated didactic or transmission pedagogy; *analyzing* in the socially aware tradition of critical pedagogy; and *applying* in the pragmatic tradition of communicative or functional pedagogies.

As discussed in the introduction to this volume, students' work within the knowledge processes involves the development of dialogical and collaborative instructional sequences that integrate multimodal content and tasks as

well as the use of a variety of media. Curricular connections with learners' diverse identities, personal experiences, and community backgrounds are established, fostering both a sense of belonging and engaged, critical citizenship and lifelong learning (Cope & Kalantzis, 2023c; Kalantzis et al., 2016). When language learning is grounded in this pedagogy, students are exposed to and critically interact with texts originating in the target cultures and/or in diasporic communities within their own, and they participate in meaningful, communicative tasks that enhance their language skills and result in new personal, linguistic, and multimodal connections (Zapata, 2022).

We believe GenAI opens out new possibilities for the materialization of these practices in ALL. We offer some examples in the next four sections.

Experiencing

The *experiencing* knowledge process involves connecting learners' prior knowledge and lived experiences to new language and cultural concepts as well as establishing instructional practices tailored to their personal and academic needs, including their target language use. GenAI can effectively support these processes by assisting teachers in the creation of personalized content, and, when appropriate, culturally relevant resources. For instance, GenAI can generate a wide array of text types, styles, and genres that can resonate with students' lifeworlds and address their academic needs. GenAI outputs can also expose students to language use that goes beyond traditional textbook examples, which could be particularly useful in the case of languages for which there is a dearth of authentic materials, such as those previously discussed in this chapter. These practices not only facilitate connections between students' existing linguistic knowledge (e.g., how language functions in diverse social contexts) and their new language, but also promote belonging, since learners can see the relevance of their learning in their own lives.

The incorporation of GenAI to language teaching can also enrich students' individual, communicative experiences, particularly for those learning in large language classrooms. Consider Benjamin Bloom's (1984) "2 sigma problem." Bloom showed that in one-to-one tutoring, students performed better than they did in group instruction by a factor of two standard deviations, and he proposed this gap could be closed in part at least with a combination of formative assessment, group work, and motivational approaches. In practice, however, Bloom's program of "mastery learning" was difficult and expensive to implement in conventional school settings.

GenAI can offer a tangible solution to Bloom's (1984) problem. In language learning, GenAI conversational agents can now interact with students at levels sensitive to their current level of language understanding, pushing them into their zone of proximal development (Vygotsky, 1978) to a carefully calibrated degree. In this context, the teacher can design their relationship with multiple students so that the AI acts as their mouthpiece in what is now for all intents and purposes a hybrid, one-to-one, cyber-social learning situation.

In some ways, the AI can "know" more about language than a human teacher because their sources can be almost all of any and every language in their published forms. And it can "do" more than a teacher because, via contextual AI (e.g., keystrokes, audio recordings, timestamps, clickstreams, facial expressions, and sensors capturing embodied meanings), as they can "see" more empirical detail in the language learning experience than the most observant instructor. Nevertheless, in their embodied and emotive sensibilities, human teachers still have the importantly different responsibility to shape these learning experiences. There is still a hugely important role for the practitioner, in "prompt engineering" and supplementing the vector knowledge base with teacher-selected curriculum content. So it is not a mere machine that is dialoguing with the student, but the teacher's educational designs layered over the broader human experience captured in the foundation LLM. Learning has become deeply cyber-social.

Conceptualizing

The conceptualizing process involves the identification of patterns, the classification of information, and the development of abstract understandings and generalizations about language use. GenAI can support this knowledge process in a number of ways, making it easier for learners to engage with and organize new knowledge.

For instance, GenAI can assist learners in brainstorming and organizing ideas by generating vocabulary lists, creating concept maps, or outlining essays and ideas for projects linked to specific genres or communicative situations solely linguistic or multimodal. GenAI can also offer explanations and examples that are helpful for expanding learners' understanding of language, including definitions and specific instances that show how words are used in various communicative contexts. These outputs can enrich students' lexical repertoires and facilitate the comprehension of abstract language concepts, both of which can enhance their language use.

AI-powered tools can also support grammar learning and practice in meaningful contexts. These tools can provide explanations of grammatical rules, generate communicative tasks tailored to each learner's specific needs, and offer instant feedback on their performance. Furthermore, GenAI can produce sample outputs that incorporate particular grammatical points, helping students see these structures in real use. Then, under instructor guidance or relying on fine-tuned GenAI tools, students' learning can be steered toward critical reflection that allows them to discover and establish connections between language, text type/genre, and meaning-making. These affordances also pertain GenAI multimodal outputs (see Chapter 5 in this volume for more information about the possible applications of OpenAI's DALL·E 2 for language learning).

We advocate these kinds of theoretical tasks, of course always combined with practical language use, because we would argue that, in formal education

settings at least, the first of our four pedagogical components, experiential immersion, is not enough. Formal education is a limited opportunity in terms of time and resources. Generalization is a more efficient way of learning. Explicit call-out is pedagogically powerful, exercising the capacity to move between cognition and metacognition, or between knowledge specifics and knowledge transfer.

Immersion pedagogy also tends to favor insiders whose informal life experience means they seem naturally to "get" the discourse of the classroom or its target domain. Explicit pedagogy is particularly beneficial for learners whose lifeworlds are more distanced from the culture of schooling and the contents of its curricula. These are some of the reasons why pedagogical discourses should at least at times be more explicit than vernacular ones. GenAI can facilitate their inclusion through the generation of outputs that not only exemplify specific language uses, but also allow for students' critical, explicit (but always guided) examination of formal aspects of those uses, leading to in-depth understandings and generalizations of how languages work.

Analyzing

Upon concepts and theories, learners build analysis and critique. They can parse meanings for their functions and then think critically about the interests reflected in these functions. These are the main objectives of the analyzing knowledge process, and GenAI can support students' work within this process in multiple ways.

For example, GenAI can assist students in understanding how language functions at a micro-level, offering information about the reasons why a particular structure or word is more effective in a given context compared to alternative linguistic choices. This, in turn, can allow learners to delve into the more specific nuances of language use. Additionally, GenAI can facilitate discussions on bias and perspective. By analyzing AI-generated texts, learners can identify connections between linguistic choices, audience, communicative purpose, and the underlying interests of the "meaning maker." This enables students to critically assess potential biases within the texts, fostering greater cultural awareness and an understanding of the impact of perspective on language use. Gen-AI-supported tasks can also be created to facilitate learners' critical understanding of linguistic colonialism and its antidotes.

In addition to these affordances, GenAI can support the critical analysis of media and cultural representations. For instance, learners can explore diverse perspectives by engaging with multimodal texts produced by GenAI (see also Chapters 4 and 5 in this volume), leading to rich discussions on social and cultural issues related to the target language. These types of activities can broaden students' awareness of cultural nuances and help them develop a more critical approach to the representation of ideas in language as well as other modes of communication present in the GenAI-generated multimodal artifacts.

Besides analyzing specific linguistic/multimodal aspects of meaning-making, students can also work on tasks that can result in the development of their AI literacy. This would, for example, entail an instructional focus on issues connected to the general use of GenAI tools, such as hallucinations, intellectual property, AI plagiarism, impersonation, privacy, basic explainability, and more.

Applying, from Appropriately to Creatively

Finally, there is the business of performance in another language. It is unrealistic and anachronistic to measure performance in classroom or examination environments where learners or test-takers have been denied language technology support. The measure of performance today will be the learner's capacity to negotiate technology-mediations across and between different languages, registers, and domain-specific areas of knowledge. GenAI can contribute to students' language use in several ways.

For instance, one way in which GenAI can support learners is by generating writing prompts and scaffolding creative tasks. GenAI can offer prompts for various writing genres, provide sentence starters, and even suggest plot twists, all of which encourage learners to express themselves creatively. Furthermore, GenAI can assist in planning the development of creative, multimodal artifacts, such as brochures, recipes, posters, or even educational environments (a use directly connected to pre-service teacher education). By integrating text and visual elements (and more, e.g., gestural and spatial aspects), learners can develop richer, more diverse communication skills.

Students can also employ their new language and other meaning forms to extend or improve GenAI-generated texts and images. Instructors need to ensure that these tasks are accompanied by specific guidelines for learners' critical analysis of GenAI's strengths and weaknesses. This approach, thus, supports the development of AI literacy by facilitating students' understanding of both the affordances and limitations of AI in creative processes.

Finally, GenAI can support peer feedback and collaboration. For instance, learners can use the AI to generate constructive feedback on their peers' work and/or collaborate on writing/multimodal projects. These types of tasks can result in an interactive, cyber-social learning environment that promotes cooperation and mutual growth.

GenAI-Supported Language Pedagogy: Implications for Practice

In order to achieve the effective integration of GenAI into language learning, it is first essential to set specific learning objectives and outcomes. Clearly articulating the goals and expected outcomes for GenAI-supported tasks within the chosen knowledge process(es) to ground language instruction will help ensure that learners understand the purpose and relevance of using GenAI in

their learning journey. When students are aware of the intended objectives and they know exactly what is expected of them, they can engage more meaningfully with instructional activities and make the most of the AI's potential.

Another crucial pedagogical aspect is the need to scaffold learners' interactions with GenAI. Providing guidance on effective prompting, including structured examples and hands-on activities, as well as critical evaluation of AI-generated content, will foster digital and AI literacy skills and will enable students to navigate AI with a more discerning approach. Also, every GenAI-supported task should include opportunities for critical assessment of the tool itself, and the language used, addressing both analytical and functional aspects of language. Here, the teacher and students can ask the same five questions (Figure 1.2) and, in doing so, achieve a critical understanding of not only how language and forms of communication work to convey intended meanings in specific sociocultural contexts, but also what role GenAI plays.

GenAI-supported language learning grounded in *Learning by Design* also entails tying the use of GenAI to students' personal experiences—starting with familiar concepts and contexts. This can not only help learners move from the *known* to the *new*, but can also make their interaction with AI more relatable and accessible. Encouraging reflection and self-assessment is another valuable practice. By prompting students to reflect on their learning processes

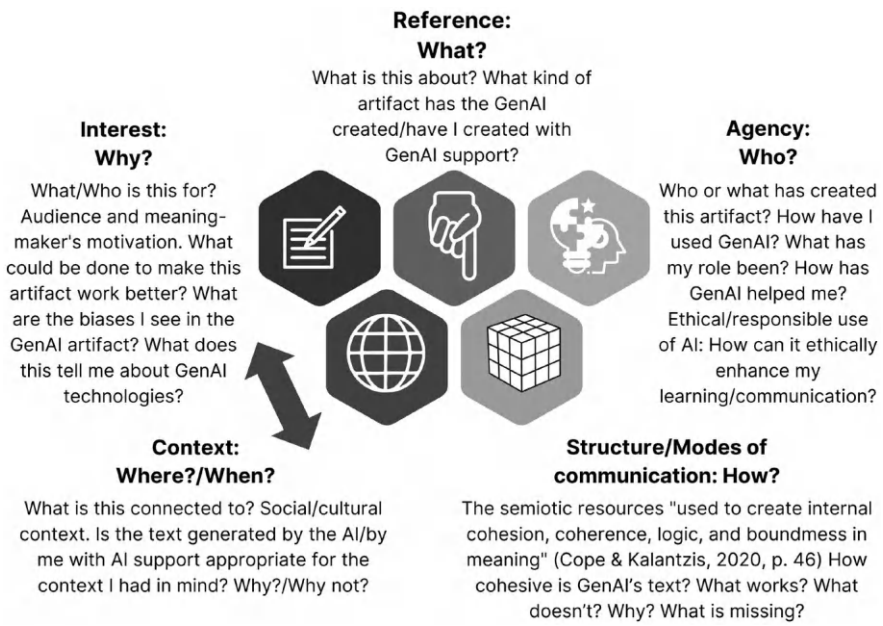

Figure 1.2 Functions of meaning: Questions to critically assess GenAI-supported meaning-making

and consider how GenAI has contributed to their understanding and communication in the target language, teachers can promote metacognitive skills. Through this reflection, learners can build awareness of their learning progress and can identify areas for improvement.

Finally, collaboration and peer feedback should also be incorporated into GenAI-based activities. Designing tasks within each knowledge process that encourage learners to work together and provide feedback to one another using GenAI creates a supportive, interactive learning community. This cyber-social environment enables learners to grow together while benefiting from shared insights.

Looking Ahead

With the coming of text-semantic AI, the time has come to reconsider the aims and pedagogies of Another Language Learning. When the machine will do translation, the language teacher might focus more on how to use this facility effectively, and how to learn language incidental to human-machine translanguaging possibilities offered by AI. It is also time to reconsider the balance of activities in language learning. Ironically, when many of the functional objectives for language learning are now shared with a machine, old liberal education objectives may once more come into play—learning a language to develop an appreciation of another culture, or as a way to study the nature of language and multimodal meaning, or even as a way to develop and exercise wider and deeper capacities to think and interact across cultures and discourse domains.

GenAI is destined to become central to the future of language teaching and learning. This will require teaching and learning a basic understanding of AI language technologies and a practical capacity to use them effectively in a cyber-social relation. A critical assessment of GenAI technologies and the products they generate is essential, as is the ability to identify and evaluate ethical issues associated with AI use, considering personal, social, cultural, and political implications.

Note

1 Ironically, this takes us back to Chomsky's notion of a universal grammar grounded in a shared ontology of human experience, converging since the emergence of written language and propelled more recently by globalizing technologies of information and communication.

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2 Translanguaging and Transposition in the Generative AI Era

Exploring Multimodal Meaning Without Borders in Second Language Education

Anastasia Olga (Olnancy) Tzirides

Introduction

As Generative Artificial Intelligence (GenAI) increasingly integrates into everyday life and the realm of language education, this chapter seeks to delve into the innovative ways in which the combination of translanguaging and transposition, enhanced by GenAI practices, can revolutionize second language (L2) learning. By fostering a more inclusive and dynamic learning environment, these approaches can empower learners to navigate language learning with greater ease and confidence, ultimately enriching their educational experience.

Translanguaging is a dynamic pedagogical approach articulated by García and Wei (2014) that conceptualizes language as a rich, multilingual, multisemiotic, and multimodal resource. This framework transcends traditional bilingual and multilingual models by embracing flexible and adaptive language practices that reflect the realities of multilingual speakers. Rather than segregating languages into distinct systems, translanguaging celebrates the strategic and pragmatic utilization of learners' entire linguistic and semiotic repertoires, allowing for more effective communication across diverse contexts (García, 2009; García & Wei, 2014; Wei, 2018). Rooted in well-established practices such as code-switching and hybridity, translanguaging redefines these elements as contextually grounded, creative, and socially responsive methods of communication (Cope et al., 2024). By fostering an environment where multiple languages coexist and interact fluidly, translanguaging not only enhances learners' linguistic skills but also cultivates a deeper understanding of cultural nuances and social interconnectedness, ultimately enriching the educational experience.

Transposition serves as a valuable complement to translanguaging by offering a more comprehensive framework for understanding multimodal meaning-making processes. According to Cope and Kalantzis (2020b), transposition can be defined as the dynamic transfer and transformation of meaning across a wide array of communicative modes, including text, image, sound, and gesture. This conceptualization explains how meanings are not only constructed but also reshaped as they traverse different modalities, especially within the

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context of digital environments. Unlike translanguaging, which primarily focuses on the utilization of linguistic resources, transposition embraces the full spectrum of multimodal communication, thereby enriching the meaning-making processes. This approach is deeply aligned with the multiliteracies framework (Cope & Kalantzis, 2015, 2023; Tzirides et al., 2024a), emphasizing the variability of meaning that emerges across diverse sociocultural contexts and the unique affordances of various modes. By integrating these insights, transposition equips educators with the tools necessary to navigate and address the intricate complexities inherent in multimodal learning (Cope & Kalantzis, 2020b).

The incorporation of GenAI has profoundly revolutionized the landscape of L2 education, paving the way for innovative multimodal and transpositional teaching methodologies (see the Introduction to this volume and Chapter 1). With the aid of advanced tools such as large language models (LLMs) and sophisticated multimodal content generators, educators can offer real-time translation, deliver personalized feedback, and facilitate the creation of rich, engaging content. These advancements empower learners, providing them with dynamic and interactive experiences that can significantly enhance their educational journey. Moreover, these cutting-edge technologies are intricately aligned with the principles of translanguaging and transposition. For example, they enable learners to immerse themselves in multimodal texts while seamlessly integrating linguistic, semiotic, and cultural resources, thereby fostering complex meaning-making processes (Chandel & Lim, 2024; Ji et al., 2023). The capabilities afforded by GenAI extend beyond mere language learning; they enhance learners' performance/proficiency in navigating digital environments and cultivate a deeper engagement with diverse multimodal learning practices (Cope et al., 2024; Cope & Kalantzis, 2020a). As a result, GenAI not only enriches the learning experience but also prepares students for the multifaceted realities of a globalized digital world.

This chapter delves into the interplay between translanguaging and transposition in the context of GenAI, providing an insightful framework for navigating the pedagogical possibilities and obstacles introduced by these technological innovations. By employing AI-driven resources—including chatbots, LLMs, and multimodal content generators—educators have the opportunity to enhance students' linguistic abilities and diverse modes of expression while nurturing critical thinking and creativity (Chandel & Lim, 2024). Moreover, the chapter addresses significant concerns surrounding equitable access and ethical implications associated with AI technology (Alshumaimeri & Alshememry, 2024). It emphasizes the importance of inclusive strategies that ensure all learners benefit from advancements in technology. Through a comprehensive analysis of the synergies between translanguaging, transposition, and GenAI, this chapter enriches the contemporary dialogue on language education in an increasingly digital landscape. It underscores the necessity for innovative teaching strategies that account for the intricacies of communication in the digital realm, while also tackling pressing challenges. Finally, this

chapter aspires to empower educators to adeptly utilize GenAI tools, preparing students to succeed in an AI-driven world.

The chapter begins by delving into the foundational concepts of translanguaging and transposition, situating them within the evolving framework of multiliteracies in digital and educational contexts. Subsequently, the discussion transitions to examine the role of GenAI in transforming language learning, emphasizing its potential to enrich multimodal meaning-making processes. Alongside this, ethical challenges and equity concerns associated with AI integration are critically explored. The chapter concludes by presenting innovative pedagogical strategies that leverage AI tools to foster linguistic creativity, multimodal literacy, and inclusivity in L2 education. Together, these sections provide a comprehensive exploration of the synergies between AI-driven technologies and contemporary language pedagogies, offering educators actionable insights and future directions.

Translanguaging and Transposition in Meaning-Making

This section examines the concepts of *translanguaging* and *transposition*, two pivotal frameworks that shed light on the interconnectedness of language and multimodal meaning-making in contemporary contexts. By exploring their definitions, applications, and synergies, the discussion highlights how these frameworks intersect and integrate with AI advancements. Together, they provide a lens for understanding the evolving dynamics of communication, education, and digital interaction in a rapidly transforming world.

Translanguaging as a Framework for Multilingual Education

Translanguaging is a concept introduced by Cen Williams in his 1994 Welsh PhD thesis, which remained untranslated until Baker (2003) provided an English version. This concept constitutes a significant shift in how we understand and practice bilingual and multilingual education. It is rooted in the natural mixing of languages observed in bilingual communities. Translanguaging thus challenges the traditional practice of separating languages in educational systems, a practice historically justified as necessary to maintain linguistic purity (Williams, 2012). By acknowledging the dynamic and fluid use of multiple languages as a valuable resource, translanguaging aims to align educational practices with the integrated ways people naturally use language in everyday contexts.

Unlike earlier frameworks such as "separate bilingualism" (Baynham & Lee, 2019) and "monological multilingualism" (Makoni & Pennycook, 2012), which focus on the compartmentalization of languages, translanguaging promotes a holistic and interconnected approach to language use. It critiques the "two solitudes" model (Cummins, 2019) present in both subtractive and additive bilingual education, which often restricts students' ability to fluidly navigate and integrate their linguistic repertoires. This critique also addresses

the broader issue of the "normative ascendancy of monolingualism" (May, 2014, p. 3), where prevailing educational ideologies have favored standardized languages defined by nation-states (García & Kleifgen, 2020; García & Otheguy, 2020).

Historically, applied linguistics has examined language mixing using terms such as code-switching, translation, and biliteracy. While each of these terms offers valuable insights, they often fall short of capturing the transformative nature of translanguaging. For example, code-switching assumes that there are distinct linguistic systems between which speakers "switch" (Gumperz & Hymes, 1972; Wei, 2018). Similarly, translation, as described by Jakobson (1959), typically preserves linguistic boundaries rather than dissolving them, which reinforces the separations between languages (Baynham & Lee, 2019). In contrast, translanguaging flourishes in the "turbulent space" where languages, discourses, and modalities interact dynamically, fostering a "creative thrown-togetherness" of meaning-making (Baynham & Lee, 2019).

Translanguaging not only challenges traditional views of language but also addresses the power dynamics present in bilingual education. It gives priority to the voices and linguistic practices of marginalized communities, thereby counteracting the social stigmatization of non-dominant languages (García & Wei, 2018). This approach is seen as a political act—a decolonizing process that restores the linguistic agency of communities that have been marginalized by monolingual or standardized language ideologies (García & Kleifgen, 2020). Baynham and Lee (2019) posit that translanguaging functions as "language from below," inherently resisting purist or regulated bilingual practices. It serves as a means of "speaking back" to dominant ideologies.

Translanguaging serves as a powerful educational framework that complements progressivist and critical pedagogies by allowing students to leverage their diverse linguistic backgrounds within formal learning environments. This approach deeply values situated and experiential learning, enabling students to connect their prior experiences and knowledge to academic contexts. By critically engaging with the material in relation to broader sociopolitical dynamics (Kalantzis et al., 2016), learners can cultivate a more nuanced understanding of the world around them.

By embracing translanguaging, educators have the opportunity to design inclusive and learner-centered classrooms that not only celebrate linguistic diversity but also promote creativity and critical thinking (Tzirides, 2022, 2023, 2024). This method empowers students to assert their linguistic agency, encouraging them to view language as a dynamic resource for communication and expression rather than a rigid set of rules. Thus, translanguaging enriches the educational experience, preparing students to navigate and contribute to an increasingly digital society.

In sum, translanguaging redefines language education by encouraging educators to go beyond traditional ideas of distinct languages and even the concept of language itself. It recognizes that the components of language—such as speech and text—are closely connected to other forms of meaning-making.

As digital technologies and global communication change the way we create and share meaning, translanguaging provides a progressive framework for equipping learners with the skills they need to navigate and succeed in these dynamic environments.

Transposition and the Dynamics of Multimodal Meaning-Making

Transposition refers to the dynamic movement of meaning across different modalities, such as from speech to gesture, text to image, or sound to object (Cope & Kalantzis, 2020b). Initially based on the idea of "substitution" proposed by Bogdanov (1923/2016), transposition expands on this concept by emphasizing the layering and continuity of meaning rather than simply replacing one form with another (Cope & Kalantzis, 2020b). Unlike static translation, which often restricts meaning to discrete systems, transposition highlights the continuous movement of meaning, exploring both the similarities and the distinct differences that arise as meaning transitions between different forms (Jakobson, 1959; Kalantzis & Cope, 2020).

At its core, transposition aligns with multimodal learning and the multiliteracies framework (Cope & Kalantzis, 2009, 2023,; Kalantzis et al., 2016, 2020; Tzirides et al., 2024a; see also the Introduction to this volume and Chapter 1). This framework focuses on how meanings are co-constructed across diverse media. It builds on the concept of multimodality by categorizing the material manifestations of meaning—such as text, image, space, object, body, sound, and speech—as "forms." Additionally, it adopts Halliday's metafunctions (ideational, interpersonal, and textual) (Halliday & Matthiessen, 2014), which are reframed as reference, agency, and structure. To this framework, context and interest are added, broadening the scope of analysis (Kalantzis & Cope, 2020; see also Chapter 1).

Transposition offers a systematic framework for understanding how meaning is created beyond just language. For instance, nouns and verbs can be reinterpreted as entities and actions, respectively, while the distinctions between singular and plural can be viewed as instances and concepts. Additionally, personal pronouns can be reframed as self and other, highlighting their adaptability in meaning-making processes (Cope & Kalantzis, 2020b). This approach recognizes the different ways meaning can be conveyed, acknowledging the roles of both redundancy and enrichment in multimodal communication (Kalantzis & Cope, 2020). For example, using images alongside text in scientific articles or combining gestures with spoken words demonstrate how each form contributes unique elements to the overall meaning.

The transpositional perspective challenges traditional boundaries in linguistic analysis by integrating both structuralist and poststructuralist paradigms. It emphasizes the traceability and accountability of meaning patterns, while also recognizing their inherent fluidity and variation. In this view, meaning is both coherent and endlessly transformative, shaped by meaning-makers' unique social contexts and life histories (Kalantzis & Cope, 2020).

