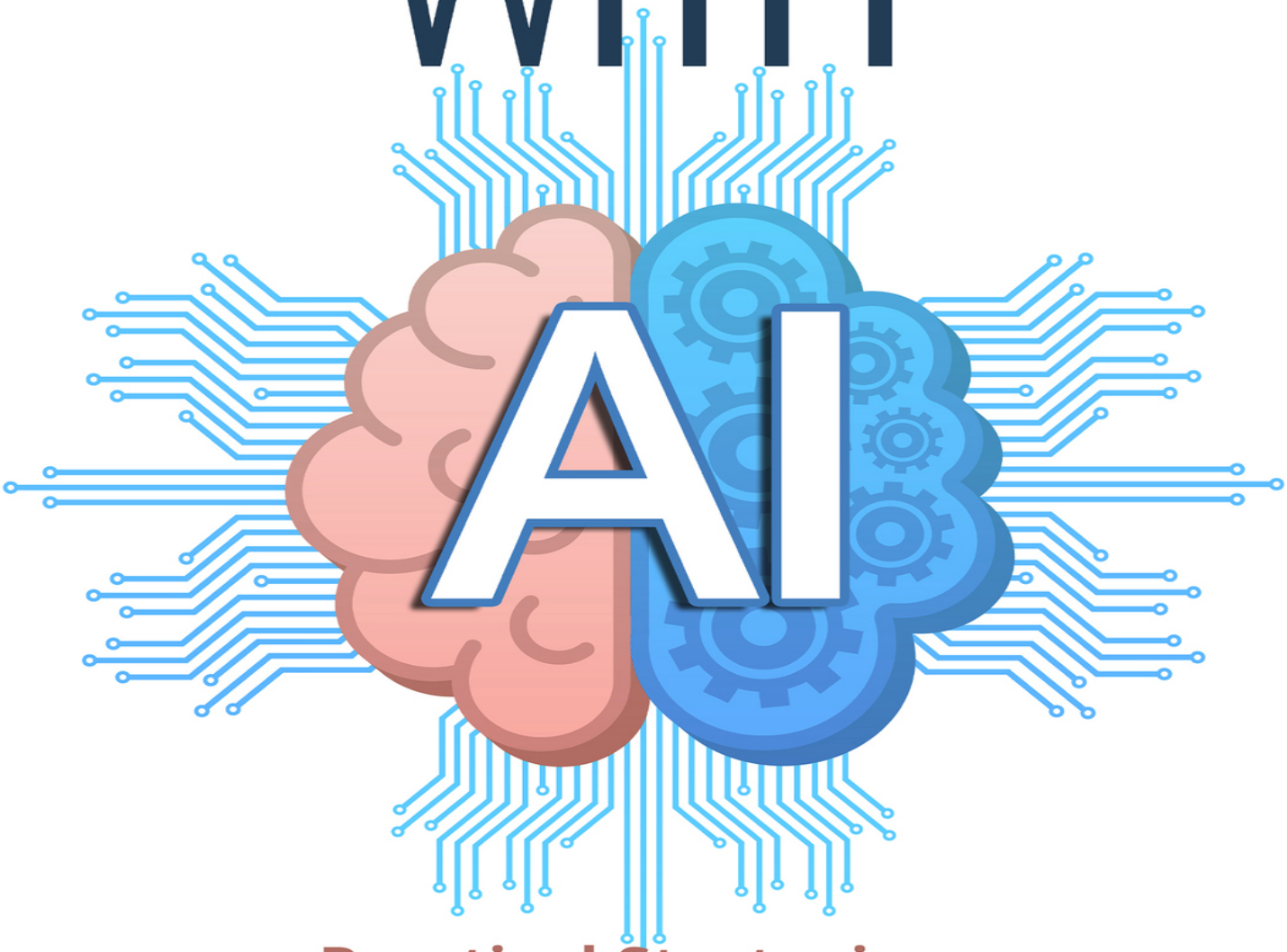
TEACHING WITH



Practical Strategies to Integrate AI in the Classroom

MED KHARBACH, PHD

Teaching with AI

Practical Strategies to Integrate AI in the Classroom

MED KHARBACH, PHD

Teaching with AI

Practical Strategies to Integrate AI in the Classroom

MED KHARBACH, PhD

First Edition 2025

For permission requests, contact the author directly at med@educatorstechnology.com

Published by Educators Technology Publications, Montreal, Canada

DEDICATION

To my mother, who left this world just as this book began to take shape.
Your kindness, patience, and belief in learning live on in every page.