Transposition also further develops the multiliteracies concept of "design" by emphasizing the role of meaning-makers in actively transforming available resources. This transformation reflects the social nature of meaning while also creating unique expressions that are situated within specific contexts (Cope & Kalantzis, 2020b). By examining these patterns, transposition reveals the meaningful coherence of the world and underscores the responsibility of meaning-makers to reshape their environments and experiences (Kalantzis & Cope, 2020).

Overall, transposition offers a comprehensive framework for analyzing and understanding the ceaseless interplay of meaning across modalities. It can equip educators and researchers with tools to navigate the complexities of multimodal learning, fostering a deeper appreciation for the nuanced and interconnected processes of meaning-making in a digitally mediated, multiform world.

The Synergy of Translanguaging and Transposition in Digital Meaning-Making

Translanguaging and transposition are closely related concepts that together redefine how we create meaning in the digital age. Traditionally, translanguaging refers to the fluid integration of different linguistic practices. However, its scope broadens when combined with transposition, which extends beyond language to include multimodal and diverse forms of interaction (Cope & Kalantzis, 2020b). As Kress (2009) notes, translanguaging rarely exists in isolation; rather, it operates within "multimodal ensembles" that incorporate text, sound, images, and gestures. This comprehensive perspective requires a framework capable of analyzing how these various forms of meaning interact, complement, and transform one another. Therefore, the combination of translanguaging and transposition effectively addresses this challenge.

In the context of digital media, the process of meaning-making is shifting from a dependence on specific languages to an emphasis on their ontological forms, viewing them as data points and information structures (Cope et al., 2024). Visual, auditory, and textual elements—such as written text, spoken language, and images—can now be mediated, recorded, and represented as labels, transcriptions, and machine translations (Cope & Kalantzis, 2020a). This mediation allows for the scripting of entire multi-faceted experiences, which encompass spatial, conversational, embodied, and object-oriented elements. These experiences can be transformed into dynamic and diverse possibilities through variable data points (Cope et al., 2024).

The rise of advanced digital tools significantly enhances our ability to seamlessly shift meanings, which are not limited to language but are also found in objects, bodies, and spaces. These meanings can change from one form to another, such as converting text to sound or images to speech, thanks to sophisticated ontologies and integrated information

systems (Cope et al., 2024). For example, AI makes it easy to convert images into text or text into sound or images (see Chapter 5 in this volume), demonstrating the extensive use of digital transformation in modern communication. This ability highlights the fluid and adaptable nature of meaning-making, driven by data structures that track meanings across various forms of transformation.

Transposition challenges traditional understandings of language and meaning, suggesting that natural languages may become increasingly arbitrary due to machine translation and multimodal digital tools (Cope et al., 2024). In both formal and informal learning contexts, digital devices serve as "cognitive prostheses," extending human perception and meaning-making abilities (Cope & Kalantzis, 2020a; Cope et al., 2024). These devices not only enhance memory retention but also shift the focus of learning toward the critical discernment and effective navigation of meanings mediated by digital tools (Cope & Kalantzis, 2020a). As a result, learners are required to master these cognitive tools to navigate a contemporary landscape of meaning that encompasses everyday language practices as well as academic and technical fields (Cope & Kalantzis, 2020a).

The relationship between translanguaging and transposition offers a strong framework for understanding and navigating the complex process of meaning-making in the digital age. By combining linguistic and multimodal practices, these concepts connect traditional and emerging forms of communication, facilitating more fluid and adaptable interactions in various contexts. As digital technologies continue to develop, they challenge established norms of language and learning, enabling individuals to engage critically and creatively with the meanings conveyed through these mediums. The perspectives of translanguaging and transposition emphasize the transformative potential of digital tools in promoting innovative educational and communicative practices, preparing learners to succeed in an AI-driven world.

The Role of GenAI in Language Education

As AI continues to evolve, its role in language education is expanding, offering unprecedented opportunities to enhance learning experiences while also raising significant challenges. This section explores the multifaceted impact of GenAI on language education, examining its complementary relationship with human intelligence, its innovative affordances, and the ethical considerations it entails. By integrating AI technologies into language learning, educators can leverage advanced tools to foster personalized, inclusive, and culturally responsive environments. At the same time, the rise of AI underscores the need for critical reflection on issues such as accessibility, bias, and the implications for teaching and learning practices. Together, these discussions offer a comprehensive view of the potential and complexities of AI in reshaping the future of language education.

The Complementary Roles of Artificial and Human Intelligence in Language Education

Artificial and human intelligence each play distinct yet complementary roles in modern education. As noted by McCarthy et al. (2006) and Nilsson (2009), AI excels at computational reasoning and problem-solving, while human intelligence is better suited for intuitive and emotional processing. Cope et al. (2021) emphasize that this distinction is especially important in language education, where AI's ability to analyze large amounts of linguistic data might enhance educators' capacity to provide contextual understanding and emotional support.

AI can be conceptualized as a cognitive extension that enhances human intellectual capacities in educational settings. According to Cope et al. (2024) and Cope and Kalantzis (2020a), AI can contribute to language learning by helping students analyze language patterns, creating personalized learning paths, and delivering instant feedback, thereby improving the efficiency and effectiveness of the L2 learning process (see Chapter 1). These innovations might also result in the introduction of novel methodologies in L2 education. Similarly, the Stanford report by Stone et al. (2016) underscores the role of AI in personalizing educational experiences—not as a replacement for teachers but as a tool to enhance teaching practices. This is particularly impactful in translingual education, where AI can adapt to diverse linguistic backgrounds and learning preferences, enriching the overall educational experience. For example, AI-powered language models can simulate realistic conversational scenarios and provide cultural insights, creating a more engaging and immersive environment for learners (Kannan & Munday, 2018; see also Chandel & Lim, 2024 and Chapter 1 in this volume).

As we look to the future, the evolution of AI in education, especially in translingual contexts, might allow for the introduction of systems that are both empathetic and culturally aware. The goal for future AI tools is therefore to not only analyze linguistic structures but also to understand cultural nuances. This change will allow AI to function as more than just technical support; it will become an empathetic educational partner, promoting inclusive, culturally responsive, and effective language learning environments.

GenAI and Its Affordances in Language Education

The integration of GenAI tools into language education has captured significant interest, as it might result in innovative ways to enhance literacy and language performance/proficiency. For instance, recent research on conversational AI has shed light on its promising applications for L2 learning. Conversational AI platforms, including OpenAI's *ChatGPT* and Google's *Gemini*, leverage advanced Natural Language Processing (NLP) technologies to comprehend and effectively respond to user interactions. Yusuf et al. (2024) underscore the manifold advantages of GenAI, highlighting its capacity to

support multilingual learners, facilitate personalized learning experiences, automate assessments, and expand accessibility for diverse student populations.

The results of Law's (2024) comprehensive literature review in this area mirror Yusuf et al.'s (2024) work as it emphasizes GenAI's transformative role in L2 education, particularly its positive impact on writing skills, the development of tailored learning pathways, and the provision of immediate, constructive feedback (see also Chandel & Lim, 2024, and the Introduction to this volume). Together, these insights suggest that GenAI tools can enhance the language learning landscape, making it more engaging and effective for learners of all backgrounds.

A systematic review conducted by Ji et al. (2023) has also demonstrated the effectiveness of conversational AI in L2 learning, identifying its roles as a conversational partner, evaluator, and provider of personalized feedback. The study found that these tools can not only help alleviate foreign language anxiety in L2 learners but can also boost their motivation, engagement, and overall language learning outcomes. However, challenges such as technical issues, topic deviations, and limited emotional responsiveness have been noted, highlighting the necessity for teacher intervention to optimize the use of these tools.

Alshumaimeri and Alshememry (2024), in their review of studies on AI tools for English as a Foreign Language, have expanded on the instructional benefits of AI-powered tools. For example, they have highlighted the affordances of these tools for personalized feedback, the establishment of personalized learning paths, and support for developing oral fluency and literacy skills. However, these scholars have also noted significant limitations such as a lack of interactivity, a restricted vocabulary, and the absence of real-time graded feedback. Despite these challenges, both Ji et al. (2023) and Alshumaimeri and Alshememry (2024) have emphasized the potential of AI to enhance L2 learning experiences through dynamic and adaptive tools.

Recent advancements in GenAI technology, however, have overcome many of the earlier limitations reported in the AI-supported L2 learning literature. Unlike traditional AI, GenAI platforms provide more interactive and contextualized learning experiences. For example, they can simulate real-life conversations, integrate extensive vocabulary databases, and offer real-time feedback (Baidoo-Anu & Ansah, 2023). These features effectively address issues related to interactivity and contextual learning highlighted in previous literature (e.g., Alshumaimeri & Alshememry, 2024; Ji et al., 2023). As a result, educators can now employ GenAI for more effective personalized and immersive language instruction, enhancing student engagement and outcomes (Chandel & Lim, 2024).

A growing body of research, such as the studies previously discussed, highlights the transformative potential of GenAI in language education. GenAI can not only enhance traditional language learning but also support the development of multiliteracies by allowing learners to engage with multimodal and culturally diverse texts (Chandel & Lim, 2024; see also Chapter 1 in this volume). As GenAI tools continue to evolve, their ability to provide personalized

and dynamic learning experiences makes them invaluable resources for both educators and students. This evolution paves the way for a more inclusive and effective approach to L2 education.

GenAI Challenges and Ethical Considerations in Language Education

As shown in the previous section, the integration of GenAI into language education might offer a wealth of opportunities. Nevertheless, it is important to consider that it might also pose significant challenges that demand careful consideration. For instance, it is imperative to acknowledge and address its ethical implications and practical ramifications (see Chapter 1 in this volume). This section examines specific fundamental concerns that require attention moving forward. It is important that the pedagogical strategies and practices developed for language education are informed by these challenges and educators as well as other relevant stakeholders actively engage with them. By doing so, a more effective and responsible framework for utilizing GenAI in the classroom can be created, ultimately enhancing educational experiences while safeguarding the integrity of L2 learning.

One of the primary concerns is the potential threat that GenAI poses to the employment of language educators. The efficiency of AI-driven translation tools may lead some people to underestimate the importance of learning additional languages, thereby fueling arguments against investing in humanities education. This trend reflects a broader movement towards automation, where AI eliminates labor-intensive roles across various industries, including customer service and professional sectors (Eloundou et al., 2023; OECD, 2023). Such shifts raise critical questions about the long-term implications for the L2 teaching profession.

Additionally, the disparities in access to GenAI technologies are a growing cause for concern. The development of LLMs is largely dominated by private corporations. Although there are free versions available, the more sophisticated and powerful iterations are often locked behind paywalls. This trend towards commercialization poses a significant risk of widening the digital divide. Affordability challenges may restrict access to AI tools, particularly for marginalized communities, thereby exacerbating existing social inequities. As a result, the benefits of these advanced technologies may remain out of reach for those who could benefit from them the most (see Chapter 1, page 26).

Another ethical challenge arises from the development and ownership of the datasets used to train AI systems. Unlike earlier technological advancements, such as the internet, which were largely driven by public or academic initiatives, LLMs now depend on private funding and extensive computational resources. These models are trained on data collected from the web, including copyrighted material and content in the public domain, often without obtaining permission. This practice raises significant concerns about the commodification and privatization of linguistic and cultural heritage for profit.

Additionally, the environmental impact of training these models is considerable, with their energy consumption compared to that of heavy industries in the past (see Chapter 1, page 27).

Also crucial is the bias embedded in AI systems, which further complicates their ethical use in L2 education. For example, the training data often reflects outdated ideologies, such as sexism, racism, and homophobia, which necessitates filtering processes. However, these adjustments may introduce new biases that align the AI's outputs with the perspectives of its developers or corporations (Buyl et al., 2024; Hristova et al., 2023). Additionally, the dominance of English and other "high-resource languages" in training datasets results in limited support for less widely spoken languages, leaving many linguistic communities underserved (Nicholas & Bhatia, 2023).

Furthermore, GenAI raises broader issues beyond just bias and access. These include the spread of misinformation or "hallucinations," privacy concerns related to personalized AI tuning, risks of impersonation through voice or facial replication, and a lack of transparency regarding how AI-generated content is created. In educational settings, these challenges are intensified by concerns over academic dishonesty, as it becomes increasingly difficult to distinguish between student-created work and that generated by AI. This ambiguity has heightened fears about the misuse of GenAI tools for cheating, further complicating their role in language education (see Chapter 1, p. 27). In the next section, we consider the pedagogical implications of both GenAI's affordances and limitations.

Innovative Sample Uses of GenAI in L2 Education

GenAI tools offer innovative opportunities to enhance L2 education by combining translanguaging, transposition and multiliteracies and fostering linguistic creativity, multimodal learning, and collaboration:

- **Conversational partners:** Tools like ChatGPT enable learners to engage in low-stakes translingual dialogues, blending native and target languages to co-construct meaning. Educators can leverage these interactions to facilitate discussions on linguistic and cultural dynamics in AI-mediated communication.
- **Visual meaning-making:** AI image generators, such as *DALL-E* (see Chapter 5 in this volume) and *MidJourney*, allow students to create visual representations of idiomatic expressions, proverbs, or newly learned concepts in their target language (Hwang et al., 2023). This might enhance understanding of cultural nuances and aligns with transposition principles, showcasing how meaning shifts across modalities.
- **Collaborative digital projects:** Learners can co-create digital storybooks that integrate text, images, and audio elements (Mesa Morales & Zapata, 2024). AI tools assist in generating content, fostering both linguistic and

digital literacy. These projects encourage collaboration, peer learning, and metacognitive reflection on multimodal practices.

By integrating AI-driven activities, educators can enrich classroom experiences, promoting deeper engagement with linguistic and cultural contexts.

Expanding the Pedagogical Repertoire

To fully leverage the potential of GenAI in promoting translingual and transpositional practices, educators should adopt a broader range of pedagogical approaches. This includes designing activities that make translanguaging and transposition integral parts of L2 learning. For example, teachers can encourage students to reinterpret written texts through multimodal forms, such as creating visual narratives that capture the thematic essence of the original text. These activities not only stimulate creativity but also help learners grasp linguistic and cultural nuances through multimodal meaning-making.

In this context, the role of educators goes beyond traditional teaching methods. Teachers become facilitators who employ AI tools to enhance creative and critical thinking. For instance, educators can use GenAI platforms like ChatGPT to collaborate with students in creating narratives, allowing learners to experiment with different language structures and styles. Similarly, image generators like DALL-E can be used to visualize abstract concepts or cultural themes, which helps to foster deeper engagement and understanding (Hwang et al., 2023; see also Chapter 5 in this volume). By integrating these technologies, educators can create a dynamic learning environment that encourages multimodal exploration and empowers students to use their full range of semiotic resources as well as develop their multiliteracies, all of which might result in their growth as multimodal communicators, including the effective use of their L2.

Additionally, GenAI offers opportunities to address the challenges of low-resource languages by leveraging multilingual LLMs. For example, researchers have shown how LLMs trained on multilingual corpora can support languages with limited textual resources, enabling meaningful learning experiences even in contexts where traditional materials are scarce (see Chapter 1, page 27 for an in-depth discussion of this affordance). These tools can help educators bring underrepresented languages into the classroom, fostering linguistic pluralism and countering "linguistic imperialism" (Phillipson, 1992).

Fostering Digital Literacies

AI literacy has become a crucial element of language education in the era of GenAI. In addition to teaching language skills, educators need to prepare students to critically engage with AI-generated multimodal content. This includes helping learners understand how GenAI tools function, what advantages they

offer, and their limitations (Long & Magerko, 2020; Ng et al., 2021). For example, students should be encouraged to assess the accuracy, cultural relevance, and ethical implications of AI-generated outputs. Furthermore, reflecting critically on the biases inherent in GenAI systems—such as language dominance and cultural stereotypes—can significantly enhance students' digital literacy.

Practical strategies for fostering AI literacy in language education might include assigning tasks where students analyze and critique translations or narratives generated by AI. In these assignments, learners can identify inconsistencies or cultural mismatches and propose revisions that align with contextually appropriate language use. Another effective approach is to train students in prompt engineering, allowing them to optimize AI-generated outputs by experimenting with different input styles to achieve their desired results (Hwang et al., 2023). These practices can not only enhance learners' technical proficiency but also empower them to navigate the complexities of AI-mediated communication with confidence and discernment (Tzirides et al., 2024c).

Implications for Educators and Institutions

The effective integration of GenAI in language education requires ongoing professional development for educators (see Chapters 4, 6, and 7 in this volume). Training programs should focus on helping teachers understand the functionalities and educational applications of GenAI tools while also addressing ethical considerations and potential biases. Institutions need to prioritize equitable access to these technologies, ensuring that all learners, regardless of their socio-economic backgrounds, can benefit from AI-enhanced educational experiences.

Teachers should adopt a reflective and iterative approach when integrating GenAI tools into their instruction. This method involves gathering feedback from learners, assessing the effectiveness of AI-enhanced activities, and refining teaching strategies as necessary. GenAI has the potential to improve language learning by personalizing instruction, providing instant feedback, and supporting learners within their zone of proximal development (Vygotsky, 1978). Educators can utilize AI to create cyber-social learning environments that combine the benefits of human instruction with the computational power of technology. This concept is supported by studies conducted by Cope and Kalantzis (2024), Saini et al. (2024), Tzirides et al. (2024b, 2024c), and Zapata et al. (2024a, 2024b; 2025).

Towards a New Vision of Language Learning

As posited in this chapter as well as in Chapter 1, the integration of GenAI requires a fundamental rethinking of language education, involving a shift from traditional proficiency models to a broader understanding of multiliteracies and multimodal competence. As AI increasingly enables real-time translation

and facilitates cross-linguistic interactions, educators can concentrate on teaching students how to effectively engage with human-machine translanguaging. This approach emphasizes the importance of understanding the relationship between language and multimodal meaning-making in digital environments.

One of the most promising aspects of GenAI is its potential to dismantle linguistic hierarchies by enabling equitable access to multilingual resources. Multilingual LLMs can support low-resource languages, allowing speakers of underrepresented languages to participate fully in global communication. This democratization of linguistic resources can address historical inequities and promote linguistic pluralism, aligning with the vision of reversing "linguistic imperialism" (Phillipson, 1992).

Bridging Multiliteracies and GenAI for Language Education in the Digital Age

The integration of translanguaging and transposition frameworks, augmented by GenAI, marks a pivotal moment in language education. These concepts challenge traditional notions of L2 learning, advocating for a more dynamic, multimodal, and inclusive approach that resonates with the demands of contemporary communication. The synergy of human and artificial intelligence offers unprecedented opportunities to expand pedagogical practices, foster multiliteracies, and prepare learners to navigate the complexities of a digitally interconnected world.

This chapter has focused on how GenAI tools can facilitate multimodal meaning-making and enable learners to transcend linguistic boundaries. By engaging in translingual and transpositional practices, students can develop critical skills to communicate effectively across diverse modalities and cultural contexts. The expanded pedagogical repertoire highlighted in this chapter prepares educators to design learning experiences that embrace creativity, collaboration, and critical engagement, supported by AI-driven insights and scaffolds.

However, these advancements also bring ethical and practical challenges. Issues of equitable access, bias in AI systems, and the potential commodification of linguistic and cultural heritage require careful consideration. Educators, institutions, and policymakers should work collaboratively to ensure that the benefits of GenAI are distributed equitably and that its integration aligns with principles of social justice and inclusivity. By fostering AI literacy among both teachers and learners, the educational community can navigate these challenges while maximizing the potential of AI-enhanced tools.

Looking ahead, the future of language education lies in a balanced integration of human and artificial intelligence. This entails not only leveraging GenAI's capabilities for personalization and multimodal exploration but also cultivating critical awareness of its limitations and ethical implications.

The convergence of translanguaging, transposition, and GenAI in language education offers a transformative vision for teaching and learning in the digital

era. By embracing these innovative frameworks and technologies, educators can create inclusive, adaptive, and engaging learning environments that empower learners to thrive in an increasingly complex and interconnected world. This chapter calls for continued innovation and collaboration in reimagining language education, ensuring it remains a powerful tool for communication, cultural exchange, and social transformation.

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3 Culturally Responsive AI Integration in Language Education

Amelia Ijiri and Sandra Healy

Introduction

The *Learning by Design* (LbyD) instructional framework, developed by Kalantzis and Cope (Kalantzis et al., 2005), reimagines traditional teaching practices by prioritizing a collaborative and reflexive pedagogy. At its core, LbyD emphasizes learners' active engagement with multimodal texts, transforming learning environments into dynamic spaces where students transition from passive consumers to active creators of knowledge (Zapata, 2022). This focus on multimodal engagement is integral to fostering critical thinking and creativity (Kalantzis & Cope, 2010), making it particularly compatible with advanced technologies such as Generative Artificial Intelligence (GenAI).

GenAI enhances these multimodal processes by empowering students to experiment with creative outputs and critically evaluate their work through iterative practices. For instance, instructors can integrate GenAI tools to deepen students' understanding of complex meaning-making processes while encouraging real-world applications (Clark, 2024; see also Chapters 1, 2, and 4 in this volume). Recent studies highlight the growing role of GenAI in higher education (Chiu, 2024; Kurtz et al., 2024). The LbyD framework (Zapata, 2022; Zapata et al., 2023) intersects with essential educational paradigms, such as multimodal learning, experiential learning, and critical thinking, to foster creativity. However, this integration also raises concerns about cultural bias and necessitates a critical evaluation of AI outputs to ensure alignment with diverse cultural contexts.

Despite the promise of GenAI, its role in fostering creativity—particularly through tools like AI-generated images—remains underexplored within the LbyD framework. This gap is specifically pronounced in non-Western educational settings, where culturally responsive teaching methods may require adaptation when incorporating AI-driven creativity tools. Addressing this gap, this chapter investigates how LbyD can foster creativity through AI-generated images, posing the central research question: *How does LbyD align with fostering culturally responsive creativity through AI-generated images in language learning classrooms?*

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The next section reviews existing research on GenAI in educational contexts, followed by a detailed discussion of the study's participants, data collection, and analytical methods. The findings are then presented and discussed, culminating in a conclusion that synthesizes the implications for integrating GenAI into culturally responsive educational frameworks.

Literature Review

Recent studies on the integration of AI in education highlight significant opportunities for enhancing student-centered learning. By leveraging GenAI technologies such as large language models (LLMs), diffusion model images, and video generators, educators can create innovative teaching materials more efficiently, enriching the overall educational experience (Menekse, 2023; see also the Introduction to this volume and Chapters 1 and 2). The rapid evolution of GenAI, driven by advancements in machine learning algorithms and natural language processing, has expanded its applications in education (Kessler, 2018; Wang, 2023; Xiao et al., 2023). Personalized and adaptive learning platforms now cater to individual student needs and learning styles, tailoring content and pacing for optimal outcomes (Al-Abdullatif, 2023; Algabri et al., 2021; Alotaibi & Alshehri, 2023; Bearman et al., 2023; Bond et al., 2024; Zhang et al., 2024).

For instance, through practices like prompt engineering and critical evaluation of AI-generated outputs, students can engage in deeper learning processes that challenge traditional knowledge consumption models (Cain, 2024). Additionally, AI-powered tools can facilitate personalized feedback loops, enabling more targeted, data-driven interventions that enhance academic performance and creative expression (Hida et al., 2020). These feedback mechanisms, supported by real-time data, allow educators to adapt instruction to individual learning trajectories, fostering more responsive and adaptive educational environments (Bond et al., 2024; Zhang et al., 2024). Moreover, Intelligent Tutoring Systems (ITS) provide 24/7 personalized guidance, simulating real-world problem-solving scenarios and enhancing critical thinking skills (Crompton & Burke, 2023).

The role of GenAI in creative work has also gained substantial attention, as AI tools increasingly emulate artistic styles, blending computational scalability with human creativity (Oksanen, 2023; Schmidt, 2023). These tools can foster collaborative creativity by accommodating diverse inputs, enabling students to collectively explore innovative solutions (Creely & Henriksen, 2019). For instance, Avci (2024) found that individuals with a creative mindset excel in leveraging AI tools to generate novel ideas, embrace innovations, and approach problem-solving flexibly. This adaptability is critical for pushing the boundaries of GenAI, as creative thinkers readily identify opportunities for innovation and AI advancement. Vinchon et al. (2023) support this by emphasizing that AI mimics human creativity by generating new content from pre-existing data, mirroring the human capacity to reshape knowledge based on experience (see also Gruber, 1981; Hanchett Hanson et al., 2021; Weisberg, 2006).

The convergence of AI and human creativity thus introduces a new era of assisted creativity. Recent studies (e.g., Organisciak et al., 2022; Vinchon et al., 2023) suggest that AI could play a pivotal role in offering feedback on human-generated creative content, providing a platform for enhanced creative development and reflection. Glăveanu et al. (2019) argue that creativity is not merely an individual pursuit, but a socio-cultural process influenced by collective traditions and contemporary dynamics. This perspective aligns with culturally responsive approaches, where GenAI leverages vast databases to generate content that reflects evolving notions of creativity. Such insights are particularly relevant when embedding GenAI into frameworks like LbyD, which emphasize cultural nuance and contextual adaptability.

This theoretical foundation informs this study's focus on the integration of GenAI within culturally nuanced pedagogical frameworks, particularly in contexts like Japan. That is, while Western perspectives usually prioritize innovation and the creation of new works, focusing on the final product, Japanese perspectives emphasize the process over the product, focusing on thinking and problem-solving rather than merely producing new ideas. This approach, grounded in Mizuno and Xu's (2022) work, values the cognitive journey and methods involved in reaching creative outcomes. Tradition is significant, and replicating and adapting existing works is considered important. Emotional connection is also linked to creativity in Japan, where students emphasize art's impact on viewers. Cultural norms and social harmony are integral, with the concept of *joushiki* (common sense) highlighting adherence to cultural norms and harmony. The similar pronunciation of "creativity" (創造性) (*sōzōsei*) and "imagination" (想像力) (*sōzōryoku*) in Japanese suggests a deeper integration of imaginative thinking within the creative process compared to Western perspectives.

Mizuno and Xu (2022) thus provide a critical lens for understanding how Japanese students approach creativity, emphasizing the balance between tradition and modernity. These insights shaped this work's methodology, particularly when examining the ways in which student artifacts and reflections reveal this interplay. In this context, creativity is seen in the process of refining or reinterpreting what already exists rather than focusing solely on producing something entirely original.

Building on these works, this chapter explores the pedagogical implications of integrating GenAI into creative curricula, focusing on how students negotiate originality and ownership in AI-assisted compositions. To examine these dynamics, the next section outlines the methodology employed in this study, detailing the participants, data collection methods, and analytical procedures used to investigate these questions.

Methodology

Educational Context

This study was conducted at a national institution of higher education in Japan, specializing in science, technology, engineering, art, and mathematics

(STEAM) education. The participants were enrolled in English language courses, each meeting weekly for fifteen mandatory 90-minute sessions over one semester. The curriculum adopted a blended learning approach, integrating digital literacy and creativity into English language instruction. Guided by constructivist learning theory, the classes employed problem-based and inquiry-based methodologies, framed within LbyD (Cope & Kalantzis, 2009, 2015; Zapata, 2022) to engage students in its knowledge processes: *experiencing*, *conceptualizing*, *analyzing*, and *applying* (see Chapter 1 in this volume). GenAI tools were incorporated to support creative tasks, facilitate multimodal outputs, and promote critical reflection. For example, students completed classroom tasks that required them to reflect on their connections with and use of technology as well as their professional future (*Future Me* task), focusing on possible scenarios based on their lifeworlds, lived experiences, and specializations. These reflections were multimodal, involving the use of text, image, and other meaning forms, and allowed learners to express their creativity, both with and without GenAI support.

Participants

The study involved 64 first-year university students, aged 18–19, from four English language classes. Seventy percent of the participants were male, and thirty percent were female. English proficiency was assessed using the Computerized Assessment System for English Communication Test (CASEC, n.d.), with scores ranging from 400 to 951, corresponding to levels from pre-intermediate to advanced. The students participated during the summer semester of 2023 as part of a requirement to fulfill their foreign language credits.

The research team consisted of two individuals referred to as Teacher/Researcher 1 (TR1) and Teacher/Researcher 2 (TR2), who were also participants in the study. Both Western females residing in Japan, they collectively bring 44 years of teaching experience at secondary and tertiary levels. TR1 specializes in working with minoritized populations, digital literacy, and intercultural communication, while TR2 focuses on instructional technologies and has expertise in Japanese art.

Research Design

The study employed a grounded theory design, following Charmaz's (2014) guidelines. This design was selected for its flexibility in enabling the organic identification of themes, a critical aspect for capturing the study's cross-cultural dimensions. This approach also allowed for the exploration of both anticipated and unexpected outcomes. To enhance validity, the researchers employed continuous reflexivity and triangulation to minimize bias and ensure a balanced interpretation of the data.

The data collection combined quantitative and qualitative methods to provide a comprehensive analysis of how students and teachers navigated

creativity, digital literacy, and GenAI integration in the classroom. In this chapter, we focus solely on the qualitative data collected.

Data Collection

Data collection spanned five weeks, using multiple instruments to gather a range of insights. The qualitative data sources consisted of the following:

- **Student artifacts:** Each week, students created hand-drawn and AI-generated images. A total of 38 hand-drawn and 47 AI-generated images were systematically organized and stored in Google Slides for structured analysis.
- **Learning reflection journals:** Students completed weekly take-home reflections via Google Forms, responding to open-ended prompts about creativity and their experiences with GenAI. These journals provided insights into their creative processes and digital literacy development, achieving an 80% completion rate.
- **Teacher autoethnographic documentation:** Researchers maintained semi-structured reflective journals, documenting daily class observations, teaching challenges, student engagement, and pedagogical adjustments. Entries were recorded in Google Docs and informed instructional refinements.

Data Analysis

Following Charmaz's (2014) guidelines, the study adopted a systematic approach to data analysis, combining human insight with AI tools. The process unfolded in three stages:

1 Preliminary analysis: Using MAXQDA 14 Analytics Pro and ChatGPT 4.0, initial coding patterns were identified. Human researchers reviewed and refined AI-suggested patterns, documenting emerging themes through digital memoing.
2 Data-driven analysis: MAXQDA 14 Analytics Pro facilitated coding and cross-referencing of data from student artifacts, reflection journals, and autoethnographic documentation. This analysis yielded culturally relevant themes.
3 Theme refinement and validation: From 90 preliminary codes, six primary socio-cultural themes were identified and validated through peer review and triangulation. Comparative analysis with existing literature, particularly Mizuno and Xu's (2022) work on creativity, contextualized the findings.

To ensure methodological rigor, reflexivity was documented throughout all phases, employing digital memoing and constant comparison across data sources. Themes were verified by multiple coders, both human and AI, enhancing the reliability and cultural relevance of the study's findings. In the next section of the paper, we present the findings resulting from this analysis.

Results

The findings resulting from the qualitative analysis provided rich insights into how the LbyD framework, supported by GenAI, fostered creativity, cultural engagement, and digital literacy among students. These results are synthesized in the next three sections, from teacher reflections, student learning journals, and creative artifacts. The presentation of results is organized into major themes to highlight the nuanced ways in which creativity and cultural integration were influenced by the study's interventions.

Themes from Teacher Reflections

The teachers' reflections showcased how student creativity in the tasks that were part of the Japanese classrooms of focus appeared to have been fostered through an interplay of cultural values, emotional engagement, and iterative design. The LbyD framework, combined with GenAI tools, seemed to have allowed for the establishment of an instructional environment where students could explore their creative potential through both traditional and modern lenses. While students often found deeper emotional resonance in handmade, culturally grounded creations, the presence of GenAI provided a structured yet flexible space for creative dialogue and iterative learning. This balance between tradition and technological innovation is critical for fostering creativity in culturally diverse learning settings, highlighting how LbyD and GenAI together support student-centered creative development.

Overall, the analysis of teachers' reflections revealed that LbyD, in tandem with GenAI, encouraged creativity by promoting iterative learning, emotional engagement, and the integration of cultural traditions. Additionally, both teachers' diaries offered valuable insights into the complex and culturally nuanced understanding of creativity in Japanese education. These reflections highlighted the importance of process, tradition, emotional connection, cultural norms, and imagination in fostering creativity among students. Specific themes revealing these insights are presented as follows.

Process vs. Product

Creativity emerged as process-focused rather than product-oriented, aligning with LbyD's iterative learning cycles. TR1 observed that students were deeply engaged in dissecting their creative processes, valuing the journey over the outcome. For instance, she noted that "Class A did an amazing job analyzing their work and their process. They showed great interest in the topic—discussing it at length," which suggests that students embraced the iterative nature of creativity, engaging in meaningful dialogue about their multimodal work. This observation also points to the connection between creativity and reflection. In this context, GenAI acted as a co-designer helping students explore different aspects of their creative process by providing feedback and generating new ideas, thus supporting the reflection and iteration central to LbyD.

Role of Tradition

The reflections revealed how Japanese students integrated traditional practices into their creative processes, often valuing adaptation and replication over complete novelty. For instance, TR1 observed that students practicing traditional Japanese arts such as *kendo* and the tea ceremony viewed adaptation and copying as part of creativity. TR1 also noted discussions on topics like sampling in hip hop, where students debated the boundaries between creativity and copying, reflecting on the Japanese concept of *onkochishin*, which refers to learning from the old to create the new. These ideas can be seen in this reflection:

> "We had a very long and interesting [discussion] about the connections between different art forms, for example, music and literature and painting and fashion. The students discussed where the line could be drawn between creativity and copying. They talked about the importance of repetition and mastery in Japanese art forms, bringing up examples of their own experiences at school and in their hobbies."
>
> (TR1)

GenAI contributed to these discussions by offering new perspectives on traditional themes, allowing students to reimagine them in novel ways—such as the example of a "dystopian salaryman." This integration of tradition and innovation underscores the potential of GenAI to bridge cultural heritage and contemporary creative practices within the LbyD framework.

Emotional Connection

The theme of emotional connection in creativity appears repeatedly in both teachers' reflections. For instance, TR1 observed that particularly students with higher level of English proficiency enjoyed bouncing ideas with peers and AI tools, which seemed to enhance their emotional engagement within the learning process. TR2 also noted that creativity for Japanese students is closely tied to emotional expression and the ability to evoke feelings, as evinced in their presentations and creative assignments. Learners' use of GenAI as a "creative partner" suggests that it can function as a catalyst for emotional engagement by offering students a platform to experiment with ideas in an interactive, dynamic way, thus fostering deeper creative exploration.

Cultural Norms and Social Harmony

The teachers' diaries also revealed how cultural norms seemed to have shaped students' creativity, with many adhering to "inside the box" thinking while still exploring variations. This theme connects with LbyD's principle of designing experiences that respect students' cultural contexts while encouraging exploration.

An example of culture permeating students' work was reported by TR2. In one of her classes, focused on improving university life, TR2 recorded that three out of five groups had proposed adding lockers to benefit all students' daily university life. This example reflects learners' collective orientation and the concept of social harmony central to Japanese cultural (*joushiki* [common sense]). When reflecting on this classroom instance, TR2 noted that "despite the freedom given, students gravitated towards practical ideas, suggesting a cultural tendency to stay within familiar boundaries." In this educational context, GenAI's role was to propose a range of possibilities challenging these norms, allowing students to consider alternatives while still operating within familiar cultural frameworks. This highlights how GenAI can gently nudge students toward more innovative ideas without disconnecting them from their cultural values.

Integration of Imagination and Creativity

The reflections pointed to the identical pronunciation of "creativity" and "imagination" in Japanese, to highlight the cultural overlap and deeper integration of imaginative thinking within creativity. For example, both teachers noted that students often incorporated imaginative elements, like envisioning future selves in AI-generated scenarios. TR1 reported that, relying on GenAI, "Class A loved the idea of creating using the same story and creating vastly different styles like a *noh* play or a children's story from the same source." This suggests GenAI served as a springboard for students' imaginative endeavors, helping students visualize various possibilities and thus encouraging creative expression in line with the LbyD approach.

Themes from Students' Weekly Learning Journals

The analysis of students' weekly learning journal (WLJ) data revealed three key themes regarding creativity in Japan. Each theme is presented below in separate sections.

Definitions of Creativity

The students' learning journals provided insights into their perceptions of creativity across various domains. Students offered diverse definitions of creativity, reflecting both traditional Western perspectives and more nuanced Japanese views. For instance, one student described creativity as "the ability to generate new ideas, concepts, and solutions, introducing unique perspectives beyond conventional frameworks." Another felt that "creativity means coming up with new things. New does not mean something that does not yet exist in the world, but something new to the person," reflecting a more Japanese perspective on originality. The definitions offered by learners appeared to be influenced by cultural and environmental factors, shaped by individual experiences and contexts. For example, one student observed that "creativity is related to

individuality because it grows from experience. Everyone has different experiences, influencing their creativity," while another added, "to develop creativity, it's necessary to learn from the past and various ideas." These perspectives reflected aspects of learners' cultural identity, and they also highlighted the tension between tradition and innovation.

Functions of Creativity

Students also described creativity as a means of personal expression, enabling them to convey emotions and lived experiences as well as aspects of their identities. For instance, one student felt that "creativity is the act of reflecting one's thoughts and emotions onto objects such as paintings, items, or words," while another learner believed that "creativity is using your imagination to create something new. It doesn't always mean you're artistic or unique, but original." Technology also appeared to play a significant role in students' understanding of creativity. For example, some learners viewed AI as a collaborative partner in creative endeavors: "Even if created using AI tools, as long as new value is created, it can be said to be a creation."

Additionally, some students seemed to see creativity as essential for problem-solving and innovation, in line with the Western perspective, as evident in this quote "creativity is the ability to generate novel and valuable ideas by connecting disparate concepts uniquely." Another participant emphasized the concept's broad application, stating that "creativity is important in all fields. Generating creative ideas leads to innovation and brings new value to society." Also, as one student noted, "Creativity only works when you use your own brain to come up with the idea or your own hands to create it."

When considering the range of these definitions, we can see the diversity present among students. Additionally, the learners' reflections suggest that GenAI can foster autonomy by allowing students to refine ideas and incorporate AI suggestions into their creative work.

Cultural Influences

Students felt that creativity requires courage and risk-taking. One student remarked, "creativity involves taking risks and being open to failure." Another elaborated, "creativity is about making connections, transforming the mundane into the extraordinary. It requires courage to embrace vulnerability and the unknown." Japanese culture influences creativity and problem-solving, emphasizing subtlety and feeling over direct expression. This foundation supports a balance between self-expression and traditional values, shaping how individuals express creativity. As one student reflected, "Japanese culture doesn't express things clearly. I believe it is a culture that makes you feel. I try to express myself while keeping the Japanese cultural aspect."

Also, the collectivist nature of Japanese culture prioritizes group harmony and decision-making, fostering collaboration where the diversity of ideas may

lead to innovative solutions, but potentially suppressing individual creativity in the Western perspective of this concept. One student explained, "Japanese people like to do things in a group, allowing multiple perspectives for understandable Japanese educational and cultural practices promote meticulousness and a synthesis of traditional and modern methodologies, fostering teamwork and precision." As one student noted, "Japanese culture encourages working together to solve problems, teaching reliance on others." Another learner observed, "Japanese culture values accuracy and responsiveness, influencing problem-solving skills."

Other important manifestations of Japanese popular culture that significantly shape creative thinking and problem-solving are anime and manga. These media offer diverse scenarios that stimulate creativity. As one student stated, " "Anime expands viewers' creativity and fosters innovative ideas."

Considered as a whole, these quotes illustrate how Japanese culture impacts creativity and problem-solving, shaping approaches to challenges through collectivism, tradition, media, and multicultural exposure.

When considering the role of GenAI in connection with this theme, it appears that this tool acted as a collaborative partner, and it seemed to have aided students in exploring creative possibilities while maintaining cultural cohesion.

Results from the Analysis of Student Artifacts

The hand-drawn images (Figures 3.1 and 3.2) were created over the semester, with students visualizing data they collected and explaining their drawings to classmates. The images showcase distinct creativity through intricate details and personalized styles. Each drawing captured unique perspectives, incorporating elements like abstraction, for example, to represent everyday interactions with technology graphically. The integration of various elements highlights meaningful connections, while the visual appeal ranges from simple sketches to detailed, colorful designs, reflecting individual artistic abilities. Because these drawings reflected personal interests and experiences, they were both relatable and immersive.

In contrast, AI-generated images, although polished and visually striking, offered a different form of creativity, often lacking the human emotion present in hand-drawn works. These images depicted imaginative scenarios, such as a futuristic scene featuring a Japanese woman on the moon accompanied by cats that stood out for their high aesthetic quality and professional appearance (Figure 3.3). However, while these images conveyed intended messages, they often missed the nuanced explanations of hand-drawn annotations and might not resonate personally, due to the lack of context specific to the creator's experiences. AI-generated images also often focused on students' future roles in Japanese work culture (Figure 3.4), even when they were prompted to imagine scenarios beyond current norms, such as visualizing places, activities, or jobs that do not yet exist.

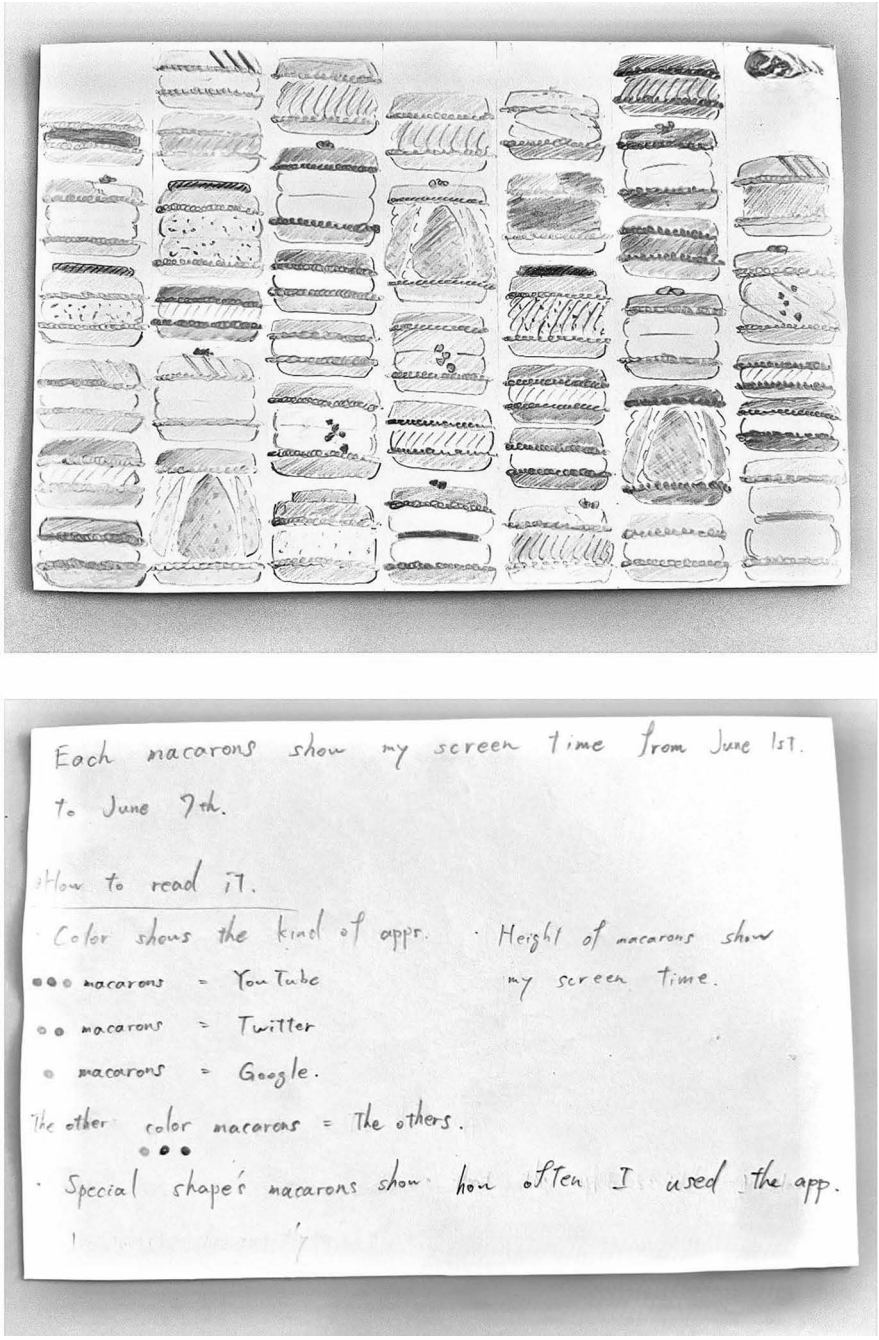

Figure 3.1 Hand-drawn visualization of screen time analysis using macarons

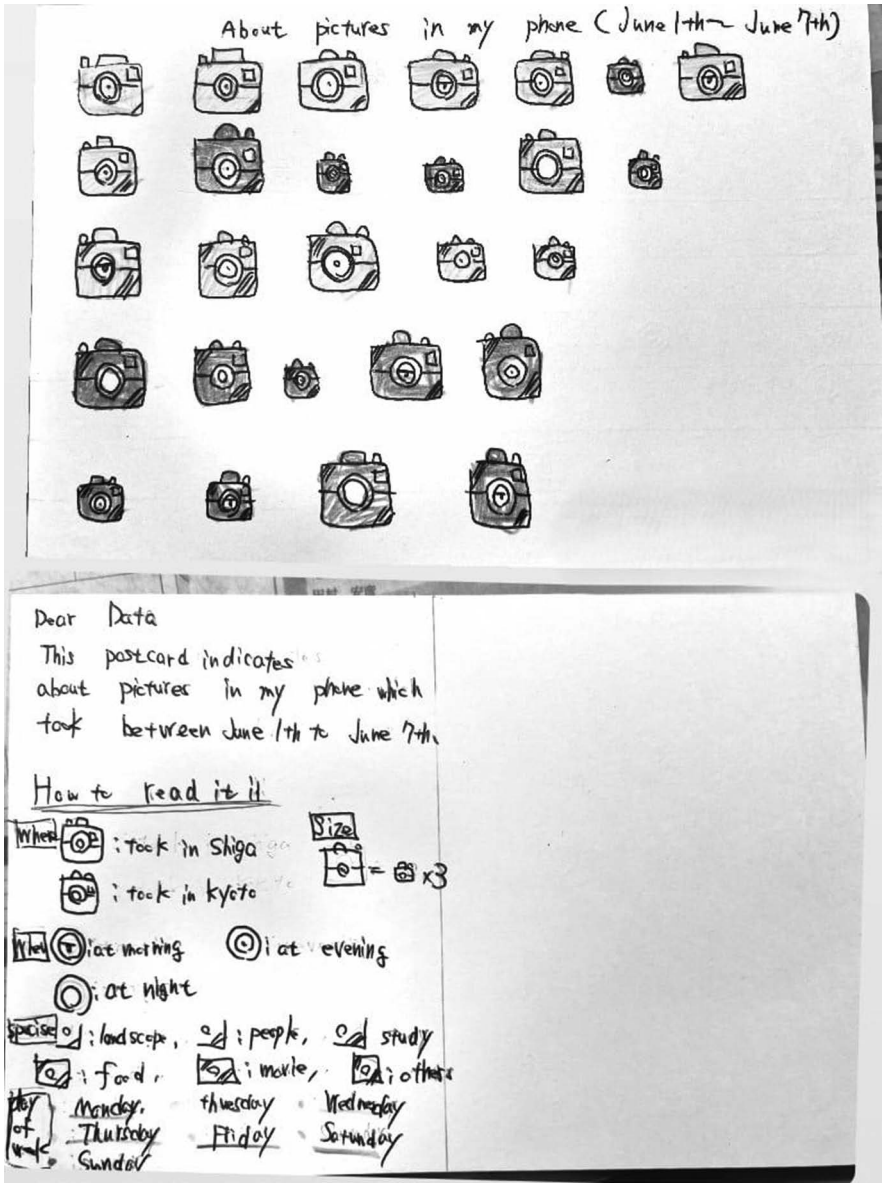

Figure 3.2 Example of students' hand-drawn images

Figure note: This figure shows a student's hand-drawn visualization relying on camera icons to represent photos taken on a phone. The icon's colors, sizes, and positions convey metadata, such as the time and location the photos were taken. The visual elements are accompanied by a key explaining the symbols used. This image showcases the artist's phone usage during a specific time frame.

Figure 3.3 AI's rendering of a cosmic kimono woman with cats for the "Future Me" student assignment

Figure note: This image was created using the DreamStudio AI platform by Stable Diffusion.

Hand-drawn images often aligned with *joushiki* by respecting cultural norms and collective experiences, while AI-generated images, though more innovative, might not align as closely due to the absence of personal and cultural context. For instance, AI prompts that included references to Japanese culture frequently generated stereotypical images (Figure 3.3), such as a woman in a kimono or a conservative predominantly male work environment (Figure 3.4). This may reflect GenAI's limitations in nuance and possible biases within the training models. However, when students re-prompted with more creative or fantastical scenarios, AI-generated images had the potential to challenge traditional norms by introducing unconventional concepts. This illustrates the ongoing tension between tradition and modern innovation in creative expression. Overall, *joushiki* shapes creativity in Japan by promoting a balance

Figure 3.4 Example of stereotypical GenAI-generated image. This image was generated for the "Future Me" student assignment

Figure note: This image was created using the DreamStudio AI platform by Stable Diffusion.

between individual expression and collective harmony, influencing both traditional and modern forms of artistic expression.