About This Book

I wrote this book primarily for teachers, educators, school leaders, and anyone working in education who is trying to make sense of AI's growing presence in the classroom. The book grew out of a real need I witnessed through daily interactions with educators on LinkedIn and other digital spaces. The same questions kept surfacing: *Where do we begin? How can we use AI without losing what makes teaching human?*

Teachers today are navigating extraordinary uncertainty, often with limited guidance. I realized that many wanted support from someone who understands the classroom firsthand, someone who has walked the same path and faced the same questions. So, I decided to take my chances and write the book I wished I had when I first started exploring AI in education.

Indeed, the ideas in this book have been forming for the last two years. I have written about them, shared them through my *Educators Technology* platform, and created visuals that have sparked meaningful discussions across the education community especially on LinkedIn. The engagement and constructive feedback I received convinced me that it was time to bring these ideas together in one place; a practical, research-informed guide that teachers could return to for clarity and direction.

The approach I advocate here is grounded in research and classroom experience. You will find a wide range of authoritative references woven throughout, connecting educational theory with real-world application. I wrote each chapter in such a way that it is both accessible and evidence-based. I used ChatGPT and Claude in a limited capacity for editing, proofreading, prompt generations, and refining my writing style. I also used Napkin AI and Canva AI to help with the creation of the diagrams and illustrations that accompany the text. I hope you find the content of this book as useful and inspiring as it was challenging and rewarding to create.

Med Kharbach, PhD
Montreal, Canada
October 17, 2025

Table of Contents

Introduction

The world of education is living through an increasingly volatile period. AI, and more specifically generative AI, has reshuffled the decks in ways no other general-purpose technology ever has. In just a short time, entirely new AI-mediated ways of learning and creating knowledge have emerged challenging the very foundations of education as we have known it for centuries.

AI tools can now generate essays that read with human fluency, solve complex math problems, compose poetry in the style of any writer, produce and debug code, plan detailed trips, create photo-realistic images from text, or assemble entire slide decks in minutes. What once took hours of human effort can now be completed almost instantly. This marks a profound cognitive and cultural shift, what assistant professor Johan Woodworth and I (2025) call ‘the AI Turn’.

The turn was sudden and disorienting, and we have seen the chaos that followed. Many school boards, caught off guard by the speed of change, rushed to ban ChatGPT and other generative tools outright only to reverse those decisions months later. The reaction reflected more fear than understanding. Across the world, school districts and universities are still struggling to craft clear, balanced policies on AI use. Some treat it as a threat to academic integrity; others view it as a catalyst for innovation. Most are somewhere in between, trying to navigate the tension between protecting learning and embracing progress.

The burden of this transformation, however, has fallen squarely on teachers’ shoulders. Many are being asked, or quietly expected, to integrate AI into their classrooms, either through directives from their districts or simply because their students are already using it daily often on their mobile devices. Yet professional development remains scarce and clear guidance is still largely missing.

I know this firsthand, not only because I am an educator myself but also through my ongoing work with teachers around the world via

Educators Technology and my LinkedIn community. Over the past two years, I have shared numerous AI resources, frameworks, and classroom ideas, and in response, I've heard from countless teachers, school leaders, and instructional coaches seeking clarity, direction, and practical support.

It was within this uncertain and rapidly evolving context that the idea for this book began to take shape, a response to a genuine need for grounded, educator-focused guidance on how to understand, evaluate, and meaningfully integrate AI in teaching and learning. My purpose behind this work is to provide teachers with a practical guide that combines both conceptual clarity and hands-on strategies to help them integrate AI in their teaching in ways that are pedagogically grounded, ethically informed, and responsive to the realities of today's classrooms.

As I was working on this book, Justin Reich metaphor keeps coming up in my mind, he said:

> "Writing a guidebook on Generative AI in Schools in 2025 is a little bit like writing a guidebook of aviation in 1905, just two years after the Wright Brothers launched from Kitty Hawk. No one in 1905 could have said the best way to build a plane or fly one or operate an aviation system. And no one in 2025 can say how best to manage AI in schools. It will take our school systems (our educators, our policymakers, our researchers, our parents, our governments) some number of years to try a range of approaches and suss out which ones work best in which contexts" (Smith et al., 2025, p. 1).

The comparison captures the spirit of this moment perfectly. We are still in the early stages of discovery: experimenting, adapting, and collectively learning what responsible and effective AI integration looks like. This book is part of that process: an attempt to offer structure amid uncertainty and to translate a fast-moving technological shift into meaningful, classroom-ready practice.