The analysis of students' artifacts underscores how the LbyD framework, together with GenAI, might cultivate a unique fusion of cultural sensitivity and creative expression in Japanese classrooms. By supporting both personal and collective engagement in digital and traditional creative practices, this approach demonstrates the potential for culturally resonant innovation. In the following discussion, we explore the broader implications of these findings, considering their impact on creativity and pedagogy in culturally diverse educational settings.

Discussion

This study examined the integration of the LbyD framework and GenAI to foster culturally responsive creativity in Japanese university classrooms. The findings underscore the importance of aligning educational practices with

cultural values, particularly in contexts where students balance independence with collective harmony (Sugimoto, 2010). The teacher reflections, student WLJ, and student artifacts show how the LbyD framework works in university classrooms by highlighting personal and cultural experiences. Students were encouraged to integrate their personal backgrounds into their educational activities. And the WLJs revealed how cultural contexts shaped their evolving perceptions of creativity. The teacher reflections further highlighted the process-focused nature of creativity, emphasizing learner engagement and emotional connections.

The cultural values of *joushiki* and *onkochishin* appeared to have played a pivotal role in shaping students' creative processes. The iterative, multimodal approach of the LbyD framework allowed learners to incorporate these values into their work, fostering a sense of cultural authenticity. By enabling independent exploration while supporting meaningful group contributions, LbyD aligns pedagogical practices with cultural norms, promoting personalized and culturally relevant learning experiences.

GenAI emerged as a dual-faceted tool in supporting creativity. For instance, it provided opportunities for students to visualize abstract concepts and express themselves in ways that complemented their linguistic development. By encouraging experimentation and refinement, GenAI supported the Japanese cultural value of *onkochishin*, allowing learners to innovate within established cultural boundaries. Moreover, its role in collaborative projects aligns with Bond et al.'s (2024) findings on GenAI's capacity to scaffold students' independent exploration while enabling group contributions. Despite these advantages, learners also reported that AI-generated images often lacked the subtlety and emotional resonance inherent in hand-drawn work, reflecting the limitations of current GenAI tools in capturing nuanced cultural and emotional depth. These challenges underscore the importance of developing culturally adaptive AI tools capable of producing meaningful and contextually rich content.

The ethical implications of integrating GenAI in education further illuminate the need for culturally sensitive tools. McStay's (2021) concept of *kokoro* (heart) emphasizes the importance of embedding emotional and cultural responsiveness into AI. Incorporating ethical principles such as community, wholeness, sincerity, and sensitivity into AI tools could help balance individual creativity with collective harmony, aligning with Japan's communal values. Such developments would enhance the potential of AI to support both personal growth and cultural heritage, fostering meaningful creative expression within the LbyD framework.

The integration of LbyD and GenAI also revealed challenges related to achieving cultural and emotional depth in creative outputs. While students appreciated GenAI for its utility in developing prompt engineering skills and visualizing abstract ideas, the inability of AI-generated content to replicate the emotional and cultural richness of hand-drawn artifacts was a recurring limitation. This was particularly evident in tasks requiring students to create

culturally resonant videos or music. Addressing these challenges will require the development of AI tools that can bridge the gap between traditional cultural norms and modern technological capabilities.

Insights from teacher reflections and student journals further highlight the significance of cultural norms, emotional engagement, and iterative processes in shaping creativity. WLJs demonstrated how students' cultural contexts seemed to have influenced their perceptions of creativity, while teacher reflections emphasized the importance of a process-focused approach that prioritized emotional connections and engagement. Additionally, both hand-drawn and AI-generated artifacts showcased how emerging technologies can interact with human-centered art forms, fostering an environment that promotes creativity, critical thinking, and cultural sensitivity.

The findings also carry significant implications for instructional design. The observed correlation between English proficiency and creative potential (De Prada et al., 2020) suggests that language instruction should simultaneously support linguistic and creative development. Furthermore, the preference for independent work over collaboration witnessed in some students points to the need for strategies that emphasize teamwork and leadership development. GenAI, with its ability to facilitate collaborative projects and provide scaffolded feedback, represents a promising avenue for addressing these needs, particularly in digital environments.

In sum, this study's findings contribute to the growing body of research on AI-assisted education by demonstrating how the integration of the LbyD framework and GenAI can foster culturally responsive creativity in Japanese classrooms. By aligning pedagogical practices with cultural values, the LbyD framework supports personalized and culturally relevant learning experiences. GenAI complements this framework by providing tools for visualizing abstract concepts and scaffolding creative processes. However, its limitations in capturing nuanced cultural and emotional depth highlight the need for further development of culturally adaptive AI tools.

Limitations and Future Research

This study has limitations that may influence the scope of its findings. First, the research is culturally specific, focusing exclusively on Japanese university students within a national university setting. While the insights gained are valuable for understanding creativity within this context, the findings may not be directly applicable to other cultural or educational settings. Expanding the scope to include diverse cultural contexts could provide a more comprehensive understanding of how the LbyD framework and GenAI function across varied learning environments.

The sample size of 64 students, with a gender distribution of 70% male and 30% female, presents another limitation. This demographic imbalance may not fully represent the broader Japanese student population, potentially affecting the study's representativeness and the diversity of perspectives included in the

analysis. A larger and more gender-balanced sample would enhance the robustness and generalizability of future findings.

Additionally, the qualitative nature of the study introduces a degree of subjectivity. The researchers' interpretations of teacher reflections, student journals, and creative artifacts inevitably shaped the analysis. While qualitative methods provide rich insights, the inherent subjectivity underscores the need for triangulation with other data sources to validate findings.

Another limitation lies in the capabilities of current GenAI tools. As noted in the findings, AI-generated content often lacks the cultural nuance and emotional resonance necessary for meaningful creative expression. This limitation affects the depth and authenticity of students' creative outputs, which may influence their engagement and satisfaction with creative tasks. Further research is needed to address these technical shortcomings, exploring ways to enhance the cultural and emotional depth of AI-generated content.

Despite these limitations, the study offers valuable insights into the intersection of culture, creativity, and technology in education. To build on this foundation, future research could explore the integration of GenAI and the LbyD framework across diverse cultural and educational contexts. Investigating how GenAI tools can be adapted to reflect and respect different cultural traditions would be instrumental in ensuring their relevance and authenticity. Such adaptations could enrich the cultural resonance of AI-generated content, supporting more meaningful creative expression across various settings.

Furthermore, enhancing the emotional depth of AI-generated content might represent a critical area for innovation. Techniques such as incorporating culturally specific design elements, improving contextual understanding, and leveraging multimodal inputs could enable GenAI to produce more engaging and emotionally resonant outputs. These improvements would help align AI tools with students' cultural and personal identities, fostering deeper engagement in creative tasks.

Addressing these limitations and exploring these areas of future research will refine the use of GenAI grounded in the LbyD framework in education. As technology continues to evolve, striking a balance among tradition, innovation, and creative exploration will be essential in preparing students to thrive in an interconnected, AI-enhanced world.

Conclusion

This study demonstrates how the integration of LbyD and GenAI can effectively support creativity, critical thinking, and cultural engagement in language education. By placing students' personal and cultural contexts at the heart of the learning process, the LbyD framework fosters a dynamic environment that blends tradition with innovation. The findings reveal that creativity in Japanese classrooms is deeply influenced by cultural values such as *joushiki* (social norms), emotional engagement, and a process-oriented mindset, where the creative journey is prioritized over the final product.

GenAI serves as a pivotal tool in this ecosystem, providing students with opportunities for creative experimentation and multimodal expression. Its ability to support iterative processes aligns well with the LbyD framework, enabling students to explore, refine, and expand their creative ideas. However, challenges remain in ensuring that AI-generated content reflects cultural sensitivity and emotional resonance, both critical for meaningful engagement in culturally diverse contexts.

The study highlights a strong connection between digital literacy and creativity, emphasizing the importance of equipping students with technological skills to enhance both individual expression and collaborative learning. These findings provide valuable insights into how LbyD and GenAI can be adapted to support culturally responsive education in non-Western contexts.

Future research should further explore the cultural adaptability of GenAI, focusing on its potential to enrich cultural authenticity and emotional depth in creative outputs. By addressing these areas, educational technologies can better align with diverse learner needs, ensuring a balance between innovation and cultural heritage. This approach will not only enhance creativity and critical thinking in the classroom but also prepare students to navigate the complexities of an increasingly interconnected and AI-driven world.

Authors' Note

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- GenAI use in this chapter: The participants in this work generated the images presented in Figures 3.3 and 3.4 as part of the pedagogical tasks they needed to complete in their L2 classes. The employment of GenAI was supervised by the authors of this work. The inclusion of the images adheres to the tool's, *Dream Studio AI*, sharing and publication policies.

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4 Teacher Agency in Response to the Emergence of Generative AI

A Scaffolded Writing Project within the Multiliteracies Framework

Hala Sun

Introduction

The emergence of generative AI (GenAI), particularly the release of OpenAI's ChatGPT in November 2022 and its record-breaking uptake (Jurenka et al., 2024), appears to have disrupted traditional practices in education, presenting both opportunities and challenges for educators. In English language teaching, the impact seems to have been immediate and significant, as teachers are faced with urgent demands to adapt their curricula and assessments to navigate this new reality (Le-Khanh et al., 2024). I experienced this firsthand during the Fall 2022 semester teaching English as a Second Language (ESL)/multilingual college students. In a routine end-of-semester activity, I asked students to give group presentations summarizing "what is considered good writing" in their disciplines based on what they had learned throughout the semester. To my surprise, several groups presented nearly identical bullet-point lists that appeared to have been generated by ChatGPT. As an educator, this moment served as a wake-up call—the technological landscape had shifted, and I needed to reevaluate how I was preparing students for writing in a world increasingly shaped by GenAI.

This realization reflected a broader uncertainty among educators about how to navigate the rapidly evolving capabilities of ChatGPT and similar tools. Questions about what these technologies could and could not do, their implications for originality and authorship, and their role in fostering or hindering learning created an urgent need for action. Like many educators, I had to re-examine my curriculum, which I had been teaching for over five years, and redesign it to respond to this new landscape, while addressing students' anxieties and misconceptions about GenAI-assisted writing.

During times of crisis or significant disruption, the concept of teacher agency often becomes a vital lens for understanding how educators adapt to new challenges. Defined as the capacity of teachers to make decisions and enact changes in their practice, teacher agency is frequently invoked in response to moments of uncertainty and change (Zhai, 2024). This was true in my case as well. Faced with the rapid prevalence of GenAI tools in educational contexts, I had to take agency to critically redesign my curriculum and

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assessments, ensuring they remained relevant and rigorous while fostering my students' ethical and reflective engagement with GenAI technologies. This process required reimagining my role as an instructor—not as a gatekeeper of traditional literacy practices, but as a guide helping students navigate the complexities of writing in a GenAI-mediated world.

In this chapter, I share my experiences redesigning my writing curriculum to address the challenges and opportunities introduced by GenAI tools like ChatGPT. I focus on a pedagogical intervention I titled *AI-Genre Exploration Writing Project*, a scaffolded learning initiative designed to help my students critically engage with AI-generated texts, explore genre conventions, and reflect on the societal and ethical implications of GenAI. The chapter begins with an overview of the project, including its rationale, structure, and the ways scaffolding was used to support students' learning. Next, I examine how the project aligns with the multiliteracies framework (New London Group, 1996), particularly its emphasis on *situated practice*, *overt instruction*, *critical framing*, and *transformed practice*. Finally, I discuss the outcomes of this approach, drawing on student reflections to illustrate their growth in critical thinking, digital literacy, and ethical awareness. My aim is to provide insights into how educators can adapt their practices to prepare students for writing in a rapidly evolving, AI-mediated world.

Expanding Genre Exploration

Traditionally, my writing curriculum began with students exploring genre as a foundational step in academic writing, focusing on understanding the conventions and purposes of traditional texts, such as news articles and academic journals. However, the rise of GenAI presented an opportunity to broaden this exploration to include what might be considered "modern genres." Hyland (2004) identifies modern genres as encompassing "films, music, and computer games" (p. 1), highlighting how communication evolves in response to societal and technological shifts. Building on this idea, Cope and Kalantzis (2023) emphasize the multimodal nature of contemporary genres, which integrate visual, auditory, and digital elements. Additionally, Martin (2001) underscores the social dimension of genres as "a staged, goal-oriented, purposeful activity in which speakers engage as members of [a] culture" (p. 155). This perspective positions genres not merely as textual artifacts but as tools for participation in diverse discourse communities. To facilitate this participation, Paltridge (2006) advocates for explicit instruction to help learners navigate the conventions and expectations of various genres.

Synthesizing these definitions, I frame genre as a dynamic and purposeful tool for language learning, one that guides students to notice, engage with, and produce texts tailored to specific contexts. With the advent of GenAI, I recognized the need to adapt this concept further, challenging students to analyze not only traditional and modern texts (e.g., social media posts,

video content) but also the unique input and output generated by AI tools. This shift could encourage students to critically engage with the communicative strategies embedded within GenAI, such as the conversational tone of ChatGPT or the structured format of summaries and lists. By expanding their exploration to include these AI-mediated contexts, students could therefore deepen their understanding of genre conventions and the multimodal, digital nature of modern communication. This approach could not only demystify the capabilities of GenAI but also prepare students to critically and ethically engage with emerging technologies in their writing practices.

Scaffolding as a Framework for Learning

In addition to expanding the concept of genre, I redesigned my curriculum to adopt a scaffolded approach to teaching and assessment. Scaffolding, as defined by van Lier (1996), provides learners with temporary support that enables them to perform tasks they would otherwise find challenging. This support is gradually withdrawn as learners develop independence. Walqui and van Lier (2010) describe scaffolding as a dynamic process, in which "good scaffolding involves constant assessment and adjustment of support, as well as providing opportunities for learners to gradually take more control over their learning" (p. 5). This approach proved particularly effective for my students, especially in the context of GenAI. ESL learners often face heightened anxiety when tasked with producing long, structured essays, a challenge compounded by their unfamiliarity with new writing formats, such as research papers or theses, and by past experiences with overly critical feedback (The Writing Center at UNC-Chapel Hill, n.d.).

Recognizing the rapid adoption of GenAI tools, I transformed my traditional genre exploration project into the *AI-Genre Exploration Writing Project* (hereafter referred to as the *Writing Project*; see Appendix 4A). The primary goal of this project was to provide students with opportunities to directly engage with GenAI tools, exploring the textual genres these tools produce and require, as well as the practices necessary to become literate in using them. Additionally, the project encouraged students to examine the affordances and limitations of these technologies, consider their ethical implications, and develop their digital literacy skills.

By breaking the project into smaller, manageable tasks, I sought to reduce students' anxiety and create a learning environment that prioritized critical analysis and reflective practice. For example, initial tasks focused on identifying and analyzing the genre conventions of GenAI-generated texts, which allowed students to build foundational knowledge before advancing to more complex critiques of these technologies. This incremental design enabled students to see writing as an iterative process rather than a high-stakes activity. Their end-of-semester metacognitive reflections highlighted the effectiveness of this model: Many students reported feeling more confident in their ability to approach writing thoughtfully and independently. Furthermore, the scaffolded

structure minimized reliance on GenAI for generating entire texts, instead fostering learners' growth as critical and ethical writers in a world increasingly shaped by AI. More details about the project are provided in the "Overview of the Writing Project" section.

The Pedagogy of Multiliteracies and AI-Genre Exploration

While the revised Writing Project curriculum implemented in January 2023 was not initially designed around the multiliteracies framework (Cope & Kalantzis, 2023; Zapata, 2022), this study examines the alignment of the project with its principles. The multiliteracies framework emphasizes addressing the diverse modes of communication and cultural contexts that shape literacy, particularly in an era of technological and societal change (New London Group, 1996). Its four dimensions—*situated practice, overt instruction, critical framing, and transformed practice*—offer a timely and comprehensive lens for examining the complexities of literacy in the age of GenAI (see the Introduction to this volume and Chapter 1).

The concept of multiliteracies emerged in response to shifts in communication practices brought about by globalization and the rise of new media. The New London Group (1996) introduced multiliteracies as a pedagogical framework that broadens the scope of literacy to include multiple forms of meaning-making, such as linguistic, visual, audio, spatial, and gestural. Cope and Kalantzis (2023) build on this framework, arguing that "traditional" approaches to literacy, which often center on monolingual, print-based texts, fail to address the dynamic and multimodal nature of contemporary communication. This expanded view is particularly relevant in the context of GenAI, where digital tools generate multilingual texts, integrate multimodal elements like images and videos, and challenge conventional understandings of authorship, originality, and genre (Cope & Kalantzis, 2024).

The first dimension of the framework, *situated practice*, immerses learners in authentic tasks connected to their lived experiences and existing knowledge. In the Writing Project, situated practice manifested in tasks where students analyzed AI-generated texts reflecting real-world communication scenarios, such as conversational AI or text-to-image tools. This approach aimed to help students connect genre conventions to their practical applications in both academic and digital contexts.

Overt instruction, the second dimension, emphasizes explicit teaching of the conventions, rules, and strategies that underpin effective communication in specific genres. Within the Writing Project, this was achieved through scaffolded tasks, rubrics, and instructor feedback that guided students in identifying genre markers such as tone, structure, and audience (see Appendices 4A and 4B for examples). For instance, students explored the conversational style of ChatGPT or the visual design elements in tools like *Starryai* (https://starryai.com/), enhancing their understanding of how different modes of communication serve distinct purposes.

Critical framing, the third dimension, invites learners to examine texts within their broader social, cultural, and ethical contexts. This aspect was especially pertinent when students explored GenAI genres, as they considered algorithmic bias, data privacy, and the societal and ethical implications of AI-generated content. By moving beyond surface-level analysis, students were encouraged to notice, connect, and evaluate elements in digital and GenAI texts that reflect deeper sociocultural and ethical issues.

Finally, *transformed practice* emphasizes the application of learned skills and knowledge to new contexts, enabling learners to create and adapt texts innovatively. In the Writing Project, this was demonstrated through students' ability to critique AI-generated texts and apply genre conventions to their own writing. For example, students analyzing ChatGPT texts examined not only its rhetorical strategies but also their own writing as "human" counterparts. Through this comparative process, they developed a heightened awareness of their tone, word choice, and overall writing strategies, which they then applied to improve their academic essays.

Cope and Kalantzis (2023) emphasize that a pedagogy of multiliteracies empowers learners to become "designers of their own social futures," equipping them with the skills needed to critically engage with and contribute to a rapidly changing world. The framework's value in language education lies in its capacity to address both the multimodal nature of AI-generated texts and the cultural dimensions of writing (see the Introduction to this volume and Chapters 1 and 2). GenAI introduces unprecedented complexities to literacy practices, blurring the boundaries between traditional (e.g., academic essays) and digital genres. The multiliteracies framework not only accommodates these shifts but also provides a robust foundation for fostering critical, creative, and reflective engagement with new forms of communication.

This chapter uses the multiliteracies framework to analyze how the Writing Project prepared students to navigate these complexities. In the following section, I outline the study's design, describing the Writing Project in detail, including its implementation, the scaffolded tasks, and the methods used to examine its alignment with multiliteracies principles. By connecting theoretical frameworks to practical application, this study aims to contribute actionable insights into literacy education in the GenAI era.

The Study

The purpose of this study is twofold: (1) to propose a writing project developed in response to the emergence of GenAI, emphasizing the value of scaffolding as a dynamic and pedagogically sound framework for teaching writing to ESL and multilingual learners; and (2) to demonstrate how the Writing Project aligns with the multiliteracies framework, underscoring the importance of integrating this approach into writing curricula and assessments. This study advocates for scaffolding as a key strategy to reduce

student anxiety and foster reflective writing practices. It also makes the case for the multiliteracies framework as an essential tool for addressing the complexities of teaching and learning in an era shaped by GenAI. By analyzing the alignment between the Writing Project and multiliteracies principles, this study highlights the significance of adapting language instruction to meet emerging challenges in literacy education.

The presentation of the study is organized into two distinct sections. The first section, "Overview of the Writing Project," outlines the redesigned writing project, including its course context, participants, and the rationale behind the scaffolded curriculum. It also details the scaffolded tasks, key deliverables, and assessment strategies. The second section, "Alignment with the Pedagogy of Multiliteracies," examines how the Writing Project aligns with the framework's four dimensions, offering insights into its application in the GenAI context. This is followed by the discussion of the lessons learned through my students' and my involvement in the project, including the insights gained through their metacognitive reflections.

Overview of the Writing Project

Course Context and Participants

This study was conducted in the context of an advanced-level, college linguistics course, designed to prepare students for the university's entry-level writing requirement, a prerequisite for all students. The course is part of a three-tiered ESL program aimed at developing proficiency in university-level reading and writing. Students were placed into this advanced course through the university's ESL placement exam or by successfully completing the intermediate-level course in the previous semester(s). The course took place at a four-year public university located in the West Coast region of the United States.

The majority of participants were international ESL students, as defined by the university, representing diverse linguistic backgrounds and varying levels of familiarity with English-language academic writing conventions. The course emphasized genre analysis and the development of structured, coherent essays, equipping learners with the skills necessary for academic success. Data for the study were collected from two sections of the same course: Course A, with 16 students, and Course B, with 13 students, for a total of 29 participants.

The newly revised curriculum was introduced in the Winter semester of 2023, following the release of ChatGPT in November 2022. The revisions aimed to address the challenges and opportunities presented by this new technology, integrating GenAI exploration into the course design to enhance students' critical engagement with AI-generated texts and their broader understanding of digital literacy practices.

Objective and Rationale

The Writing Project examines AI-generated texts as a "new" genre of writing, expanding the scope of analysis beyond traditional academic and non-academic sources, such as social media posts, blog entries, and newspaper articles. The project's primary objective is to help ESL students deepen their understanding of written genres and the conventions that shape them by critically analyzing the linguistic and communicative features of AI tools. Rather than simply summarizing the functions of GenAI tools, students are encouraged to uncover the "what" and, more importantly, the "why" behind how these tools communicate and generate text. The project challenges students to identify genre-specific patterns in AI-generated outputs, including their purpose, intended audience, and defining conventions, while also exploring multimodal aspects such as layout, usability, and interactivity.

Before engaging in the project, students participate in a foundational lesson designed to build a strong analytical base. This begins with a reading of Dirk's (2010) article on genres, which provides a theoretical framework for understanding how genres function and the conventions that define them. Following this, a genre familiarization session is conducted, where students explore a variety of textual genres, discussing their unique features, purposes, and the cues that signal each genre. These activities are intended to help students recognize that writing serves diverse purposes and follows distinct rules based on its context and audience. By making students aware of these nuances, the preparatory work equips them with the critical lens needed to analyze AI-generated texts effectively.

This approach ensures that students are not only attuned to the overt features of GenAI outputs but are also able to critically evaluate the underlying communicative strategies and their implications. The Writing Project thus aims to foster a deeper appreciation of genre as a dynamic tool, helping students navigate the complexities of writing in a GenAI-mediated world while developing their ability to engage thoughtfully with emerging technologies.

Scaffolded Tasks

The Writing Project is designed to guide students through a scaffolded, step-by-step process that facilitates a thorough exploration and analysis of AI-generated genres. The assignment begins with students selecting a GenAI tool or bot of their choice that requires written input, setting the foundation for them to investigate how these tools "talk" and interact with users through textual and multimodal elements. This selection process enables students to engage with GenAI tools in a hands-on, meaningful way, fostering a deeper understanding of their communicative strategies and genre conventions.