To help you navigate its content with ease, I've organized this book into three main parts. The first part, *Foundations of AI Literacy*, contains two chapters that lay the groundwork for understanding and using AI thoughtfully in education. Chapter 1 introduces the concept of AI literacy and explains why it matters for teachers and educators. Chapter 2 examines AI and critical thinking and shows how generative tools alter reasoning, originality, and intellectual effort. I draw on cognitive and educational research to present strategies that help teachers and students sustain deep thinking and reflection in an age of instant answers.

The second part, *AI Integration Frameworks*, contains four chapters that present established pedagogical models teachers can use to integrate AI

in purposeful and pedagogically sound ways. Chapter 3 revisits the SAMR Model and shows how AI can support substitution, augmentation, modification, and redefinition of learning tasks. Chapter 4 applies Bloom's Revised Taxonomy to demonstrate how AI tools can strengthen higher-order thinking. Chapter 5 examines the TPACK Framework and explains how the intersection of technological, pedagogical, and content knowledge creates balanced AI integration. Chapter 6 introduces Webb's Depth of Knowledge (DOK) model and provides a way to evaluate how AI-supported activities can move beyond surface-level engagement toward deeper and more complex understanding.

The third part, *Applying AI in Practice*, contains three chapters that translate these frameworks into classroom action. Chapter 7 examines AI in lesson planning and shows how teachers can use AI to support design, differentiation, and formative assessment while maintaining professional judgment. Chapter 8 presents a curated overview of AI tools and resources for teachers and chapter 9 addresses AI ethics and discusses issues of data privacy, bias, intellectual outsourcing, and environmental impact.

Finally, it is my hope that this book contributes to the ongoing conversation about AI use in education. I know the questions surrounding this technology are still unfolding, but that uncertainty is also what makes this work meaningful. My aim is that the ideas and examples shared here offer clarity, practical direction, and encouragement for teachers who want to engage with AI in ways that strengthen both learning and human connection.

Part I: Foundations of AI Literacy

Chapter 1: AI Literacy

The term AI literacy shows up everywhere in current conversations about education and technology. It has quickly become a buzzword, but when we pause and ask, what exactly do we mean by AI literacy? the answers are less clear. Without a shared understanding of the meaning of AI literacy, we run the risk that the term gets stretched to mean everything and nothing at once.

This shared understanding matters. If educators, policymakers, and researchers are working from different definitions, we can't design effective policies, create meaningful professional development, or prepare students in consistent ways. Having a clear picture of what AI literacy entails gives us a common language for collaboration and a framework for guiding practice.

In this chapter, I examine AI literacy from multiple angles to build this shared understanding. I begin by presenting key definitions from leading researchers, organizations, and educational institutions. These definitions reveal both the diversity of perspectives and the common themes that emerge across different approaches. Through analyzing these definitions, we can identify the core elements that most experts agree constitute AI literacy.

From there, I explore the three fundamental components that consistently appear across definitions: knowledge, skills, and attitudes. Knowledge encompasses understanding what AI is, how it works, and its capabilities and limitations. Skills involve the practical competencies needed to use, evaluate, and create with AI tools effectively. Attitudes address the mindsets and dispositions that enable thoughtful, ethical engagement with AI technology. Together, these three domains create a comprehensive framework for understanding and developing AI literacy.

I then discuss each component in detail, breaking down what students and teachers need to know, what they should be able to do, and how they should approach AI technology. The chapter concludes with a critical discussion of why AI literacy matters now more than ever. My goal is to provide a clear, actionable understanding of AI literacy that educators can use in their practice.

What is AI Literacy?

When we hear the word literacy, our minds usually go straight to the basics: the ability to read and write. That traditional definition has shaped our understanding for centuries (Ng et al., 2021). But literacy has always been more than just decoding letters on a page. It's about having the functional knowledge that allows us to participate fully in society.

If we carry that idea into today's context, AI literacy becomes the ability to develop functional knowledge that lets us use AI to meet our teaching, learning, and research goals. You'll also come across related terms like AI fluency and AI education. In this book, I'll stick with AI literacy, but it's helpful to keep in mind that these terms often overlap.

To ground this conversation, I've gathered some of the most widely cited definitions of AI literacy from the grey literature. These are worth looking at closely, because when you put them side by side, certain themes repeat themselves.