Over the course of a 12-week semester, students complete two writing projects, each building on the skills and insights gained from the previous one. Table 4.1 provides an overview and timeline of the redesigned Writing

Table 4.1 Timeline and description of the writing project stages

Stages	*Description (students…)*	*Timeline*
1. AI-bot Selection	Select an AI-bot that either requires written input or generates text as output, which shapes their genre conventions analysis.	Week 1
2. Gathering Textual Evidence	Collect at least three pieces of textual evidence about the chosen AI-bot from different genres (e.g., company website, news articles, discussion forums) to understand its portrayal across various contexts.	Week 1–2
3. Project Builder	Complete Project Builder as a "pre-writing" stage using guiding questions from the AI-Genre Description Sheet. • **Grading approach:** Focus on content quality and completeness rather than mechanics. Grade on a 2-1-0 scale. • **Feedback focus:** Guide students to refine analysis by focusing on gathering evidence and organizing ideas.	Week 2
4. Writing Project Draft 1 and Peer Review	Expand Project Builder findings into Draft 1, which is then peer-reviewed in class to exchange feedback and identify areas for improvement.	Week 3
5. Revised Draft 2 Submission	Submit Draft 2 after incorporating peer feedback, with deeper analysis of genre conventions. Receive instructor feedback for further refinement. • **Grading approach:** Assess using a rubric (1-4 scale) across five areas: organization, content, evidence use, writing process, and language. • **Feedback focus:** Aim at deepening analysis, improving structure, and integrating peer feedback.	Week 4
6. Final Peer Review Session	Bring a revised version of Draft 2 for the final peer review session. Complete the "Peer Review Editing Sheet" and write a peer review letter. This step is required before submitting the final portfolio.	2–3 weeks prior to the end of course
7. Final Portfolio Submission	Submit a portfolio containing all previous drafts, peer review comments, and the final revised writing project to demonstrate progress and the iterative nature of the writing process. • **Grading approach:** Grade out of 100 points across five categories: creativity, organization, evidence, writing process, and convention. • **Feedback focus:** Demonstration of growth and completeness across all drafts and checklist submissions.	End of course

Project, while a detailed description can be found in Appendix 4A. By emphasizing scaffolding throughout the course, the project encourages students to approach writing as an iterative and reflective process. That is, learners are guided to revise their work continuously, incorporating feedback from peers and the instructor to refine their analysis and strengthen their writing. This

structured approach not only helps demystify the complexities of academic writing but also empowers students to develop critical and independent thinking skills in the context of AI-mediated communication.

Scaffolded Course Materials

As outlined in Table 4.1, students are required to submit a portfolio at the end of the semester, which serves as a comprehensive compilation of their work and progress, culminating in their final revision paper. The portfolio components—from the initial Project Builder to the Final Revision—are introduced incrementally, with detailed guidance provided at each stage. This scaffolded approach ensures that students build their knowledge and skills systematically, allowing them to reflect on their progression throughout the course.

The portfolio includes the following components, all designed to support the iterative writing process and encourage critical engagement:

- **Student Work:** Project Builder, Writing Project Draft 1, Draft 2, and Final Revision.
- **Peer Review Letters:** Feedback exchanged between students, including letters both given and received.
- **Student Reflections:** Cover letters submitted with Draft 2 and the final Portfolio, along with a metacognitive reflection submitted at the end of the course. These reflections provide valuable insights into students' progress, self-assessments, their engagement with genre analysis, and the strategies they employed to improve their writing.

To support students in successfully completing the portfolio, I provide a variety of prompts and materials in addition to the course syllabus, reading materials, lecture slides, and online discussion activities. These resources include:

- **Project Descriptions:** Detailed guides for the Writing Project, Project Builder, and Portfolio (Appendix 4A).
- **Submission Checklist:** A comprehensive checklist outlining all required materials, such as drafts and peer review letters.
- **Peer Review Session Guidelines:** Instructions to help students provide meaningful and constructive feedback.
- **Rubrics:** Evaluation criteria for the Writing Project, Project Builder, and Portfolio (Appendix 4B).
- **Cover Letter Guidelines:** Templates and instructions for writing cover letters for both the Writing Project and the Portfolio (Appendix 4C).

By structuring the portfolio process in this way, students are encouraged to approach writing as an evolving and reflective practice. The scaffolding not only reduces anxiety by breaking down the writing process into manageable

steps but also empowers students to take ownership of their learning, fostering growth in both their writing skills and metacognitive awareness.

Alignment with the Pedagogy of Multiliteracies

This section demonstrates how the Writing Project can be seen through the lens of the pedagogy of multiliteracies (Cope & Kalantzis, 2023; New London Group, 1996; Zapata, 2022), specifically its four dimensions—(1) *situated practice*; (2) *overt instruction*; (3) *critical framing*; and (4) *transformed practice*.

Situated Practice: Immersing Students in Authentic Digital Literacy Practices

Before the surge in GenAI's prominence, my focus on teaching writing for nearly 6 years revolved around helping students understand textual genres and the conventions that shape them. With the learners in my classes, I explored how diverse platforms influence language use, such as Twitter (now X) with its strict character limits, shaping concise and impactful messages. We also examined how within social media, the purpose and audience differed across platforms—e.g., LinkedIn shifted from being just a professional profile repository to including a feed of career accomplishments, where the language is more formal and tailored toward networking rather than sharing personal struggles or casual updates. Similarly, text messages versus Instagram direct messages ("DMs") illustrate different communication styles; text messages often lean toward plain text exchanges, whereas DMs on Instagram frequently include visual elements like images, forwarded Instagram stories, and emojis, which convey additional meaning.

Now, in a world increasingly dominated by technological advancements, communication extends beyond traditional text to include multimodal elements such as sounds, recorded voice, videos, GIFs (Graphics Interchange Format), and even implied meanings through emojis. For instance, using emojis like "🔥" [fire] to indicate something "hot" or "trending," or "💯" [one hundred percent] to signify agreement or enthusiasm, are common practices among generation Z (GenZ; Katz et al., 2021). The prevalence of internet slang, like "cap" for a lie or "bet" for "sure," further illustrates how digital communication evolves with each generation. Understanding these practices was crucial before introducing GenAI into the classroom, where AI-generated texts represent a new layer of digital literacy. The Writing Project aimed to open students' eyes to the fact that even these emerging forms of communication have their own genres, with each GenAI tool potentially possessing unique conventions and digital literacy practices.

By engaging students in this project, I wanted them to step back and observe how GenAI communicates across different genres. For example, students analyzed tools like ChatGPT to understand how it functions as a conversational agent capable of generating a range of outputs, from summarizing texts to crafting conversational replies, depending on user prompts. The exploration

included considering how ChatGPT's "input" functions like a command given to the GenAI, with the resulting text varying based on the genre it is asked to produce. This type of analysis allowed students to identify genre markers, such as the conversational tone in responses or the structured format of text summaries. Additionally, students considered multimodal aspects, such as how visual elements or interactive features on an AI bot's interface might influence communication. Through guided tasks in the classroom, they developed an awareness of how they engage with multimodal communication as both consumers of information and producers of texts.

Overt Instruction: Scaffolding the Writing Process

The Writing Project involved a scaffolded process designed to help students gradually build their understanding of genre conventions. I began the course by discussing the concept of genres through Dirk's (2010) article; students also engaged in an in-class activity, using a "genre description handout" I created to help students understand what genre is, its conventions, and why genre analysis is essential (see Project Builder section in Appendix 4A). In class, we explored how every genre serves a specific purpose, audience, and communicative function. The goal was to unpack genres and make students aware that they are constantly engaging with them—whether they are posting on Instagram or sending a text message to their friends.

From there, the Writing Project followed a structured process (see Figure 4.1; flows from top to bottom). Students began with writing their Project Builder (PB) and receiving my feedback before moving on to writing Draft 1, which was then peer-reviewed. After that, they revised Draft 1 based on peer feedback and wrote Draft 2, which I assessed. This scaffolded approach continued with a final revision before students submitted their work as part of their portfolio. Through this process, students engaged in four rounds of feedback and three rounds of drafting and revision. Based on students' feedback collected at the end of the semester (their metacognitive reflection), many expressed that this structure not only reduced their writing anxiety, but this process also reinforced the idea that even drafts are written genres with their own conventions.

I also conducted an in-class practice session where students used a sample GenAI tool (ChatGPT) to understand how it communicates. Students analyzed how input language (typically user commands) differs from output language and discussed the tool's purpose and audience. This hands-on session helped students recognize the genre markers of AI-generated texts, such as conversational tones, text structure, and multimodal elements, setting the stage for their analysis in the project.

The repeated peer review sessions were instrumental in helping students not only refine their own work but also reflect on how to improve their writing by evaluating others'. Through multiple rounds of feedback and revisions, students were not only engaged in the act of reviewing and writing but also

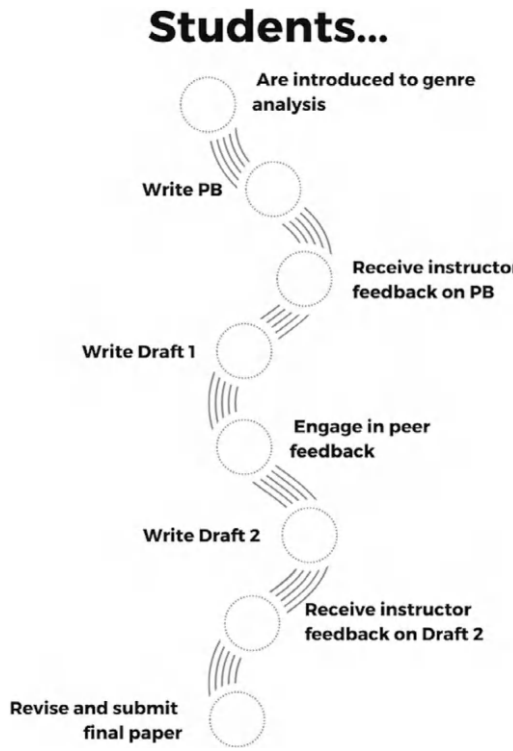

Figure 4.1 The writing project scaffolded process

became more metacognitively aware of their own writing style. Moreover, because they engaged in multiple feedback-revision processes (three or more times) per project, students became more comfortable receiving constructive criticism and were given opportunities to be challenged and resolve the feedback they had received—just like in the academy, where researchers/authors need to address comments on their manuscripts to enhance their work and make it publishable. Students' ability to respond to feedback is an important skill not just for academic writing but also in the real world, where most outputs undergo quality checks and revisions.

Critical Framing: Encouraging Analysis of Societal Implications and Ethical Considerations of AI

According to Cope and Kalantzis (2023, 2024), meaning is not only linguistic but multimodal, encompassing various forms such as text, images, and sound, which is increasingly relevant with digital and GenAI tools. When students engaged with GenAI in the Writing Project, they were prompted to think beyond its surface-level functionality. Instead, they had the opportunity to

examine how GenAI tools communicate within different genres and for diverse audiences. That is, thinking beyond the basic functionality of the GenAI tools, students were asked to analyze why these tools are designed the way they are and to reflect on how they communicate. Also, by reflecting on the tool's intended audience, learners were able to assess how the communicative style of GenAI (e.g., conversational, formal, etc.) aligned with its social function. Specifically, students reflected on the audiences these genres serve and the power dynamics they reinforce.

Cope and Kalantzis (2023, 2024) stress the importance of recognizing the diverse modes of meaning-making and how these are mediated by digital technologies. At the beginning of the Writing Project (e.g., when discussing what genre is), I incorporated in-class discussions and reflection exercises that guided students to explore the ethical implications of their GenAI interactions. For example, we had a class session where I asked students to closely examine OpenAI's (creator of ChatGPT) privacy and data retention policies, so that they could better understand how user data might be stored and/or (mis)used. Introducing students to the ethical implications of GenAI use enabled them to think about broader societal issues tied to technology use, including potential biases embedded in AI-generated content (Zapata, 2022). This exercise also helped students realize that their personal interactions with GenAI tools can have consequences, especially if they are not careful with inputting sensitive and/or personal data. I also encouraged students to incorporate their reflection on ethical considerations in the implication sections of their Writing Project papers.

Transformed Practice: Applying Learning to Create and Critique AI Texts

Through the transformed practice lens of the pedagogy of multiliteracies, learners who participated in the Writing Project were able to transform their basic composition writing practice into a more complex reflective practice, where they sought to understand the genre conventions of GenAI texts (e.g., audience, purpose, language, medium) and critique its content, including its societal implications and ethical considerations. This approach aimed to empower students to apply their learning to real-world scenarios, moving beyond traditional writing tasks (e.g., summarizing texts) to actively engage with AI-generated texts as a distinct genre.

Upon reviewing students' reflections written in their cover letters, it was interesting to note that because they were learning to identify and analyze genres of GenAI texts, they also became more conscious of how they crafted their own essays. In other words, they applied their genre knowledge and analytical skills to examine their own written texts, ensuring that these essays conformed to the conventions of academic writing. For instance, several students revised their work to include clearer thesis statements and structured paragraphs that contributed to a more logical flow of ideas. This active engagement with genre conventions demonstrated their ability to adapt writing strategies to meet specific rhetorical requirements, strengthening the coherence and impact of their essays.

As students continued to refine their writing, I also noticed that they became more intentional in their revisions. For instance, in their cover letters, learners indicated that they had employed strategies learned in class, such as "reverse outlining," "mind mapping," and "paraphrasing" to improve the organization and clarity of their essays. This shift from merely drafting to adopting a more strategic approach to writing was one of the objectives of the course, as students gained a deeper understanding of the writing process. Additionally, engaging in peer review and revision sessions further supported their growth as writers, as learners identified areas needing improvement. Through these scaffolded, iterative practices, students seemed to have a better understanding that writing is a continuous process of reflection and improvement.

In addition to refining their writing strategies, some students highlighted the challenge of integrating evidence and citations to support their analysis of GenAI tools, as it was not a "known" practice on how to qualitatively collect and analyze GenAI tools, its textual contents, etc. However, these students took on this challenge to try evaluating the genre conventions of GenAI tools and contents, while integrating their examination of sources, societal implications, and ethical considerations connected with the use of these technologies. By engaging in thoughtful analysis, learners went beyond simple descriptions to offer critiques of GenAI; instead, they considered both the affordances and limitations of these tools as well as their broader impact on society.

Through this Writing Project, students transformed the literacy practices they had learned, adapting their work to new contexts. Throughout the duration of the project, I encouraged learners to examine GenAI texts and reinterpret these as a "new" genre, engaging in the practice of capturing genre conventions through analyzing "nontraditional" texts like AI-generated, multimodal (e.g., inclusion of emojis, videos, images) texts. The peer review sessions and revision process allowed students to practice giving feedback and responding to it through revision, honing their skills in effective communication and problem-solving. In this project, therefore, students were encouraged to take agency of their work, exercise critical thinking, and engage meaningfully with GenAI content, demonstrating their capacity to navigate and adapt to evolving (multi-)literacy demands.

Reflecting on my role as an instructor during the implementation of the Writing Project, I found that consistent guidance and adaptability were essential to addressing the challenges posed by GenAI. In the following section, I delve into the strategies I used to support students in navigating these complexities and the insights gained from facilitating this transformative learning experience.

Lessons Learned and Insights Gained

Reflecting on my role as an instructor during the implementation of the Writing Project, I recognize the importance of consistent guidance and adaptability in navigating the challenges posed by the emergence of GenAI tools. My primary aim was to create an environment where students could explore the

complexities of AI-generated genres, engage deeply with the writing process, and develop metacognitive awareness of their own learning journey. Below, I expand on the specific strategies and insights gained from facilitating this project.

Tailoring Feedback to Encourage Progressive Growth

One of my central responsibilities was providing feedback tailored to the specific requirements of each stage, ensuring that students developed their skills incrementally. For the Project Builder, I prioritized helping learners select appropriate GenAI tools and guiding them to identify genre-specific characteristics. For example, one student initially struggled to understand how ChatGPT's conversational style and multimodal outputs (e.g., code snippets, lists) could be analyzed within a genre framework. Through targeted feedback that emphasized focusing on language features and audience purpose, this student refined their analysis significantly by the time they submitted their first draft.

Feedback on drafts was similarly scaffolded. Draft 1 served as a peer-reviewed step, where students gained insights from their peers while drafting a near-final version of their work. To ensure meaningful engagement, I modeled effective peer review practices, emphasizing that feedback should move beyond surface-level corrections to address content, organization, and genre conventions. For example, during one peer review session, a student pointed out that a classmate's analysis of ethical issues in AI-generated art lacked specific examples. This comment, guided by our prior discussions on ethical implications, prompted the student to incorporate examples of copyright concerns in subsequent drafts. This iterative feedback process reflects the "critical framing" dimension of the multiliteracies pedagogy, encouraging students to interrogate and refine the social purposes and implications of their work (Cope & Kalantzis, 2023; Zapata, 2022).

Addressing Challenges of Overwhelming Complexity

Introducing scaffolded tasks initially overwhelmed many students, particularly those accustomed to single-prompt essay writing with minimal opportunities for revision. To mitigate this, I explicitly explained the purpose of each task and reassured students that the drafts themselves carried low grading weight, with greater emphasis placed on their participation and engagement with the process. For instance, when students expressed anxiety about creating Draft 1 as a "complete" paper, I explained that they should view Draft 1 as a starting point for meaningful peer and instructor feedback rather than a finished product.

This iterative approach, which began with the GenAI-focused Writing Project and extended into Writing Project 2, helped familiarize students with the draft-revision cycle. By the time they reached the portfolio submission stage near the end of the semester, learners demonstrated greater confidence

and independence. Such scaffolding embodies the "overt instruction" lens of the multiliteracies framework, where explicit guidance helps students navigate new literacies and genres, eventually enabling them to transform their practices (Cope & Kalantzis, 2009; New London Group, 1996). Several students noted in their final metacognitive reflections that this scaffolded process helped "reduce [their] last-minute stress" and helped them internalize writing as an evolving practice.

Observing Growth in Student Engagement with GenAI Genres

Through iterative tasks and reflection prompts, students began to move beyond basic descriptions of GenAI tools to more nuanced analyses of their implications. For example, one student initially described *Starryai* as simply "an AI tool for creating art." By their final draft, this student had critically examined how *Starryai*'s outputs challenge "traditional" notions of art and creativity (i.e., only human-created art), drawing parallels with the historical skepticism toward photography as an art form. Similarly, another student analyzing *Make-A-Video* progressed from listing its functionalities to discussing ethical concerns about deepfake technology and the regulatory challenges it presents.

Across all stages, I observed that scaffolding tasks helped students develop depth in their analysis. One student noted in their cover letter that "breaking the project into smaller steps allowed [them] to explore ideas in more detail and connect them better in the final version." Students' work overall reflected growth, as they fine-tuned their organizational strategies, integrated diverse sources, and engaged with ethical considerations. Learners also engaged in multimodal analysis, synthesizing diverse modes to construct critical analyses (Kalantzis & Cope, 2020).

Fostering Metacognitive Awareness Through Peer Review

The peer review sessions emerged as a critical component in fostering metacognitive awareness and collaborative learning. Students reflected on the feedback they received, often articulating how their peers' perspectives helped them identify gaps in their own work. For example, one student characterized their "peer review [as] a game-changer because [their] classmate pointed out that [the learner's] argument lacked depth in discussing AI's limitations. That feedback pushed [them] to dig deeper into scholarly articles."

Through these sessions, students also learned to evaluate the quality of feedback they provided. In one instance, a student who initially struggled to critique their peer's work remarked in their final reflection that the peer review process had "helped [them] see what strong analysis looks like, which [they] then tried to apply in [their] own revisions." This collaborative feedback process aligns with the "transformed practice" dimension of multiliteracies, which enables learners to use acquired knowledge to create meaningful contributions

in authentic and socially relevant contexts. This iterative practice, thus, not only enhanced students' writing skills but also cultivated their ability to reflect critically on their own learning.

Students' Metacognitive Reflections

Based on students' cover letters and reflections, it appears that many embraced the idea of writing as a reflective process, largely facilitated by scaffolded tasks. For instance, one student articulated how the structured revision process had allowed them to refine their ideas and strengthen their arguments with each draft. They noted that "the multiple rounds of revisions [had] helped [them] see how to build stronger connections between ideas and dig deeper into the analysis," which demonstrates an increased understanding of writing as a recursive and reflective activity. Similarly, another student expressed that this writing course had constituted the first time they had consistently engaged in continuous improvement for a single project—a process they described as akin to "building an animal toy," with each draft adding a new layer, "from bones to flesh to skin," resulting in a polished final product. This metaphor highlights their growing recognition that writing involves multiple iterations and that each stage is essential to achieving clarity and depth.

The peer review process also played a crucial role in encouraging students to engage critically with both their own work and their peers' perspectives, fostering this reflective mindset and a deeper awareness of audience and purpose (New London Group, 1996). Many students indicated that peer reviews not only improved their drafts but also allowed them to develop evaluation skills by examining their peers' work.

Overall Impact on Learning and Literacy

Through the Writing Project, students' understanding of genre conventions, multiliteracy practices, and communication in this digital/AI era deepened compared to when they first started. Learners demonstrated a growing awareness of how AI-generated content could challenge traditional ideas of authorship, originality, and audience expectations. This was particularly evident in their reflections on how analyzing GenAI tools like *Starryai* or *Make-A-Video* had shaped their approach to writing. For example, one student reflected on how their engagement with *Starryai* had deepened their understanding of genre conventions in digital art. In their work, they explained, "I initially focused on describing how the tool generates images, but later I realized that discussing the ethical implications, such as copyright and ownership of AI-generated art, made my argument stronger and more relevant."

Over time, students' reflections also showed a clear trajectory of growth in their metacognitive awareness. Early in the course, many students had focused on surface-level improvements, such as grammar and formatting, rather than on the implications of their writing choices. By the end, there was a noticeable

shift toward more complex reflections on how genre conventions influenced their writing decisions, how they adapted to different rhetorical situations, and how they engaged with ethical considerations. One student wrote about how they had "revised [their] thesis statements and topic sentences to better meet the audience's needs," while integrating feedback to enhance clarity and coherence across all their drafts.

In sum, when reflecting on the implementation of this project, I recognize the effectiveness of scaffolded, iterative practices in promoting these deeper levels of engagement. This approach enabled students to experience, analyze, and transform their writing practices in meaningful ways, preparing them to meet the demands of a rapidly evolving digital world.

Conclusion

Cope and Kalantzis (2023, 2024) emphasize the importance of preparing students to navigate the demands of a digital, multimodal world by equipping them with both technical and critical skills to engage with evolving literacies effectively. In response to these demands, I designed the Writing Project to integrate GenAI genres into my writing curriculum, recognizing them as a key part of the "new normal" in writing practices. While I continue to grapple with the challenge of creating "ChatGPT-proof" assessments, my primary aim remains to help students embrace, rather than shy away from, the diverse, digitally driven literacy practices that characterize contemporary communication.

This Writing Project was my first attempt at encouraging students to critically engage with emerging issues in GenAI and digital communication. Reflecting on its implementation, I recognize the untapped potential for expanding students' understanding of literacy beyond traditional academic frameworks. Through scaffolded tasks and iterative feedback, I observed students move beyond surface-level writing to develop a nuanced understanding of genre conventions and the ethical complexities of GenAI technologies. The process also underscored the value of scaffolding as a pedagogical approach that not only reduces anxiety but fosters metacognitive growth and reflective writing practices.

Moreover, the multiliteracies framework provided a robust pedagogical lens for examining this project and reaffirmed its relevance as a toolkit for educators navigating the fast-paced generative capabilities of AI. By embedding iterative feedback, scaffolded materials, and collaborative peer review into the curriculum, I was able to guide students in understanding that writing is not an isolated, high-stakes activity but a continuous, reflective process. This approach also enabled students to build resilience and develop perseverance through drafting, revising, and collaborative learning activities.

Looking ahead, further research is essential to explore how GenAI can continue to support writing development and foster digital literacy over the long term. This includes addressing questions of accessibility and equity, ensuring that all learners have the opportunity to engage meaningfully

with these tools. As educators, we must remain adaptable, ensuring that our teaching strategies evolve in tandem with technological advancements, preparing students to become critical, ethical, and creative participants in a rapidly changing digital landscape.

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Appendix 4A Writing Project 1: "The AI-Genre" Exploration Project

In this assignment, you will demonstrate your knowledge of written genres and their writing conventions by analyzing an AI-bot, specifically focusing on its purpose, functions, medium/platform, processes, language/written inputs and outputs, and intended audience.

Important: Please do not just write a summary about your chosen AI-bot. Instead, tailor your thesis statement-driven argument to an intelligent audience that is unfamiliar with this AI field, especially its language and platform(s). Not only will you uncover the "what," but you will also want to focus on examining the "why"(s)—e.g., the reason behind the (written) conventions of the inputs and outputs; the argumentation or the rationale behind why this AI-bot is significant or useful; etc. Make sure to use your textual evidence and enough data to write a detailed paper.

1 Choose an AI-bot. This AI-bot should require a written input or produce a written output.
2 Gather at least three textual pieces of evidence that describe and discuss this AI-bot. Each instance of textual evidence needs to be from a different genre (e.g., company website description, news, discussion feeds, opinion columns, etc.), reporting on the same AI-bot. One of the pieces of textual evidence needs to be from the company website that created this AI-bot, if there is one.
3 Use the "AI-Genre" Description Sheet (your PB) to guide you when writing your paper.
4 Include an analysis of this AI-Genre in your paper, using the following guiding questions:

Purpose/Significance:

- What is the purpose of this AI-bot?
    - How did you find its purpose? Where in the textual evidence did you find the purpose?
- According to your sources, why is this AI-bot claimed to be useful/significant?
- In your opinion, what "universal problem" is this AI-bot trying to solve, if any?
    - What impact do you think this AI-bot has on society?
- In your opinion, in what ways and settings can this AI-bot be used?
- Based on your research, what are some of the concerns/challenges that have been brought up when using this bot and/or *as a result* of using this bot?
    - What are the ethical concerns associated with the use of this AI-bot?
    - What are your thoughts on these concerns/challenges?
- In your opinion, how can we overcome these challenges?