> - "AI literacy includes the knowledge and skills that enable people to critically understand, evaluate, and use AI systems and tools to safely and effectively participate in an increasingly digital world." (Mills et al., 2024, p. 4)
> - "AI literacy includes the knowledge, skills, and attitudes needed to engage with AI safely. (Mills et al., 2024). This skillset is about understanding AI's strengths, limits, and impacts to make informed decisions about its integration and to prepare learners for the AI-driven future (Kulesa et al., 2024)." (U.S. Department of Education, Office of Educational Technology, 2024, p. 41)
> - "The collection of skills and knowledge that a person needs to confidently understand, ethically use, and critically evaluate artificial intelligence in a world where AI is ubiquitous." (aiEDU, n.d.)
> - "AI literacy refers to the knowledge, skills, and attitudes associated with how artificial intelligence works, including its principles, concepts, and applications, as well as how to use artificial intelligence, such as its limitations, implications, and ethical considerations." (TeachAI, n.d.)
> - "AI literacy represents the technical knowledge, durable skills, and future-ready attitudes required to thrive in a world influenced by AI. It enables learners to engage, create with, manage, and design AI, while critically evaluating its benefits, risks, and ethical implications". (OECD, 2025, p. 6)

When you read across these definitions, you start to see a shared picture of what AI literacy means. It revolves around three main elements: knowledge, skills, and attitudes (see also Woodworth & Kharbach, 2025). Together, these enable us to understand, evaluate, and apply AI systems responsibly and ethically, whether in the classroom, in research, or in everyday life.

Here's how these three domains break down:

1. **Knowledge**: Understanding what AI and generative AI are, how they function, how to tell the difference between AI and non-AI systems, and where the limits and strengths of AI lie.
2. **Skills:** Developing the competencies that let us use AI tools effectively to support teaching, learning, and research.
3. **Attitudes:** Cultivating the right mindset and assumptions to create an environment where AI can be used thoughtfully and productively.

In the next section, we'll take these three domains (i.e., knowledge, skills, and attitudes) and look at what each one entails in more detail. Let's begin with knowledge.

1. Knowledge

This is the knowledge side of AI literacy, the place where everything begins. To build confidence with AI, you first need a foundation in the basics (Woodworth & Kharbach, 2025). Let's start with the obvious question: what is AI?

Artificial intelligence belongs to the broad field of computer science and has roots that stretch back over a century. No single person can be credited with inventing AI, but Alan Turing's (1950) pioneering work on how machines might "think" was foundational. The actual term artificial intelligence was first introduced during the famous Dartmouth Conference in 1956, which many consider the birth of the field (Mollick, 2024).

The history of AI hasn't been a straight line forward. It has swung between periods of great progress and long stretches of stagnation (aka AI winters), depending heavily on political will, economic priorities, and funding (Suleyman & Bhaskar, 2023). Building AI requires enormous computing power and financial investment, and without that support progress often stalled. Another barrier was data. As Kate Crawford (2021) has put it, data is the new oil. Early forms of AI didn't have the vast amounts of data we take for granted today.

Two major developments changed the story. The first was the dramatic increase in computing power, particularly in the late 1990s and early 2000s. The second was the rise of the internet, which digitized much of humanity's

knowledge and made enormous volumes of data accessible. For AI researchers and companies, this flood of online data became fuel for training more powerful models. The more data the models consumed, the better their performance.

Of course, this also raised thorny ethical issues. Some of that data is copyrighted. The New York Times, for example, has sued OpenAI for allegedly using its material in training GPT models (Grynbaum & Mac, 2023). There is also the problem of misrepresentation for much of the Internet data embeds society's flaws such as bias, stereotypes, racism, and gender discrimination and these problems often surface in AI outputs. Guardrails have improved in recent years, but concerns remain, and many argue that bias isn't just a problem of data, it is also a problem of software development and users' interactions with AI (Hanna et al., 2025).

As AI systems grew more sophisticated, their presence in everyday life became clearer. Think of how we interact with tools like Google Search, Siri, or smart home devices (Ng et al., 2021). Social media platforms rely on algorithmic AI to analyze your clicks, the time you spend on a video, and your scrolling habits. Within seconds, those systems adjust and begin recommending similar content to keep you engaged.

Streaming services like Netflix use AI to suggest movies based on your viewing history, and Amazon uses it to recommend products. Education has seen its own versions of AI for decades. As far back as the 1970s, intelligent tutoring systems were already being tested. Later came adaptive learning platforms, MOOCs, and other digital tools that used AI to personalize instruction (Holmes et al., 2019).

Still, for most people, AI remained a behind-the-scenes feature until late 2022. That's when ChatGPT launched and generative AI entered the mainstream. For the first time in human history, a technology powered by AI could take on tasks that had long been the exclusive domain of human cognition. Generative AI can write essays, compose poetry, generate images and videos, produce computer code, solve complex math problems, and more. This leap is why AI has suddenly become a household term and why developing a solid knowledge base about how it works is now essential for teachers and students alike.

1.1. Why Foundational Knowledge Matters

As teachers, it helps to have at least a functional knowledge of what AI is and what its key terms mean. You don't need to master the technical side, but a basic awareness goes a long way. Terms like machine learning, deep learning, and large language models come up often, and knowing what they point to makes conversations about AI less confusing. One clarification is worth making here: some educators when they talk about AI they usually mean generative AI (Smith et al., 2025). For the sake of clarity and convenience, I'll use "AI" in that sense throughout this book.

So why does this basic AI knowledge matter? What does knowing the history of AI or understanding terms like machine learning have to do with using AI tools in class? These are fair questions. Let's think through a scenario.

Imagine one of your students uses ChatGPT, Claude, or Gemini to create an image for a class presentation. She asks the AI to generate a picture of a CEO. The result? A stereotypical image: a middle-aged white man in a business suit. But what the student actually had in mind was a Black woman in her thirties leading a company. She had to go back, rewrite the prompt, and give the AI clear instructions before she got the image she wanted. Even though she solved the problem, the fact that the AI defaulted to that stereotype bothered her, and she came to you as her teacher for an explanation.

Now pause and ask yourself: how would you respond if you had no knowledge of how AI models are trained? Without that background, it's hard to explain that these systems are trained on massive amounts of data pulled from all over the internet, including biased, stereotypical, and sometimes harmful content. That training data shapes the outputs students see and that bias in this case reflects patterns baked into the data itself. This is exactly why teachers need at least a foundational understanding of AI because when students encounter issues like this, they'll turn to us for clarity. Without that knowledge, the conversation falls flat, and the teachable moment is lost.

Building a foundational AI knowledge provides us with the language to explain, in plain terms, why an AI tool produced a certain output, how that output connects to the data it was trained on, and what limitations or biases may shape its responses. More importantly, it allows us to model this reasoning for our students and guide them to think critically about AI-

generated content and to question not just what they see, but how it came to be.

If you're wondering how to begin building this knowledge, here are a few guiding questions that can help shape your learning. Ask yourself:

1. How are AI systems trained, and what kinds of data go into them? Think of this as tracing the ingredients of a recipe, you need to know what goes in to make sense of the outcome.
2. What is the difference between AI and non-AI tools? For example, a calculator performs programmed functions, while a generative AI tool can produce new content by analyzing patterns in massive datasets.
3. Why do AI outputs sometimes contain errors, inaccuracies, or what researchers call "hallucinations"? Understanding this helps you explain to students that AI doesn't "think" or "know" in a human sense; it simply predicts text or images based on probabilities, which sometimes lead to confident mistakes.
4. How does bias creep into AI systems, and what can we do about it in our classrooms? This question opens the door to discussions about equity, stereotypes, and digital citizenship.

Starting with questions like these helps you frame your AI learning in a way that connects directly to your teaching practice. Each question opens a door to deeper understanding that will serve you and your students well. You might explore one question per week during professional development time or discuss them with colleagues who are also navigating this new terrain.

Such discussions can spark practical insights. For example, a colleague might share how they explained "hallucinations" to their students, or how they helped a class recognize bias in AI-generated images. Over time, these conversations build a shared vocabulary and a culture of curiosity around AI. The point is not to find all the answers at once, but to get into the habit of asking the right questions and making AI literacy a living part of your professional practice.

I've stayed away from going into too much detail about AI's history or the technical terms that often come with it. The aim here is to keep the focus on how you can start developing a working understanding through

everyday practice and discussion. If you'd like to go further (e.g., exploring the evolution of AI, the key ideas behind it, and the language that helps make sense of it) you'll find plenty of starting points in the *AI and Teacher Professional Development* chapter. That section highlights trusted guides, frameworks, and courses that can help you deepen your knowledge at your own pace.

2. Skills

When we talk about the skills that make up AI literacy, it's important to stress that these are not entirely new or AI-specific. Skills are broader competencies that let you analyze, synthesize, learn (or unlearn), and then apply that knowledge to new situations. Sometimes that means creating fresh learning experiences, other times it means approaching familiar classroom routines in new ways. Working with AI builds on the same set of literacies teachers have always needed. In particular, three stand out as essential companions to AI literacy: media literacy, data literacy, and digital literacy (Woodworth & Kharbach, 2025). Each of these helps you make sense of AI in different but overlapping ways.