Other expectations:

- Minimum 1200 words (not including Works Cited page), double-spaced, Times New Roman, 12-point font, with 1-inch margins; MLA formatting and citations

Project Builders (PB)

Project Builders (PBs) are designed to help you work through issues that you will explore in your WP and to accumulate some writing to help you begin the assignment. They need to be organized and coherent, but they are also meant to serve as exploratory pieces. They are not formal essays, but they are also not freewrites. You will not put your PBs together to create your WP. Instead, think about your PBs as being part of the "pre-writing" stage, during which you can draft ideas and focus on developing your analysis of the materials that you will eventually incorporate and expand into your longer WP. Their length, topic, and structure will vary, so please see PB-specific instructions for more details.

PB1: (2–3 pages, double spaced)

Using your gathered textual evidence (don't forget to include the textual evidence links on your paper), answer the questions listed on the "AI-Genre" Description Sheet." These are guiding questions to help you write your WP1 paper. You may also include other details that are not asked in this description sheet.

"AI-Genre Description Sheet":

Genre Overview & Functions

- What genre is this AI-bot?
- You can create your own "AI-genre" category, if there's none
- What specific markers are there that point to this type of "AI-genre"
- What can it do?
- What platform/medium does it operate on?

Process & Language (Input & Output)

- What is the process of using this?
- What does the language/textual input looks like? In other words, what writing conventions (e.g., language use, sentence structure, use of specialized words, length, etc.) are used as input?
- What is the output?
- Is there a textual component to the output? If so, what writing conventions (e.g., language use, sentence structure, use of specialized words, length, etc.) are produced as an output?

Audience

- Who is the intended audience of this output?
- What in the selected texts (evidence) and the AI-bot itself indicate who the intended audience is?
- Who can access this AI-bot? Does it cost money to use this AI-bot?
- Who would benefit from it?

Appendix 4B Rubric for Writing Project 1

HOW SPICY IS YOUR WRITING? __/100 (EACH PART IS 20 PTS)

A: MD: 20 pts	C: ME: 15 pts
B: HO: 17 pts	D: MI: 13 pts

PART 1

Meltdown: Writing represents creative, insightful work with assignments.
Hot: Writing represents thoughtful, thorough work with assignments.
Medium: Writing represents competent work with assignments.
Mild: Writing is incomplete and does not address all aspects of the assignments.

PART 2

Meltdown: Writing is organized around well-developed analyses that thoughtfully and insightfully respond to assignments.
Hot: Writing is clearly organized around analyses that clearly respond to assignments.
Medium: Writing is organized around analyses that primarily respond to assignments.
Mild: Analysis in the writing is unclear or difficult to connect to assignments.

PART 3

Meltdown: Evidence is appropriate, credible, and used to develop the ideas in the writing.
Hot: Evidence is appropriate, credible, and clearly related to the ideas in the writing.
Medium: Evidence is appropriate and credible. Connections to the ideas in the writing are generally present.
Mild: Evidence is inappropriate and/or not credible.

PART 4

Meltdown: Writing shows attention to and use of processes for writing and reflection to consistently improve analysis, clarity, cohesion and focus.
Hot: Writing shows attention to and use of process and reflection to frequently improve analysis, clarity, cohesion, and focus.

Medium: Writing shows attention to and use of process and reflection to generally improve analysis, clarity, cohesion, and focus.
Mild: Writing shows minimal attention to and use of process and reflection to improve analysis, clarity, cohesion, and focus.

PART 5

Meltdown: Writing shows attention to and use of a consciously employed process to consistently improve conventions of form, style, syntax, and citation.
Hot: Writing shows attention to and use of a process to frequently improve conventions of form, style, syntax, and citation.
Medium: Writing shows occasional attempts to use a process to improve conventions of form, style, syntax, and citation.
Mild: Writing shows few attempts to improve conventions of form, style, syntax, and citation.

Appendix 4C Writing Project Cover Letter

The purpose of this cover letter is to give you the opportunity to reflect on the choices that you made as a writer during WP. Reflection not only makes you think about what you have learned and how you have developed as a writer, but it also stresses that your writing process is continual. That is, although you have submitted WP, it is still a draft, and reflecting on your process, the current state of your paper, and your plans to improve it even more will begin to orient your thinking toward the final course portfolio.

In a one- to two-page letter, reflect on the process you used to develop this WP and how you have put the submission draft packet together. I will read this letter before I review your submission packet, so please point out aspects of your paper, writing process, and revision that you would like me to know as I read your work. The issues and concerns that you raise in your letter will also help to guide my comments, so use it as a way to get feedback on aspects of your writing particularly important to you.

Make sure your cover letter adheres to the conventions of a formal letter, including an appropriate salutation (e.g., "Dear Professor,"), separate paragraphs where you answer different sets of ideas, and an appropriate closing (e.g., "Sincerely,") with your name signed.

To guide your reflection, please answer the following questions:

Your Writing Process: What have you learned?

- What have you learned about your own writing and writing process during WP? Did you notice any development between your PB(s) and the submission draft?
- What are you particularly proud of in your WP and why? Discuss some specific examples.

Feedback and Revision: What processes have you developed?

- Based on the feedback that you received during peer review and your own thinking, what will you do differently if you come back to this WP for your final course portfolio?
- How did you incorporate the feedback that you received during peer review into your work already?
- What mechanical or stylistic issues (i.e., "grammar") did you identify and address when you polished this draft before submitting it?

Final Thoughts: What else should I know?

What else would you like to mention before I read your work?

5 Exploring the Design and Implementation of Generative AI-Supported Activities for Multimodal Language Learning

Jordan Weide, Johnathan Cruise, and Emil Tangham Hazelhurst

Introduction

This chapter builds on the prospects and limitations discovered by the chapter's authors, a team of three researchers, while investigating OpenAI's text-to-visual generation tool DALL·E 2. The research report (Weide et al., 2024) aimed to reveal practical applications for using this tool in language learning and assessment. Retrospectively, the investigation is described within the context of the multiliteracies framework *Learning by Design* (LbyD) (Cope & Kalantzis, 2023; Zapata, 2022).

Specifically, this work discusses how the understanding of Generative Artificial Intelligence (GenAI) tools was developed through an inductive, prompt-based exploratory method, and it highlights the key issues that arose during this process. The investigation primarily focused on controlled text-to-visual creation, which generally aligns with the LbyD's transactional, decoding approach to multimodal stimuli and seeing second language (L2) learners as "meaning makers" (Pittaway, 2004; Zapata, 2022). During a six-month investigation into DALL·E 2 (Weide et al., 2024), we quickly realized that GenAI interprets the ambiguities in prompts in a variety of ways. Initially, attempts to control the tool by adjusting the wording and structure of the prompts were like training an uncooperative pet cat, in as much as whatever partial success there was in getting DALL·E 2 to do things, there was always an element of unpredictability. This experience illustrated the systemic functional grammarian Eggins' observation that language uses "finite means to realize infinite ends" (Eggins, 2004, p. 116), where trying to force this tool into a narrow range of intended output was never fully achieved. Although such results were not as intended, they did provide insights into how GenAI would perform in language learning applications and what approach may be needed within prompting, indicating that DALL·E 2 would be more suited to generating creative and unique outputs rather than consistent and predictable ones.

Following the initial investigation, the focus shifted to an approach where constraints were applied not within the prompts themselves, but within the investigatory foci, and three approaches were then taken. By narrowing the focus

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of the investigations towards targeted areas of suspected variance in output, we gained clearer insights into how to interact with such tools, especially given the complexity of DALL·E 2's underlying processes. This approach aimed to demonstrate some of the extent of DALL·E's utility in the classroom, which might help practitioners avoid the frustrations of using the tool without extensive prior knowledge. However, while the insights gained from this report were initially directed toward language assessment professionals, this chapter extends beyond the investigatory work, applying its insights language teaching grounded in the LbyD framework (Cope & Kalantzis, 2023; Zapata, 2022). That is, this work intends to help teachers lower their affective feelings when approaching tools like the one we examined and gain some inspiration for learning activities from our insights. We also hope that by detailing the themes uncovered through these novel approaches, we can demystify the nature of GenAI, contributing to AI literacy that enables teachers and students to use it efficiently. This will allow for text-to-visual applications within LbyD's knowledge processes (i.e., *experiencing*, *conceptualizing*, *analyzing*, and *applying*; see Cope & Kalantzis, 2023, the Introduction to this volume, and Chapter 1) in constructive and rewarding ways.

This chapter speaks to stakeholders in the language learning domain. It serves to provide AI literacy within the LbyD framework by sharing knowledge and insights needed to use AI effectively in this context. More specifically, the chapter will first introduce the GenAI tool DALL·E 2. Then it will place the use of this tool within application for LbyD. The chapter continues by focusing on the understanding of how DALL·E 2 works, gleaned from our own research report as an example of use. The chapter finishes by addressing how these insights on the ways in which AI works can help stakeholders understand what can be done with it and when it is a good choice to use it within the LbyD multiliteracies framework.

The AI Tool: DALL·E 2

Before using an AI system, it is important to understand what it is and how it works. Although there is a variety of definitions for what is meant by AI literacy, this aim of understanding fits within the first half of the definition of AI literacy by the Artificial Intelligence Literacy Act of 2023 by the United States Congress, which posits that this type of literacy entails "the skills associated with the ability to comprehend the basic principles, concepts, and applications of artificial intelligence" (H.R. 6791, 2023). This part of the definition points out that the understanding of what an AI tool is can allow for a more realistic knowledge about their capabilities and limitations so that they can be used critically.

DALL·E and its iterations are one of the leading GenAI systems trained to generate images from text input based on OpenAI's GPT-3 (OpenAI, 2024b). The first version was released publicly in January 2021, and its successor, DALL·E 2, was launched a year later (OpenAI, 2024a). When we conducted

our study, DALL·E 2 was chosen due to its accessibility. Since we were looking to use the findings to shape pedagogical practices, we focused on using tools that teachers and students would be able to readily access without a paywall, which would promote widespread use and greater equality across economic backgrounds. During this research, DALL·E 2 was the latest version available for public use and all images were created through this system in our report between June and September 2023. The images using DALL·E 2 have retained the DALL·E 2 watermark in the bottom right corner as an IP identifier. The newer version generated images at a higher resolution and produced them with greater accuracy.

Like GPT-3, DALL·E 2 is a transformer large language model (LLM) which is trained to produce images with the highest chance of matching source syntax (OpenAI, 2024a). Efforts have been made to improve safety with more effective measures put in place to curb misuse and prevent the generation of harmful representations. While image generation is the most well-known use-case feature of the tool, DALL·E 2's capabilities are not limited to this application. DALL·E 2 and other GenAI image generators can produce unique images from text prompts using a huge catalogue of online source data. Multiple semantic elements contained in the lexical and syntactic components of texts prompts can be recreated in multimodal format signifying a large step forward in GenAI technologies. While previous studies have investigated the relationship between prompt and output in DALL·E 2 (e.g., Conwell & Ullman, 2022; Leivada et al., 2022; Marcus et al., 2022), our report was the first study with an explicit focus on the applications of GenAI image tools in language teaching and assessment.

To integrate this technology, educational practitioners often are left to rely on the "chat" interface of AI tools. Without technical knowledge of computer science, prompting, information provided to a GenAI model to influence or direct the results it produces, is how access and interaction are facilitated. Prompts provide instructions to an LLM to enforce rules, automate tasks, and ensure certain qualities and quantities in the output. They also function as a type of programming that allows dictation of the outputs and interactions with an LLM (White et al., 2023). Prompt writing techniques should be embraced in principle, but with a high degree of skepticism to ensure appropriate use for specific goals, such as a classroom task in education. Nevertheless, the vetting of prompts depends very much on the commitment and capacity of the teachers themselves. Therefore, the discussion of prompts within this chapter is meant to contribute to the rapid advancement in prompt engineering including techniques approachable for the public and general practitioners such as teachers.

The capabilities of DALL·E 2 and other GenAI tools can vary widely depending on the situation. For example, DALL·E 2 is very good at blending artistic styles and creating interesting images with one or more subjects. However, the system has trouble accurately representing specific relationships between elements, even with simple instructions. This is why testing it

with specific foci is important. Also worth noting is the fact that, unlike other GenAI tools, DALL·E 2's performance is not necessarily based on the complexity of the task, or the language used. Instead, its strengths and weaknesses are shaped by the process it follows to generate output. In other words, the way it was trained and the methods it uses to create images determine what it does well and where it may encounter challenges.

Therefore, it is important to investigate its use within the domain of education to gain a better understanding of its utility and limitations. This sentiment is carried into the second half of the definition of AI literacy by the Artificial Intelligence Literacy Act of 2023 by the United States Congress, which includes "applications of artificial intelligence, as well as the implications, limitations, and ethical considerations associated with the use of artificial intelligence" (H.R. 6791, 2023). The second half emphasizes the importance of stakeholders gaining the knowledge and tools needed to use AI effectively. For the purposes of this chapter, effective use is defined as building an understanding of how AI works, to inform what applications it may be best suited for and of what we should be aware for its constructive evaluation.

DALL·E: Integration Grounded in *Learning by Design*

The objective of this chapter is primarily to place knowledge in the hands of teachers so that they can effectively use GenAI tools such as DALL·E 2 in the classroom, and it suggests several implications related to the multiliteracies framework LbyD to support language learning stakeholders in implementing learner-centered AI. Lim et al. (2022, p. 7) define the framework as a "repertoire of knowledge processes," used by the teacher to "design strategic moves between one knowledge and another" but (notably) "in no necessary order." Cope and Kalantzis (2023) go on to identify four knowledge processes within the learning process: *experiencing*, *conceptualizing*, *analyzing*, and *applying* (see Chapter 1 in this volume for in-depth information on these processes).

We believe these pedagogical moves can guide DALL·E 2 use. The start of a learner's workflow is *experiencing*, which entails the interplay between students' personal schemata ("the known") and the novel ("the new"), in practice where pedagogical content "that resonate[s] with learners' backgrounds promot[es] engagement and facilitat[es] connections between their existing knowledge and the target language" (Zapata, 2022, pp. 10–11). DALL·E 2 enables this by having an easily accessible interface which generally provides instant output for the users' prompts, however variable in clarity or content those prompts might be.

This, however, does not mean that the output will be, or anywhere close to, a desired result. The unpredictability of output is discussed in detail further into this chapter, but for now it is sufficient to say that the way DALL·E 2 tries to accomplish almost any given instruction allows for a wide range of learning explorations. Subsequently, when utilizing GenAI and image tools, the

learner may form a working hypothesis by reinforcing or challenging existing assumptions (e.g., "how/why did this happen?"; "If I do this, maybe this will happen"; "Ok, so that worked!" etc.). This places such exploration within the LbyD workflow, where prompt writing begins from an existing notion (the *known*) towards the novel and the transformation of the process by DALL·E 2 becomes part of the *conceptualizing*, *analyzing*, and *applying* processes. In terms of new ways of ideation and learning, the necessity to engage with such technology is therefore imperative, especially for those who align with the precepts of LbyD.

Yet, the implementation of these tools can be slowed by the concerns teachers may have surrounding AI. These concerns may include how personal information is stored and shared, uncertainty about how the AI operates, and apprehension that AI could diminish the emotional and natural aspects of learning, potentially leading to a loss of authentic educational experiences (Edmett et al., 2024). Taking a historical perspective, fear mixed with fatalism seems part of the natural cycle of adoption and adaptation to new technology (see Rogers's [1962] research on "diffusion of innovations" for a deeper dive). It is worth noting that, while the skepticism and reluctance to adopt GenAI in any systematic way appears to be prevalent among some national teaching communities (such as the UK), the need to engage with GenAI tools is pressing for educators. This is also echoed by the UK government, who has noted that "Artificial Intelligence is here to stay … we want to make the most out of this emerging technology, we need to understand its risks, as well as its opportunities" (YOUGOV, 2023). More importantly, the need for educator engagement with GenAI will probably come from those most impacted by its use—current and future generations of students.

This points to the urgency for research to investigate "a) what competencies users need to effectively interact with and critically evaluate AI and b) how to design learner-centered AI technologies that foster increased user understanding of AI" (Long & Magerko, 2020, p. 1). Teachers' understanding of AI tools can help them make informed decisions about adopting and integrating them in different settings, making sure that they are suitable solutions and aligned with classroom goals and outcomes as well as ethical standards. Although elements of AI literacy such as transparency, accountability, security, and privacy are vital, this chapter will be limited to providing insights into AI competencies discovered through the researchers' investigation into DALL·E 2. The chapter will only broadly define AI literacy as, "a set of competencies that enable individuals to critically evaluate AI technologies and communicate and collaborate effectively with them" (Long & Magerko, 2020, p. 2), aligning with the previously mentioned definition provided by the US Artificial Intelligence Literacy Act of 2023. An overview definition is seen as suitable as it accounts for the continued evolution of AI tools, where the more that is known about how these technologies work, the better prepared practitioners will be when new technologies appear.

DALL·E 2: Consistency and Reliability

In line with Long and Magerko's (2020) definition of AI literacy, the more aware the practitioner is of GenAI tools' intricacies, the more effectively they will be able to guide students through the development of these new media and incorporate language learning into the process. To understand the implementation of GenAI tools in educational contexts, Weide et al. (2024) concentrated on achieving consistency in spatial relations to generate clear and consistently coded relationships. Consistency was defined as the clear correspondence between the prompt syntax and DALL·E 2's output images. For instance, if a prompt specified that one object should be positioned "to the right" and another "to the left," the output was deemed consistent if this spatial relationship was accurately reflected in the image produced by the tool.

The investigation found that, while the overall spatial relationship was consistently recognized, i.e., when the term "above" or "below" was contained in the prompt, the two objects in the output image were positioned one above the other. When "left" and "right" were included in the prompt, the objects were positioned next to each other oriented to the left and right of each other. However, the specific orientation of each object in relation to the other was not consistent. For example, in the prompt: "object 1 is on the left, and object 2 is on the right," while the objects would be positioned side by side in the output image, the chance of object 1 being on the left (as specified in the prompt) was roughly 50%. The results indicated that while DALL·E 2 was able to recognize the broad spatial relation of left and right, it seemed to position each specific object in each position at random. Based on these results, it appears that DALL·E 2 was unable to identify which modifiers belonged to which subjects based on simple syntax. These findings mirror those reported in previous studies of the tool, which also found inconsistencies in other relationships (e.g., Conwell & Ullman, 2022; Leivada et al., 2022; Marcus et al., 2022).

These results led to an understanding that it is not necessarily the complexity of the task which results in inconsistent outputs from DALL·E 2. This is because the tool's output is not always predominantly determined by prompt syntax but rather by what it was trained on and its intended purpose. This disconnect can be challenging for practitioners whose focus is language use. Nevertheless, it is important to remember that these tools were not designed specifically for the language classroom, but rather, to promote creative expression and help to evaluate and further develop GenAI platforms (OpenAI, 2024a). While creativity is hugely important in teaching contexts (especially those grounded in LbyD), the linguistic construct typically provides the foundation for activities and materials. DALL·E 2 was trained with 650 million images scraped from the web and aligned by CLIP (Cahyadi et al., 2023), and the tool has strengths and weaknesses that are important to consider.

Studies have also shown that DALL.E 2 struggles with compositionality (Conwell & Ullman, 2022; Leivada et al., 2022; Weide et al., 2024) and

Figure 5.1 Output resulting from the prompt "The panda is above, and the cat is below"

Figure note: This image was created using the DALL·E 2 AI image generation platform by OpenAI.

agentic relations (Marcus et al., 2022; Weide et al., 2024). Anaphora and basic counting also seem to be challenging for the tool (Marcus et al., 2022). Findings from the report on which this chapter focuses (i.e., Weide et al., 2024) provided some insight into these weaknesses. Agentic relationships which were uncommon in the source image data were very rarely produced by DALL·E 2. This resulted in inconsistency between the prompt syntax and visual output. For example, a prompt specifying a panda positioned "above" a "cat" resulted in DALL·E 2 overwhelmingly producing images of a cat above a panda. Figure 5.1 shows the output for the prompt *the panda is above, and the cat is below*.

Similarly, in a study by Conwell and Ullman (2022, p. 8), both "a spoon in a cup" and "a cup on a spoon" led to images representing the former relationship. These findings indicate a reliance on source image data above prompt syntax in these cases. While some aspects of DALL·E 2's output are inconsistent, results such as these suggest that some phenomena can be predicted based on the tool's background processes. For example, a search for "a plate on top of cutlery" will most often produce an image of cutlery on top of, or beside a plate, and "a cat above a mouse" will produce an image of various spatial relations, very few of which involve the cat "above" the mouse. In these cases, most of source data would feature spoons in cups, cutlery on or beside plates, and smaller animals positioned above larger animals. Thus, the images produced, while not matching the prompt syntax, do result in more common and logical spatial relations.

These findings suggest that, at least initially, and potentially as part of a testing phase, practitioners engage with GenAI tools in low-stakes settings. For example, teachers could engage with the tool in advance of their classes and use the generated materials in the classroom. However, the eventual goal should be to allow students to use the tools under supervision and guidance. Circumscribing predictable outcomes in the design of activities and materials would allow teachers to avoid unwanted distractions in the classroom. For example, creating structured activities which guide learners towards more common and logical relationships between agents or objects would minimize the conflict between syntax and source images. However, considering

the importance of incorporating new media into the classroom, GenAI processes, and how to interact with such tools, could be explored as a learning experience.

For example, since teenage and adult learners will be aware of tools such as DALL·E 2 and may already have some knowledge of their limitations, the tools could be tested and explored jointly with explicit objectives for developing proficiency and digital literacy. However, it may be advisable to oversee output images closely as there is a risk that learners may interpret unexpected output to be a result of their own error rather than a result of DALL·E 2's image generation process. The more aware the practitioner is of the tool's intricacies, the more effectively they will guide students in the development of these new media and incorporate language learning into the process effectively.

To maintain consistency of output, while allowing students to engage with DALL·E 2, it may be necessary for teachers to place some restrictions on prompts if they intend to provide structured and staged versions of them in lessons to students. This could be done by creating guidelines for prompt creation, or by providing structured prompts for learners to add to or edit. Depending on the stakes of implementation, practitioners may choose to draw upon previous studies or carry out their own small-scale tests to determine the appropriacy of the tool to their teaching context. More broadly, it is important for educators to be made aware of some of the underlying GenAI processes and its reliance on data outside of the syntax within a prompt to help inform classroom practice.

DALL·E 2: Bias and Truthfulness

The previous section highlighted inconsistencies in DALL·E 2's output which are not primarily caused by prompt syntax. The impact of prepositions and linguistic complexity in prompts were also investigated in the study on which this work is based (Weide et al., 2024). By examining these elements, the study revealed broader aspects of the GenAI model, showing DALL·E 2's creative potential and challenges in user control. Similarly, the remaining focus integrates grammar and lexis but differs in its focus on cultural context. It works to use DALL·E 2 to enhance learners' multimodal communication—the use of the L2 with other modes of communication, a key aspect in instruction grounded in LbyD. The focus on cultural context further clarifies DALL·E 2's role in pedagogy by addressing the bias and ethics for consideration in the use of these tools, developing AI literacy, including a better understanding of the credibility and truthfulness of DALL·E 2 outputs.

The prompts in Weide et al. (2024) were designed to raise awareness of English varietal differences between British and American English. From the study, prompts 1 and 2 (listed below) were input into DALL·E 2 to compare British and American English varieties. Specifically, this pair of prompts

focused on spelling and vocabulary differences between these two English varieties. The prompt pair was actualized as follows:

1 Picture of a town street, with trees changing colours for autumn. (British)
2 Picture of a town street, with trees changing colors for fall. (American)

This pair was able to demonstrate how linguistic differences within the two prompts resulted in visually distinct outputs as seen in Figures 5.2 and 5.3.

We then continued creating further prompt pairs targeting differences in spelling (e.g., "colour" vs. "color"), vocabulary (e.g., "flat" vs. "apartment"), and grammar (e.g., article use). This further testing revealed that DALL·E 2 is not equally sensitive to British and American English varieties, showing a bias towards the American context despite the language variety used in the prompt. English variety vocabulary was found to be the most consistent linguistic element in eliciting visual output that reflected the context of the variety used (Weide et al., 2024). Desired images can be achieved with the same word that refers to the different concept (e.g., "chips") or different words that referred to the same concept (e.g., "kit" vs. "jersey"). English variety spellings performed best when paired with vocabulary from the same variety. Similarly, English variety grammar produced visually distinct images when placed within a specific cultural context. The results showed that grammar could elicit culturally specific images when associated with linguistic patterns unique to certain cultural contexts. However, across all prompts there was a bias towards what is expected from the American context. Across all the trialing, the best performing prompts were when multiple English variety linguistic elements were included in a single prompt, highlighting the need to compound the prompt's linguistic elements for better results.