2.1. Media Literacy

We are surrounded by media every day. We scroll through feeds, check the news, watch videos, and now we also interact with AI-generated texts and images. We both consume and create these messages, which makes media literacy a core skill for teachers and students alike. De Abreu (2019) defines media literacy as "the ability to access, understand, analyze, evaluate, and create media in a variety of forms" (p. 25). Media literacy is as much about the medium as it is about the message. As Marshall McLuhan (1964) observed, "the medium is the message" (p. 7).

The platforms and technologies we use, whether social media, streaming services, or AI tools, shape not only how information reaches us but how we make sense of it. That means learning to see how messages are shaped: who made them, what choices they made about what to include or exclude, and how those choices influence what we believe about the world.

AI has raised the stakes for media literacy in ways we're only beginning to grasp (Kharbach, 2025a). A student might read an essay produced by ChatGPT or watch a video that looks entirely real but was

created by an advanced AI model like Sora. These videos have sparked public debate because they blur the line between what's real and what's simulated, often so convincingly that even trained eyes struggle to tell the difference. Understanding how AI shapes what we see and read equips us to help students ask sharper questions about the media they encounter and recognize the signals that distinguish authentic information from algorithmic fabrication.

To bring this into practice, it helps to frame media encounters with guiding questions. You can use the following prompts in discussions, projects, or even quick classroom reflections. Each one turns media into an opportunity for critical thinking and builds habits that carry over into how we interpret AI-generated outputs.

Table 1
Guiding questions for media literacy and AI

Guiding Questions for Media Literacy and AI
1. What kind of content is this, and what purpose does it serve? **2.** Who created it, and what can we learn about them? **3.** What perspective does it reflect? **4.** Which voices or viewpoints are missing? **5.** How is it designed to capture your attention? **6.** What assumptions does it make about the audience? **7.** What values, lifestyles, or stereotypes are present? **8.** How might people from different backgrounds interpret it? **9.** Can its claims be checked with other reliable sources? **10.** Is this human-made or AI-generated, and what clues tell you that?

Media literacy skills carry directly into AI literacy because both involve questioning sources, analyzing messages, and recognizing how information is framed. When we teach students to ask who created a message, what choices shaped it, and what perspectives might be missing, we are also preparing them to evaluate AI-generated content. The same habits that help students critique a news article or an advertisement will help them interpret an essay produced by ChatGPT, a video shaped by algorithms on TikTok, or an image created by a generative model.

This overlap is why I place media literacy within the skill set of AI literacy. AI doesn't operate in a vacuum; it produces outputs that flow into

the same media landscape our students already navigate. Without media literacy, those outputs can be accepted uncritically, reinforcing stereotypes or spreading misinformation. Indeed, when we cultivate media literacy skills, we strengthen the foundation of AI literacy by giving teachers and students the tools to question, interpret, and respond thoughtfully to both human and AI-generated content.

2.2. Data literacy

In the age of AI, data has been regarded as the new oil (Crawford, 2021). Just as oil powered the industrial revolution, data now fuels the algorithms shaping our lives, from classroom platforms to social media feeds. But unlike oil, data carries social and ethical weight. It can be biased, misused, or stripped of context in ways that affect how we teach and how students learn.

So, what do we mean by data literacy? Gummer and Mandinach (2015) define it as "the ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data (assessment, school climate, behavioral, snapshot, longitudinal, moment-to-moment, etc.) to help determine instructional steps" (p. 2)

A more recent definition from the National Center for Education Statistics (U.S. Department of Education, 2024) frames data literacy broadly as "the practice of examining and understanding data to draw and communicate conclusions and make decisions. Data-literate educators continually, effectively, and appropriately access, interpret, act on, and communicate multiple types of data from classroom, local, state, and other sources to improve outcomes and experiences for students" (p. 4).

AI systems live and breathe data. Every adaptive platform, every recommendation algorithm, every generative model is built on datasets; often messy, biased, or incomplete. When teachers and students develop data literacy, they learn to question those datasets. They start asking who collected the data, what voices were left out, and how those gaps shape the outcomes (Kharbach, 2025b).

This is why I include data literacy in the skills domain of AI literacy. Teachers need it to evaluate the AI tools they bring into class, to notice when an algorithm oversimplifies, and to safeguard student privacy.

Students need it to make sense of the information AI presents to them, whether in the form of a recommended resource, a predicted grade, or an auto-generated essay. In both cases, data literacy sharpens judgment and encourages responsible use of AI.