Given the diverse backgrounds of English speakers and the integration of various cultures, the use of English tends to vary according to context. Multimodal communication may help English language learners integrate into their desired context. Additionally, as noted by Patel (2023), there is a notable shift away from aiming for native-like fluency towards a more practical and

Figure 5.2 Four AI renderings of a photorealistic avenue, lined on one or either side with trees. This image is based on the British English prompt

Figure note: This image was created using the DALL·E 2 AI image generation platform by OpenAI.

Figure 5.3 Four AI renderings of a photorealistic avenue, lined on one or either side with trees. This image is based on the American English prompt

Figure note: This image was created using the DALL·E 2 AI image generation platform by OpenAI.

context-specific approach to language proficiency. While the study and this chapter primarily examine British and American English, the insights gained can guide a broader analysis of cultural contexts beyond these specific English varieties.

The potential risks of inconsistent output can also range from images that are illogical (i.e., conflicting with expected aspects of reality), or inappropriate for classroom learning. While violent, adult, political, or hateful content is regulated (OpenAI, 2024b), images may still be distressing or contain inappropriate themes for some learners. Even though some unpredictability may be desirable for certain activities, it is essential for teachers to have some degree of control over visual output. As discussed in the previous section, it is important to focus on visual output reliability when it serves as a means for empirical investigation.

The reliability of language models is a crucial ethical concern in their development and use (Zhuo et al., 2023). The rationale behind emphasizing reliability in determining the ethical considerations of an AI model is that false or misleading outputs may be traced back to inaccurate or biased training data. This, in turn, reveals the ethical integrity of the tool (see Chapters 1 and 2 in this volume). Although previous research does not specifically address DALL·E 2, investigations on OpenAI's ChatGPT have shown that "[it] appears to … not fully understand diverse languages" (Zhuo et al., 2023, p. 10). Due to the poor capability of multilingual understanding, ChatGPT can be biased in decision-making and creative generation. We expect that the bias in multilingualism will also potentially imply a bias in multicultural understanding, leading to the unethical impact on underrepresented groups in society.

Zhuo et al. (2023) have also warned that, despite ChatGPT's multilingual limitations, users might still see this tool as a multilingual communicator. This discrepancy underscores the need to understand GenAI technologies as tools designed for specific purposes. While ethical concerns remain paramount in the development of these tools, it is crucial to recognize that users possess a degree of autonomy in how they choose to access and utilize them, whether for benevolent purposes or otherwise. Students and educators must therefore

discover strategies to manage the challenges involved in diversity and digital technologies, while also leveraging their innovative benefits and inclusive possibilities (Cope & Kalantzis, 2024). Recent studies have demonstrated that having high-quality data, even in smaller quantities, can enhance model performance. Additionally, the design of training data is critical for efficient data utilization. For instance, experiments have shown that such methods as curriculum content learning, active learning, and prompting can improve data efficiency. However, many of these strategies are still in their early stages and require further research (Zhuo et al., 2023).

Although the results of the research report on which this work is based (Weide et al., 2024) have revealed that eliciting specific cultural references in the images from a prompt has little predictability, they also point to the fact that cultural sensitivity is paramount when using AI tools. That is, Weide et al.'s research uncovered bias when eliciting specific cultural references (as well as possible preferred lexical and syntactic patterns and relationships) within image prompts for DALL·E 2. These findings suggest that awareness of the AI's preferences may help understand and enhance the effectiveness of prompt creation moving forward. Clearly, cultural context must be considered in each interaction with these tools.

This implies that practitioners cannot avoid a focus on cultural awareness as biases in the training language may affect visual outputs. Furthermore, educators should strive to learn the origins of the tool, its intended purpose, and the motivation behind its creation. When considering DALL·E 2, these questions provide clarity regarding the apparent American bias. DALL·E 2 was developed by Open AI, an American company, and it was trained on 650 million images scraped from the web and aligned by CLIP (Cahyadi et al., 2023). It is also likely that the web scraping used for training ChatGPT, DALL·E 2's training data, is predominantly American. Given the more relaxed privacy and data protection policies in the United States (see King & Meinhardt, 2024), it becomes plausible that a significant portion of the training data originates within this country, and it is therefore reasonable to assume an American bias within the tool. To put it another way, the origin of the company and the potential sources of training data should be considered when evaluating an AI tool.

Another important aspect to explore is the intended use of the tool. OpenAI (2024a) states that they aim to promote creative expression and advance their AI platforms, positioning DALL·E 2 as a versatile tool. However, the general use also implies that the training data was sourced from diverse origins to ensure robustness, which may necessitate less filtering of content topics, potentially allowing undesirable information to be included. Schulhoff et al. (2024) echo this thought, speculating that conventional data generation methods may exhibit biases towards text lengths, locations, and styles.

Weide et al. (2024) have further demonstrated how an obvious example of bias within the training data is also apparent in its output; specifically, the potential influence large companies, brands, or individuals can have on what will be represented. In the previous section, certain specific, syntactically-based

Figure 5.4 Outputs from character specialized prompts

Figure note: This image was created using the DALL·E 2 AI image generation platform by OpenAI.

changes were addressed; however, bias is also seen in semantic/conceptual changes. In their exploration of DALL·E 2, Weide and colleagues also examined semantic/conceptual change as one element of incremental modifications introduced into the prompts with the use of proper nouns (in this case, the introduction of "Arnold Schwarzenegger" and "Mickey Mouse"). The visual output was not able to include specific characteristics associated with Arnold and Mickey, instead eliminating or homogenizing the more distinctive features, as illustrated in Figure 5.4. The inability to create these likenesses is due to copyright reasons, and the image owner's right to opt out of allowing their data to be used for training purposes. This will obviously impact expected results when depicting certain iconic forms or celebrities. Like many aspects of these technologies, having the ability to opt in or out of having your data be used for training models, such as those employed by Open AI, can be both beneficial and detrimental in terms of prompt-image fidelity.

In sum, while ethical concerns remain paramount in the development of GenAI tools, it is crucial to recognize that users possess a degree of autonomy in how they choose to utilize and access them. Consequently, this section highlighted the reality that bias and/or harmful content can emerge within these tools. Practitioners should acknowledge this when considering the utilization of GenAI within their teaching. For example, it is essential to understand who created the tool, its intended purpose, and the motivations behind its creation in order to effectively realize learning outcomes with such tools. As understood through AI literacy, evaluating AI tools involves examining how meanings are created and interpreted in specific contexts. This process requires understanding, assessing, and explaining the functional roles that GenAI plays and critically analyzing who benefits from these tools.

Pedagogical Guidelines: Applications Grounded in *Learning by Design*

This chapter seeks to encourage teachers to embrace new GenAI tools, specifically DALL·E 2, grounded in LbyD. Our aim is not to highlight the challenges of implementing DALL·E 2 or deter the use of GenAI tools in the classroom.

Instead, we address the challenges we have unveiled through our work to emphasize the importance for instructors to develop their AI literacy, and to attain the skills needed to incorporate GenAI safely and effectively into their language teaching practice. GenAI tools such as DALL·E 2 and Chat-GPT can be powerful teaching aids and excel in certain areas, but they are also significantly limited in others. Thus, the benefits they can offer in the language classroom are dependent on instructor utilization.

Clearly, GenAI tools such as DALL·E 2 can offer unprecedented opportunities for the creation of personalized content in language learning classrooms grounded in LbyD. For example, within the *experiencing* knowledge process, DALL·E 2 can be employed for the development of pedagogical materials tailored to learners' interests and sociocultural context, which can facilitate language learning through the association between familiar images and the target language. Nevertheless, as discussed above, since inherent linguistic variety biases appear to exist within this tool, practitioners must also be aware that they must specify the context of an image if the desired output is outside of the American or Western context.

DALL·E 2's limitations can also provide opportunities for activities within the *analyzing* knowledge process. For example, teachers could develop tasks that would allow learners to uncover and critically analyze the biases and problematic representations produced by the tool. To achieve this goal, students could assess the image the tool produces when asked to create a representation of an unspecified "attractive" person, a field worker, or a pilot. Since it is likely that race/ethnicity and gender would play a role in the outputs, educators could focus on issues of diversity and inclusion as well as biases and help students critically dissect the reasons behind the representations offered by the tool. In addition, when a specific cultural context is specified in a prompt (e.g., "a woman wearing traditional clothes in Nepal"), learners could analyze to what extent the tool demonstrates cultural awareness and produces a culturally accurate and appropriate image, and the reasons why this might/might not be the case. These would constitute valuable opportunities for critical analysis and, in turn, the development of students' AI literacy.

Finally, DALL·E 2 has the potential for the facilitation of the activities within the *applying* knowledge process since the tool encourages users to develop creative prompts and experiment with prompt syntax to achieve the desired visual output. As shown in existing works on the use of this tool for language learning (e.g., Hwang et al., 2023), students' L2 use for creating prompts to achieve a particular representation could extend their vocabulary knowledge. However, as discussed in this chapter, the inconsistencies between prompt syntax and visual output must be considered by practitioners aiming to use GenAI tools such as DALL·E 2 in the classroom. Our study found basic inconsistencies between prompt syntax and visual output which would limit the potential of the tool to facilitate the scaffolding of linguistic form.

Based on the potential applications of DALL·E 2 for L2 learning grounded in LbyD, and the insights from our empirical study, the following

recommendations are offered to teachers who seek to incorporate GenAI into their practice:

- Implementation may currently be most appropriate in low-stakes settings in which inconsistency of output may be less impactful to learners.
- Awareness of the intended purpose of the AI tool and of the values of the developers may highlight bias and ethical considerations inherent to the tool.
- Both students and teachers must view GenAI tools critically and develop a strong awareness of their limitations.
- Teachers must develop and maintain strong AI literacy while also having the capability to facilitate learner development of the same skills. This process must be ongoing due to the rapid development of GenAI tools.

This list of caveats is not exhaustive; yet these broad principles do provide a strong basis for effective engagement with these rapidly developing tools. It is essential to remember that GenAI tools are simply tools and cannot be seen as a replacement for human-driven communicative activities in the classroom. As with any tool, it is important to understand how and when to use them—a message that applies to both instructors and students. It is therefore essential for teachers to possess the knowledge and skills to ensure that learners engage with the tool safely and, in turn, develop an understanding of how to do so independently.

Conclusion

New technologies and new literacies are changing the way in which humans communicate. Thus, we believe it is essential for instructors to develop AI literacy as GenAI increasingly becomes a part of language learners' modes of interaction and communication. As authors, we recognize the pressure this may bring to practitioners, and we understand the feeling of trepidation when faced with the ever-changing nature of technological advances. Therefore, the recommendations in this chapter are meant to be guiding points, allowing instructors to adapt their classroom practices within a new age of technological change. The role of a language instructor is not just to provide the most appropriate knowledge, but also the skills and experience to confidently and effectively navigate new communicative contexts. It is the teachers who know learners best, and through these recommendations we encourage them to effectively leverage these tools within the learning context to best serve their students.

This chapter has attempted to demonstrate examples of how DALL·E 2 may be considered for use in the classroom for language learning grounded in the multiliteracies pedagogy LbyD. In the prompt examples, referenced from the authors' research report, insights were built to equip teachers to implement AI tools in their pedological practices. We recommend that practitioners

test AI tools like DALL·E and ChatGPT by experimenting with prompts before fully integrating them in their practice. This chapter suggests that testing should focus on identifying the most suitable settings for using these tools and considering how the tool's design and capabilities may influence its use and the outcomes it produces in the intended contexts of use. Adaptation to this epoch-defining AI field has been the overriding theme throughout this work. However, adaptation needs to be done in a principled, systematic, and evidenced-based manner with the learner's educational needs at the core to ensure lasting, beneficial impact use in language learning.

GenAI use in this chapter: The authors in this work generated the images presented throughout the chapter to show the affordances and limitations of DALL·E for educational purposes. The inclusion of the images adheres to the tool's, OpenAI's (2024c) DALL·E, sharing and publication policies.

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6 "If ChatGPT was used … then it shouldn't be graded"

Understanding Pre-Service Teachers' Perceptions Towards Generative Artificial Intelligence for English Teaching and Learning

Fei Victor Lim and Tan Xin Xin

Introduction

The multiliteracies manifesto advanced by the New London Group (1996) almost 30 years ago has emerged as a fitting response to the dual challenges confronting 21st-century education. Firstly, it acknowledges the heterogeneous nature of student populations, demanding pedagogical approaches that build upon learners' diverse experiences. Secondly, it addresses the rapid evolution of digital technologies, recognizing the imperative for students to develop robust capacities for multimodal meaning-making (Cope & Kalantzis, 2015). By envisioning students as "designers of our social futures" (New London Group, 1996), the framework necessitates a fundamental reconceptualization of literacy and pedagogy. This paradigm shift has significantly influenced literacy curricula globally (Lim, 2023; Mills, 2011; Serafini & Gee, 2017; Zapata, 2022; Zapata et al., 2023).

Recent revolutionary developments in digital technologies, particularly in Generative Artificial Intelligence (GenAI), have afforded novel ways of meaning-making as well as placed new literacy demands on students to be able to use these technologies responsibly, effectively, and critically (Cope & Kalantzis, 2024). GenAI "leverages deep learning models to generate human-like content in response to complex and varied prompts" (Lim et al., 2023, p. 10). GenAI was introduced in the 1960s with early experiments with chatbots (Lawton, 2024). However, its transformative potential to generate text, images, music, and other types of content only began in 2014 when generative adversarial networks (GANs), a type of deep learning model, were introduced. GANs consist of two neural networks—a generator and a discriminator—trained together such that the generator creates realistic data while the discriminator tries to distinguish between real and fake data (IBM, 2024). Essentially, these deep learning algorithms are trained to generate a wide range of data types similar to those in the training set.

The emergence of GenAI applications like ChatGPT-3.5 in November 2022 marked a significant turning point in this field. "GPT" in ChatGPT

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refers to "generative pre-trained transformer" which is a large language model (LLM) trained on a vast amount of data that can create new texts based on the prompts given (Gupta et al., 2023). LLMs are designed to perform various natural language processing (NLP) tasks such as text generation, summarization, and translation, among many others (Lawton, 2024). NLP involves the development of algorithms that help computers understand, interpret, and generate human language in meaningful and contextually relevant ways. The simple chat interface where users can input any prompts to elicit responses, and the unfettered access of certain limited versions of GenAI platforms, such as Open AI's *ChatGPT*, Google's *Gemini*, and Amazon Web Services' *Claude*, have made available the powers of LLMs to the masses.

As a result of their public availability, the use of these tools is growing in popularity in all areas of society, including education. Recent research (e.g., Abunaseer, 2023; Chan & Hu, 2023; Chiu, 2023; Kim & Kim, 2022; Woodruff et al., 2023) has explored how GenAI is being incorporated into instruction by examining its opportunities, challenges, and affordances. In the area of second language (L2) education, for example, studies have focused on GenAI and writing instruction, reporting benefits for students in connection with idea generation, task organization, grammar, vocabulary, text coherence, cohesion, and writing self-efficacy (e.g., Boudouaia et al., 2024; Karataş et al., 2024; Mahapatra, 2024; Pellas, 2023). Other works (e.g., Derakhshan & Ghiasvand, 2024; Jeon & Lee, 2023; Moorhouse, 2024; Ulla et al., 2023; Yeh, 2024) have also highlighted the utility of GenAI tools as pedagogical aids for educators, who can employ them to develop assignments, educational materials, and lesson plans, as well as for delivering personalized instruction and providing constructive feedback to students.

Besides examining the possible affordances of GenAI tools in specific areas of education, given their increasing pervasiveness, we believe it is also useful to consider the literacies involved in their use as part of multiliteracies, specifically in response to the affordances of new semiotic technologies. Semiotic technologies (van Leeuwen & Djonov, 2012; van Leeuwen et al., 2013) provide a valuable lens through which to examine what innovations and benefits AI tools can bring to educational contexts. As Djonov and van Leeuwen (2017) emphasize, an understanding of semiotic technologies necessitates consideration of their design, utilization, and broader sociocultural milieu. This entails the development of multiliteracies in students specifically related to the use of GenAI tools so that they can harness the affordances of the new meaning-making potential of digital technologies.

As a starting point, it is important to examine the factors shaping teachers' perceptions towards the use of these tools. This will offer us the understandings of how we can build the multiliteracies teachers and students need to engage with GenAI technologies critically and meaningfully. In this study, we seek to achieve this goal. To do so, we examine pre-service teachers' perceptions

towards the use of GenAI tools in their English language lessons in three educational contexts—Singapore, Denmark, and Switzerland. Specifically, we are interested in exploring whether educators' attitudes and beliefs vary across these contexts. We reflect on the findings and discuss the implications on the development of multiliteracies in teachers and students to engage with GenAI tools as semiotic technologies.

In the next section of the paper, we introduce the research questions that guided this work, and we present the study. This is followed by the description and discussion of our findings. In the last part of this chapter, we offer recommendations for teacher education with a focus on multiliteracies in connection with GenAI in L2 education.

Research Questions

Our study seeks to explore pre-service teachers' perceptions of the use of GenAI in English Teaching and Learning (ETL) across educational contexts by addressing the following research questions (RQ):

> RQ1: How do pre-service teachers preparing to teach in different educational contexts perceive the use of ChatGPT, as representative of GenAI technologies, in English Teaching and Learning?

> RQ2: What are the factors that influence pre-service teachers' perceptions of GenAI technologies as represented by ChatGPT?

The Study

Participants

Three primary and secondary school pre-service teachers, Clara, Ava, and Bella (pseudonyms), participated in this work. The three participants were between 21 and 24 years old, and they were recruited for the study through purposive sampling from the second author's network. The rationale for recruiting pre-service teachers, as opposed to in-service educators, was to control for variables like age and proficiency in digital technology, thereby increasing research validity. Pre-service teachers, predominantly from Generation Z (born in the 2000s), have grown up in an era of widespread accessibility to technology and social media. In contrast, in-service teachers represent a more diverse age range, encompassing varied levels of exposure to digital technology. To ensure similarities among participants, three criteria were established for their selection: They (1) had to be female; (2) had completed at least half of their teacher education coursework; and (3) would be teaching in a primary or secondary school upon graduation. These criteria allowed for the three educators to differ only in the educational context where they were studying (i.e., the country they are based in).

Educational Contexts

The countries in which the participants were studying were Singapore (Clara), Switzerland (Bella), and Denmark (Ava). Features of each educational context are presented in Table 6.1. Although the Danish and Swiss contexts were similar, they differed mainly in the emphases of their education systems: While the first one focused on fostering creativity, the second one emphasized the incorporation of vocational training. The Singapore educational context differed from the other two contexts both in geographical terms and the meritocratic approach that underscores academic performance. More importantly, all three educational contexts exhibited differing levels of receptivity towards the incorporation of AI in education. The Singapore educational context appeared to be the most receptive, followed by Switzerland, where no clear policy on GenAI use was present, and then Denmark, where the employment of

Table 6.1 Description of the participants' educational context

Participant	*Educational context*	*Features of educational contexts*
Ava	Denmark	• Located in Northern Europe • Decentralized educational system • Local authorities have greater autonomy and flexibility • Majors on creativity and critical thinking • No streaming or national examinations until upper secondary school • English as a Second Language (ESL) not the language of instruction in schools • Has an innovative education system but approaches AI with caution which might lead to slower adoption rates
Bella	Switzerland	• Located in Central Europe • Highly decentralized federal educational system • Emphasizes vocational training alongside academic education, offering multiple pathways to cater to different interests (dual education system) • Streaming typically starts later, often after compulsory education • ESL not the language of instruction in schools • Openness to AI differs significantly across states
Clara	Singapore	• Located in Southeast Asia, small city-state • Centralized educational system with national curriculum and standardized testing • Meritocratic (majors on academics and preparing students for higher education and career opportunities) • Streaming after primary school based on academic performance • English as language of instruction in schools • Very receptive to AI in education and invests heavily in using AI to promote efficiency and individualized learning

GenAI tools in academic contexts was banned. Based on these differences, the three contexts of focus represented three distinct cases to be cross-examined for this study.

Due to its popularity and the likelihood that teachers and students would be more familiar with it, in this study, Open AI's ChatGPT was selected as the representative of GenAI technologies. Also, in this work, the discussion of the use of GenAI for English teaching and learning is assumed to be within the age- and context-appropriate guidelines set for its use. The research parameters were also scoped to focus on the domain of ELT.

Data Collection

Our study adopted a qualitative research approach which involved online, semi-structured interviews conducted via Zoom. This method was selected to allow for more open-ended responses and a deeper understanding of the participants' experiences. The interview questions focused on how GenAI might impact various areas in education, such as curriculum, pedagogy, and assessment (Appendix 6A). An Institutional Review Board application was submitted and approved to ensure that the research study adhered to ethical standards, protecting participants' rights and well-being. After approval, the three shortlisted interviewees were contacted and asked to complete an informed consent form to confirm their agreement to participate in the study. A short online background questionnaire was also administered to ensure that the participants' profiles met the criteria for this research (Appendix 6B). The information gathered from this questionnaire provided useful background profiles on the participants, which helped facilitate the interview sessions. The interviews with each participant were audio-recorded and transcribed for analysis.

Data Analysis

The interview transcriptions were analyzed for meaningful themes for comparison using thematic analysis (Braun & Clarke, 2006; Clarke et al., 2015). The focus of the analysis was the determination of the extent to which the participants' perspectives were similar or different to identify possible factors influencing the recorded opinions. The qualitative data were coded inductively and categorized through a rigorous process of open, axial, and selective coding. Firstly, the transcribed data were analyzed via open coding where meaningful speech was highlighted in a different color to identify potential concepts or themes present. Next, in axial coding, certain codes related to the topic emerged such as "positive perceptions," "negative perceptions," "external factors," and "internal factors." Lastly, for selective coding, the data across all three transcriptions were integrated to focus on the key themes identified in the previous coding stage. The similarities and differences in terms of teacher perceptions (positive or negative) and influences (internal and external) were then compared across the three educational contexts of focus.

Findings

The results of the study are based on both the responses to the background questionnaire and the analysis of the transcribed interviews. From the background questionnaire, Clara, the participant in Singapore, indicated that she sometimes used ChatGPT for schoolwork and assignments as well as a source for teaching ideas. Ava, the pre-service teacher from Denmark, reported that she rarely employed ChatGPT. Bella, the Swiss participant, stated that she had never used ChatGPT. Both Clara and Ava seemed to be open to using GenAI as represented by ChatGPT as a tool in English teaching and agreed that it could be useful for English learning when employed in age-appropriate ways with students. In contrast, Bella disagreed with both her Singaporean and Danish counterparts.

The thematic analysis of the transcribed interviews resulted in the identification of four overarching themes with regard to the participants' perceptions on the use of ChatGPT for ETL, including (1) positive attitudes towards GenAI; (2) concerns about GenAI; (3) GenAI use and the teacher's role; and (4) appropriate use of GenAI. The analysis also resulted in the identification of both social and personal factors that seemed to play a role in the participants' views of GenAI in education, namely: (1) School policy, (2) news and social media, (3) friends, and (4) personal values and experiences. Results in connection with each identified theme and factor are discussed as follows in separate sections.

Participants' Perceptions of GenAI for ETL

Positive Attitudes Towards GenAI

All three participants appeared to exhibit positive attitudes towards the affordances of GenAI for ETL, as represented by ChatGPT. From a student perspective, possible benefits could involve "defining terms" (Clara) for an assignment, writing an "outline that you could follow for an essay" (Bella), and finding "synonyms … [and summarizing] the most important bullet points" in a text (Ava). From a teacher perspective, the affordances identified included "obtaining 'more options' for diverse perspectives" (Clara), "[creating] lesson plans" (Bella), and "[getting] inspiration" for teaching practices/interventions (Ava). Additionally, the three participating educators also highlighted ChatGPT's ubiquity and ease of use, which could benefit their practice in terms of both creativity and accessibility as well as save time in lesson/materials development.

Concerns about GenAI

Despite the affordances they identified in connection with ChatGPT, the three participants also expressed concerns over its use in ETL. While Clara

seemed to be aware of its technical limitations, Bella and Ava raised ethics concerns. For example, Clara made reference to misinformation and inaccuracy as "very big con[s]" of GenAI tools. This teacher also observed that the quality of the output generated by ChatGPT is dependent on the prompt, which sometimes may interfere with effective use, as "some teachers might struggle with … phrasing their questions or prompts," and might therefore become frustrated or reluctant to employ GenAI technologies in their practice. Bella and Ava also felt ChatGPT users may cultivate an overreliance on the tool. For instance, Bella feared "that [users] [will not] know how to create their own [writing] outline anymore." Similarly, Ava believed that using ChatGPT in ETL "might affect writing skills negatively because then you just copy and paste from ChatGPT … and just rephrase sentences instead of constructing [them] yourself." Two more limitations identified by these two participants were connected with academic misconduct. For example, Bella referred to students' potential misuse of this tool in school assessments based on her experience with learner works where "a few exam questions ha[d] been answered through ChatGPT," while Ava stated that she "always related ChatGPT to cheating in tests or in assignments … and cheating in exams."

GenAI Use and the Teacher's Role

The participants also discussed the impact of the use of ChatGPT on the teacher's role in the classroom. For example, Clara felt that teachers did not fully understand the implications of the use of GenAI in ETL and needed to experience these technologies as well as expand their knowledge of them. This participant also believed that teachers should be "more open to try and actually learn [how to use ChatGPT for themselves] so [they] can teach the students how to use it the right way." Ava and Bella also suggested that there might be a connection between a teacher's profile and their openness towards ChatGPT for teaching. For instance, in Bella's view, "older [teachers] are pretty much against [using GenAI, while] the younger ones are [more receptive]." Nevertheless, all participants agreed that teachers play a key role in modeling and guiding students in the use of GenAI tools in the classroom.

Appropriate Use of GenAI

All three participants felt that ChatGPT should not be used for generating content for assignments. For example, Clara rendered such use unethical because "using GenAI [to develop content implies] it's not [the student's] work anymore, so [they cannot be] fairly graded or assessed." Instead, this teacher believed, ChatGPT could be employed to "explain concepts [or] correct grammar or spelling," both of which she had tried in her own assignments. Bella and Ava had not used GenAI in their work, and they both regarded its use as problematic, even if guided by specific restrictions/rules.

Factors Playing a Role in the Participants' Perceptions on GenAI for ETL

School Policy

The participants' perceptions of ChatGPT appeared to have been influenced by the school's policy on its use in assessments. For instance, Clara recounted that in her university, students have to "sign a cover sheet before submitting [their] work." Additionally, she described how her university had "tightened down [GenAI use] restrictions" by clearly articulating how students are expected to make use of these tools. For example, she stated that it is "okay to use ChatGPT for correcting your grammar or spelling but you can't use it for generating your whole essay." By signing the clause on the cover sheet, students are expected to adhere to the guidelines set on the use of ChatGPT in assessments, and as such, this seems to have determined the way in which she uses GenAI in assignments.

Bella's situation differed from Clara's since, due to the highly decentralized Swiss federal education system, there did not seem be a clear, general policy towards the use of GenAI in ETL. Hence, Bella's university did not have an explicit policy on the employment of GenAI tools in assignments. Even though this participant stated that her friends "ha[d] used ChatGPT … for a lot of assignments … because it wasn't explicitly stated that [they] shouldn't use it," she did not appear to have embraced it for the completion of her academic work.

Ava's institution exhibited the strictest rules in connection to the use ChatGPT "because … [the school had] restricted" its use for the completion of any academic work. As a result, Ava described how, whenever her peers tried to employ this tool, they needed to connect their computers' Wi-Fi to their personal phone "hotspot." These restrictions and the behaviors she had observed seemed to have given this participant the sense that GenAI tools were forbidden, and therefore, she appeared to have developed a negative perception towards them.

Another factor that seemed to have influenced the participants' attitudes towards GenAI tools was their teachers' perceptions and use of these tools. For example, Clara observed that her university instructors "generally aren't opposed to" the use of GenAI tools. Therefore, she was more positive towards the use of ChatGPT for ETL than her fellow participants, who had not observed these types of attitudes among their tutors.

News and Social Media

All participants described the influence of news and social media in shaping their view on GenAI in education. For example, Clara recalled that the first time she had "ever heard about ChatGPT" was via "[social] media outlets" such as "Tik Tok … or maybe even a Twitter post," stating that the content

of posts that caused her to be curious about GenAI and had compelled her to learn more about it. Bella and Ava felt that the negative news surrounding the use of GenAI such as how "people ha[d] misused ChatGPT" and "the dangers of AI" had instilled in them concerns about the challenges and risks that could result from the use GenAI tools, thereby creating negative perceptions towards the incorporation of these tools in the ETL classroom.

Friends

The participants' friends appeared to have exerted some influence on their perceptions towards GenAI. For example, Clara stated that she had mostly learned about ChatGPT from her friends, and she had seen some of them successfully use this technology. These experiences, she suggested, appeared to have positively influenced her views of these new technologies. In contrast, both Bella and Ava felt that their friends' attitudes had negatively influenced their perceptions. These two participants described how their conversations with friends had mostly focused on the dangers of AI and/or unethical uses of these technologies in academic contexts. As a result, they both believed that these opinions had stayed with them and had predisposed them to question the incorporation of GenAI in education.

Personal Values and Experiences

The pre-service teachers' perceptions of the use of GenAI tools for ETL seemed to have also been affected by their personal values and experiences with these technologies. For example, Clara reported using ChatGPT often and was therefore open to embrace its incorporation into the ETL classroom in effective, responsible, and critical ways. In contrast, Bella felt that ChatGPT was incompatible with her belief in hard work. For her, people who use ChatGPT in schoolwork are lazy as they can use it to "write [their] whole assignment … and just copy over and submit [it]." Also, this participant believed that overreliance on GenAI might lead people to "forget how to do things ourselves," which, in turn, could affect the "value of working on something, thinking about something [or] creating something." Ava's opinions of ChatGPT were initially similar to Bella's. However, once this participant had been exposed to the technology, and had been able to use it and gain a deeper understanding of its affordances, her views became more positive.

Discussion

The study aimed to offer insights on how the three pre-service teachers preparing to teach in different educational contexts perceived the use of ChatGPT, as representative of GenAI technologies, in ETL. Our findings revealed both similarities and differences in the three participants' perceptions on the use of GenAI tools. Specifically, we found that the participants

shared broadly similar positive perceptions as well as concerns about the use GenAI in ETL and mostly concurred in their concerns on the limitations of GenAI tools and the challenges they might bring to ETL. Additionally, they reflected on the importance for teachers to be more receptive towards the use of GenAI in the classroom and to model and guide students on how GenAI can be used responsibly and ethically. The participants also suggested that teachers' age, which might affect their experience with and attitudes towards technology, may influence their perceptions towards the use of GenAI for ETL. Despite the similarities, key differences were observed as well. Clara had more positive perceptions of the use of GenAI tools for ETL and the concerns expressed towards the use of these technologies seemed to be informed by her familiarity and personal use of ChatGPT.

This work also sought to explore the factors that might influence preservice teachers' perceptions of GenAI technologies as represented by ChatGPT. The participants identified factors such as school policies, news and social media, friends as well as their personal values and experiences with GenAI tools as playing a role in their perceptions on GenAI for ETL. For instance, in light of the explicit school policies in her educational context of Singapore on the use of GenAI for assignments, Clara seemed to have the most informed and confident attitudes about the value of GenAI for ETL. In this participant's case, personal use of ChatGPT and her university's explicit policies appeared to have positively shaped her perceptions on GenAI technologies. Also, she was keen to understand how GenAI can be used effectively, responsibly, and critically. These understandings form the basis of the multiliteracies involved in the use of GenAI tools as semiotic technologies (van Leeuwen & Djonov, 2012; van Leeuwen et al., 2013). As part of the development of multiliteracies for the use of GenAI tools, it is important to instill a positive attitude and openness in both teachers and students to explore the features of these new technologies. Such a stance will help them identify and embrace the affordances that GenAI tools can bring to ETL. Notwithstanding, it is also crucial for them to adopt a critical perspective on the use of these tools. As semiotic technologies, GenAI tools are designed with specific values and limitations which have implications on the ways they are used and the meanings they make (see Chapters 1 and 5 in this volume). For example, concerns over algorithmic bias may lead to the perpetuation of stereotypes (Burrell, 2016; UNESCO IRCAI, 2024). As such, it is crucial, as part of multiliteracies development for the use of GenAI tools, to adopt a cautious and discerning attitude, even if teachers might be positive and open to new pedagogical possibilities for ETL.

In contrast to Clara, Bella exhibited mostly negative perceptions towards the use of GenAI for ETL. This stance appeared to have originated mostly from the participant's personal values, which inhibited her desire to explore GenAI tools (Ajzen, 1991). Despite the fundamental role played by personal views, the participant's school policy might also have contributed to her rejection of GenAI in education. That is, the absence of official restrictions on the

use of GenAI in academic work resulted in some students using it irresponsibly or, like Bella, rejecting it.

Ava's attitudes were similar to Bella's, but they became more positive as a result of the participant's experience with ChatGPT. Ava's initial negative perceptions could be attributed to confirmation bias, which is the "tendency to interpret information in a way that confirms one's preconceptions" (Nickerson, 1998). That is, Ava's initial negative perceptions about using ChatGPT were likely the result of influences within her educational context in Denmark, where her institution had restricted the access of ChatGPT on the school Wi-Fi and banned its use for the completion of academic work. Additionally, Ava's friends appeared to hold negative views on GenAI tools, which might have also affected the way she viewed them. While, clearly, as shown by Ava's case, the educational context is influential in shaping pre-service teachers' perceptions towards the use of GenAI, it is encouraging to recognize that initial negative perceptions can change through positive personal experiences and the use of the new technologies. As such, Ava's case suggests that personal experiences can have a stronger influence than other factors. This insight is particularly promising for teachers who may be less receptive to GenAI for learning and teaching. Therefore, creating opportunities for student and teachers to engage with ChatGPT and other GenAI tools may enable them to gain competence and confidence, ultimately shifting their perceptions from negative to positive.

The participants' experiences also point to the need to establish clear school policies on the use of GenAI tools for guiding their application in the classroom. Policies and curriculum documents serve a vital signaling function—indicating to both teachers and students what is valued and important (Lim et al., 2021). Therefore, we believe that the introduction and use of GenAI tools in education must be accompanied by an emphasis on multiliteracies in the curriculum. Schools and curricula must incorporate the development of multiliteracies for teachers and students in order to develop the appropriate literacies for their use of GenAI tools responsibility, ethically, and meaningfully. That is, while Bella, and initially Ava, might not have chosen to explore GenAI technologies on their own, a focus on multiliteracies in the curriculum could have challenged and potentially changed their negative perceptions of and reluctance toward the incorporation of GenAI tools for ETL. Additionally, all participants highlighted the key role that educators play in modeling and guiding students in the use of GenAI tools in the classroom. This consensus offers more support for clear, top-down guidelines, grounded in multiliteracies-based principles and practices, to support educators to effectively adopt these technologies, regardless of their initial perceptions towards them.

A way to achieve this goal would entail the establishment of opportunities for pre-service teachers to engage in the knowledge processes of *experiencing* and *applying* as part of the *Learning by Design* framework for multiliteracies learning (Cope & Kalantzis, 2015; see also Chapters 1 and 2 in this volume). Learning activities would include those that draw on pre-service teachers' experiences with the use of GenAI in their personal

lives and encourage them to experience and apply GenAI tools in the classroom, such as using GenAI tools as brainstorming and feedback assistants for writing, materials development, and/or lesson planning, or to create images and videos as part of digital multimodal composing. Additionally, the incorporation of critical assessment tasks for teachers to *conceptualize* and *analyze* the content of GenAI outputs both in terms of meaning-making and the ideologies/biases embedded in them could result in the identification of communicative strengths and weaknesses as well as problematic socio-cultural issues related to the message conveyed by the AI. Through an experiential learning and hands-on practice approach grounded in multiliteracies, we believe pre-service teachers can better understand how GenAI tools can be used effectively, responsibly, and ethically, and be inspired to revisit the initially negative perceptions they might hold towards employment of GenAI for ETL.

Even though in this study, both institutional and personal factors were identified as influencing pre-service teachers' perceptions of using ChatGPT in ETL, more needs to be done. Future research could, for example, explore teachers' perceptions across different contexts and profiles (e.g., age, gender), particularly in countries where GenAI adoption in education is more widespread. Such comparisons could provide insights and identify alternative factors that might affect teachers' views. Identifying factors that encourage or prevent teachers from adopting GenAI is an important empirical question. Understanding both external and internal variables and how they interact could help shape interventions that motivate teachers to capitalize on the affordances of GenAI tools. Such studies would support not only the training of preservice teachers but also long-serving educators, contributing to a more inclusive and technologically adaptive global educational landscape.

Conclusion

Our study aimed to contribute to research in teacher education both theoretically and practically. We examined the perceptions of three pre-service teachers on the use of ChatGPT for ETL, unveiling the factors that might play a role in them. We showed that school policies appear to matter as much as personal values and experiences. Based on our results, we emphasized the need for clear institutional policies on the use of GenAI in education as well as the establishment of opportunities for pre-service educators to explore and experiment with GenAI tools in the curriculum. Above all, we believe that the adoption of pedagogical practices grounded in multiliteracies would facilitate both the critical assessment and use of GenAI technologies. The sole focus on the use of the technologies without attention to the literacies involved is inadequate and may risk leading to misuse and abuse. Instead, having clear and explicit guidelines on GenAI usage and designing pre-service learning and continual professional development that requires students to engage with GenAI tools for themselves, through the *Learning*

by Design framework, with emphasis on socio-material learning, can counter initial negative perceptions and promote effective, responsible, and critical GenAI use.

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Appendix 6A Interview Questions

1 Could you share with me your personal experience using ChatGPT either in your own life or for the teaching of English?
2 How has your use/non-use of ChatGPT shaped your beliefs of whether and how ChatGPT should be used in the language classroom?

- What are your personal thoughts on using ChatGPT in English teaching, and why?
- What are your personal thoughts on age-appropriate students using ChatGPT in English learning, and why?

3 What is your country/city/school's stance on using ChatGPT in education, and why do you think they hold such a stance?
4 How do your personal and country/city/school's stance on the use of GenAI in education align or differ, and why so?
5 What do you think are some of the value and challenges of using ChatGPT for teachers?
6 What do you think are some of the value and challenges of using ChatGPT for age-appropriate students?
7 From the viewpoint of an English educator, with writing as an important process skill in English education, how does ChatGPT's ability to "write" for students affect language learning?
8 How do you think English educators can overcome the challenges of using GenAI in English education?

Curriculum:

9 Are there things we need to teach in the language classroom with the rise of GenAI?

Pedagogy:

10 How can ChatGPT be used in the language classroom (e.g., ways of teaching)?

Assessment:

11 With the emergence of ChatGPT, should we change the way we assess, and how (e.g., less emphasis on certain assessment components)?
12 With the use of GenAI in the language classroom, how can teachers identify that students have learned what was taught?
13 In the past, we have assessed students' learning largely through their writing. How do you think this will change in the future?

Infrastructure:

14 How would students access GenAI tools? Is technical proficiency necessary, and why?

Concluding question:

15 Are there any other thoughts or comments you'd like to add to the discussion?

Appendix 6B Background Questionnaire

Hi! Thank you for participating in my research which seeks to explore preservice teachers' perceptions on the use of generative artificial intelligence (GenAI) in English teaching and learning across educational contexts. Your valuable input will provide useful background knowledge that will facilitate the upcoming Zoom interview. Please be assured that personal details and identifiable information will be kept confidential. The questionnaire will take approximately 5–10 minutes. Your time and contribution are appreciated. Thank you!

* Indicates required question

1 **Name: ***
2 **Gender: ***

Mark only one.

- Male
- Female

3 **Age: ***

Mark only one.

- 21 years old
- 22 years old
- 23 years old
- 24 years old
- 25 years old

4 **Nationality: ***

_____

5 **Country and City of Residence: ***

_____

6 **Name of Institute of Teacher Education: ***

_____

7 **Year of Teacher Education Studies: ***

Mark only one.

- Year 1
- Year 2
- Year 3
- Year 4

8 **Teaching Subjects: ***

_____

9 **What are your post-graduation plans? ***

(e.g., Will be posted to a primary school to teach.)

_____

10 **What are some GAI platforms that you use?**

(e.g., ChatGPT, Bard, Scribe). You may skip this question if you do not use any.

_____

11 **How often do you use ChatGPT? ***

Check all that apply.

- Always
- Often
- Sometimes
- Rarely
- Never

12 **What do you usually use ChatGPT for? ***

Check all that apply.

- Support school work/assignments
- Source for teaching ideas
- Craft teaching assessments
- I don't use ChatGPT

13 **With reference to the previous question, what other personal uses do you usually use ChatGPT for?** *(If applicable.)*

_____

14 **Please indicate your level of agreement or disagreement with the following statement: ***

I would use ChatGPT as a tool in English teaching.

Check all that apply.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

15 **Please indicate your level of agreement or disagreement with the following statement: ***

16 ChatGPT is a useful tool in English learning for age-appropriate students.

Check all that apply.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

7 Reflections and Future Directions

Gabriela C. Zapata

Introduction

The chapters in this volume have collectively shed light on the potential transformative role of Generative Artificial Intelligence (GenAI) in reshaping second language (L2) education. By situating the discussion within the pedagogy of multiliteracies (NLG; New London Group, 1996) and *Learning by Design* (LbyD; Cope & Kalantzis, 2023; Kalantzis et al., 2005), the contributors have examined theoretical foundations, practical applications, and socio-cultural ramifications, offering a comprehensive understanding of how these tools can be meaningfully integrated into teaching and learning. This concluding chapter synthesizes these insights, offers a reflection on their implications for language education, and provides recommendations for teacher education and future research.

Reflections on the Volume's Contributions

The Transformative Potential of GenAI in Language Education

GenAI's ability to produce text, images, and multimodal artifacts has emerged as a pivotal innovation in language education. As articulated in all chapters, tools like ChatGPT and DALL·E have fundamentally disrupted traditional pedagogies, enabling personalized feedback and multimodal engagements that were previously unattainable. These capabilities align closely with the pedagogy of multiliteracies, as envisioned by the NLG (1996), as well as LbyD (Cope & Kalantzis, 2023). Both approaches emphasize the integration of meaning forms beyond just text or speech for communication in diverse contexts, including digital ones, as well as the development of personalized learning experiences, reflective of students' identities, lifeworlds, and personal and academic needs. And the pedagogical potential of GenAI is particularly evident in its ability to support both this type of communication and the establishment of dynamic, inclusive, and personalized learning environments.

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Ethical and Operational Challenges

While, as shown in all chapters of the book, the benefits of GenAI appear to be substantial, its integration into L2 educational contexts is also fraught with challenges. For instance, Chapters 1, 2, and 6 unveiled concerns surrounding originality, privacy, and equity, as well as raised ethical questions about authorship and intellectual property. Based on their discussions, these chapters' authors called for robust institutional guidelines and critical literacy among educators and learners as well as innovative instructional and assessment tasks. Similarly, Chapters 3–5 explored the risks of cultural insensitivity and/or algorithmic bias, emphasizing the need for culturally responsive pedagogies and vigilant oversight in the deployment of AI tools. These challenges point to the crucial role that targeted teacher education programs and professional development initiatives will play in the implementation of GenAI in L2 classrooms. That is, this book's works showed that educators must be equipped not only to harness the affordances of GenAI but also to critically evaluate its implications for diverse learning contexts.

Expanding the Scope of Multimodal Literacy

The practices discussed in Chapters 1–5 suggest that GenAI tools can inherently support multimodal literacy by enabling the creation and analysis of texts that combine a variety of meaning forms (e.g., text, image, space). This aligns with the principles of both the pedagogy of multiliteracies (NLG, 1996) and LbyD (Cope & Kalantzis, 2023), as they both emphasize the importance of engaging learners in diverse modes of meaning-making. Chapters 1, 2, and 5 provided extensive examples of how educators can leverage GenAI to enhance learners' abilities to navigate and produce multimodal texts, fostering deeper engagement with curricular content and real-world applications.

Suggestions for Teacher Education

As emphasized in Chapters 5 and 6, teacher education must also evolve to prepare educators for the complexities of integrating GenAI in L2 education. Comprehensive professional development programs should focus on building AI literacy, emphasizing the technical and pedagogical applications of GenAI tools. These programs should also provide opportunities for teachers to experiment with GenAI tools, collaborate with peers, and reflect on their pedagogical practices.

Reflective practice, grounded in multiliteracies pedagogies and supported by collaborative networks and communities of practice, can enable teachers to share experiences, strategies, and innovations. Training should also emphasize culturally responsive pedagogy, equipping teachers to address the diverse needs of their students while fostering inclusive and equitable learning

environments. Additionally, institutions must prioritize research-based approaches to professional development, ensuring that educators are equipped to navigate the dynamic landscape of AI-mediated education effectively.

Based on the information provided in this volume's chapters as well as existing literature on teacher education (e.g., Ng et al., 2021; Sperling et al., 2024), we believe pre- and in-service training modules should include the following:

- Explicit instruction on GenAI, grounded in multiliteracies pedagogies (e.g., LbyD's knowledge processes and metafunctions [see Chapter 1, pp. 29–35]), including instructional tasks offering scaffolded guidance for pre- and in-service L2 educators' hands-on engagement and work with GenAI to develop their knowledge of
  - The nature of GenAI technologies (where and by whom they have been developed, how, and for what purpose)
  - Their affordances and limitations
  - The ethical implications (e.g., personal, social, cultural, and political) arising from GenAI use for education
- Hands-on tasks for designing AI-enhanced lesson plans and instructional interventions grounded in multiliteracies practices (NLG, 1996) or LbyD's (Cope & Kalantzis, 2023) knowledge processes (see the Introduction to this volume and Chapter 1)
- Collaborative forums for sharing best practices when using GenAI tools for L2 teaching, including strategies for integrating GenAI in culturally responsive and ethically sound ways
- Critical discussions on the socio-cultural/pedagogical impacts of GenAI in L2 education

Directions for Future Research

Future research on the incorporation of GenAI into L2 education should prioritize longitudinal studies. This type of research can reveal the long-term impacts of GenAI tools on L2 learning, shedding light on the ways in which they can shape linguistic (and multimodal) competencies as well as AI literacy over time. By examining the employment of GenAI tools in L2 classrooms for extended periods, we can better understand the evolving influence of these technologies in L2 educational contexts.

In addition to longitudinal studies, cross-cultural comparisons are essential for understanding the varied ways educational contexts shape the adoption and effectiveness of GenAI in L2 education. Investigating how different cultural and sociolinguistic environments (including those characterized by translingual practices) influence AI integration can help identify best practices and create tailored curricula that maximize the pedagogical potential of these tools. Such research underscores the importance of context-sensitive approaches to technology in education.

Equally important is the focus on the ethical and social implications of using GenAI in L2 classrooms. Concerns such as algorithmic bias, data privacy, and equitable access demand careful examination. Research in this area can guide the development of policies that promote responsible and inclusive use of AI technologies, ensuring that these tools benefit all learners fairly, respecting and embracing their identities and lifeworlds as well as personal and academic needs. Addressing these issues is critical to fostering trust and equity in educational AI applications.

Learner-centric approaches also deserve focused attention. Understanding how GenAI affects students' motivation, creativity, and critical thinking is crucial. Qualitative studies can capture learners' perspectives, providing insights into how they perceive and interact with AI tools. Such findings can inform the design of more engaging and effective learning experiences.

Another critical area of inquiry is teacher preparedness. Investigating the effectiveness of teacher education programs in building AI literacy and integrating GenAI tools can highlight gaps in existing curricula. Comparative studies can also identify opportunities for enhancing teacher training, ensuring educators are well-equipped to harness the potential of AI in their classrooms.

Finally, expanding research beyond higher education, a context where much of the existing work has been carried out, is vital for understanding the broader applicability of GenAI in L2 education. Studies should explore the employment of GenAI for L2 teaching and learning in primary and secondary schools as well as adult education (e.g., community-based ESL programs). Researching age-appropriate pedagogical adaptations can reveal how these technologies might meet the diverse needs of learners across various educational stages.

Conclusion

The chapters in this volume underscore the pivotal role of GenAI in revolutionizing L2 education by enabling dynamic multimodal literacy and personalized instruction. While the potential benefits are substantial, their realization depends on addressing challenges such as ethical concerns, algorithmic biases, and equity gaps. The recommendations presented in this chapter emphasize robust teacher education and culturally responsive pedagogy as essential for effective integration. Future research must also explore longitudinal impacts, cross-cultural dynamics, and learner-centric approaches to maximize GenAI's pedagogical utility. By bridging innovation with ethical and contextual considerations, this volume envisions a future where GenAI tools enhance inclusivity, engagement, and the transformative power of L2 education.

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