Here are 10 guiding questions to build data literacy skills that carry into AI literacy:

Table 2

Guiding questions for data literacy and AI

Guiding Questions for Data Literacy and AI
1. What kinds of data are being collected, and by whom? **2.** How was this data gathered, and under what conditions? **3.** What voices or perspectives might be missing from this dataset? **4.** What patterns do you see in the data, and how reliable are they? **5.** How does the data connect to the questions you are trying to answer? **6.** What limitations or biases could be shaping the conclusions? **7.** How can the data be communicated clearly and fairly to others? **8.** What ethical considerations, such as privacy or consent, should guide how the data is used? **9.** How does this data feed into AI systems or influence algorithmic decisions? **10.** How can this data, when combined with professional judgment or student reflection, improve teaching and learning?

Exploring questions like these creates a habit of critical reflection around data, which directly strengthens AI literacy. It prepares both teachers and students to approach AI outputs with curiosity, caution, and a readiness to see beyond the surface.

2.3. Digital Literacy

Digital literacy is the third piece of the skill set that supports AI literacy, alongside media literacy and data literacy. These literacies overlap, but digital literacy focuses on the practices that allow us to use digital environments responsibly and effectively. When students learn to evaluate credibility, navigate platforms, and reflect on their digital choices, they are better prepared to handle AI systems that operate inside those same environments (Kharbach, 2025c).

Digital literacy, as defined by Paul Gilster (1997), refers to "the ability to understand information and—more important—to evaluate and integrate information in multiple formats that the computer can deliver. Being able to evaluate and interpret information is critical […] you can't understand information you find on the Internet without evaluating its sources and placing it in context" (cited in Pool, 1997, p. 6).

At its core, digital literacy means knowing how digital tools and platforms work, how information flows through them, and how meaning is shaped in online spaces. It also includes how we create and share content responsibly, how we manage our digital identities, and how we adapt when technologies change. Without this foundation, any attempt to integrate AI into teaching and learning risks becoming superficial or misguided.

AI tools generate essays, lesson ideas, feedback, and media outputs, but they all flow into digital spaces (e.g., classrooms, platforms, and online communities) where they will be consumed, shared, and judged. Digital literacy helps both teachers and students use AI as a support for thinking without outsourcing judgment to the tool itself. It also reinforces ethical habits like protecting privacy, questioning sources, and taking responsibility for what we share.

Here are 10 questions that can help frame digital literacy as part of AI literacy:

Table 3
Guiding questions for digital literacy and AI

Guiding Questions for Digital Literacy and AI
1. How do I decide which digital tools are reliable and safe to use? **2.** What strategies help me evaluate the credibility of online information? **3.** How do algorithms and platforms influence what I see and share? **4.** What responsibilities come with creating and publishing digital content? **5.** How can I manage my digital identity and online presence responsibly? **6.** What steps protect privacy when using digital and AI-powered tools? **7.** How do I adapt when digital platforms or technologies change quickly? **8.** How do I work productively and respectfully with others in digital environments? **9.** What ethical principles should guide my use of AI in digital spaces? **10.** How can I reflect on my own digital practices to improve learning and teaching?

Exploring these questions helps us and our students see digital spaces as environments to navigate thoughtfully and responsibly. This is why digital literacy belongs in the skills domain of AI literacy. It provides the grounding that makes AI integration ethical, effective, and sustainable.

Bringing the Skills Together

As we have seen, AI literacy skills emerge from the intersection of media literacy, data literacy, and digital literacy, combined with the critical thinking we've always valued in education. These literacies work together, each one reinforcing the others. When students question the source of an AI-generated image (media literacy), consider what training data might have shaped it (data literacy), and think about how to share it responsibly online (digital literacy), they're practicing AI literacy in action.

Pascal Bornet (2024) captures this beautifully when he said "AI literacy is like learning a new language. Just as language skills let you communicate and understand a culture, AI literacy helps you grasp the world of artificial intelligence" (p. 106). But here's what makes our work as educators unique: we're not learning this language just to speak it fluently. We're learning it so we can transform how we teach and how our students learn. AI becomes a tool in service of deeper goals: fostering creativity, supporting struggling learners, personalizing feedback, and opening new pathways to understanding.

The skills we've explored here form the practical backbone of AI literacy. They give us the ability to evaluate AI tools before bringing them into our classrooms, to guide students through the ethical complexities of AI use, and to model thoughtful, critical engagement with these technologies. Without these skills, AI remains a black box that produces mysterious outputs.

What's encouraging is that most teachers already possess many of these foundational skills. You've been helping students evaluate sources, think critically about media messages, and navigate digital spaces for years. AI literacy builds on what you already know and do. The challenge now is to extend these skills into the realm of AI, asking familiar questions in new contexts and helping students apply their critical thinking to algorithmic outputs alongside traditional texts.

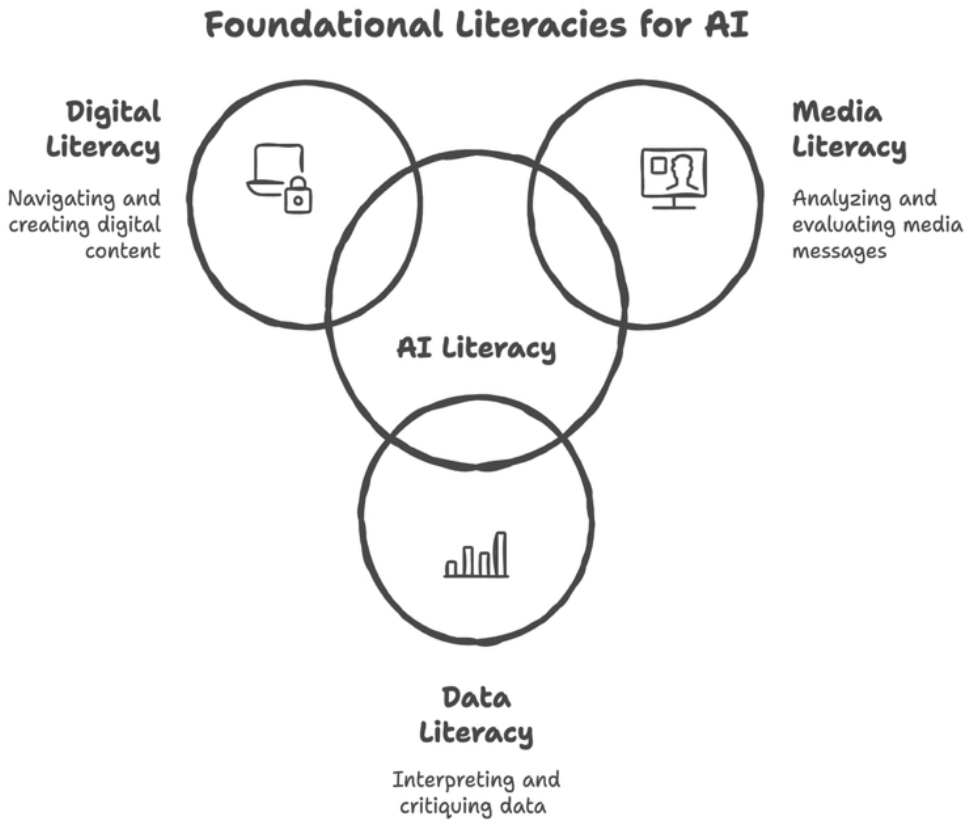


Figure 1. *Foundational Literacies for AI.*

Now let's turn to the third domain of AI literacy, attitudes, and explore how mindset shapes everything else we've discussed.

3. Attitudes

We've explored the knowledge and skills that form AI literacy, but there's a third element that ties everything together: attitudes or mindset. Without the right attitudes, all the knowledge and skills in the world won't take you very far (Woodworth & Kharbach, 2025). You could understand how AI works and possess all the technical skills to use it, but if you approach it with fear, resistance, or unrealistic expectations, you'll struggle to integrate it meaningfully into your teaching practice.

I call this an AI-friendly mindset (Kharbach, 2025d), a term that is adapted from Eliezer Yudkowsky's notion of Friendly AI (Hao, 2025). Yudkowsky coined the phrase in the AI safety community to describe well-aligned systems designed to serve human goals. I borrow the spirit of that idea and apply it to education. The challenge for us is not designing alignment at the technical level but preparing the attitudes and assumptions that let teachers and students form a constructive partnership with AI.

Bornet (2024) captures this shift in perspective vividly:

> "First, change your mindset: Think of AI as your partner, not your rival. It's not the Joker trying to outsmart you; it's Robin, ready to assist. Focus on what you can achieve together. Efficiency is your new mantra. It's also about finding balance and not burning out. Let AI handle the heavy lifting while you strategize. Most importantly, be mindful and reflective. Take time to understand and learn how AI impacts your work and life." (p. 102)

Bornet's framing sets the stage well. If we think of AI as a partner instead of a rival, the conversation shifts away from fear and toward possibility. In my own discussions with teachers, I've seen how much this mindset matters. Some educators resist AI simply because they haven't tried it and are reluctant to face its learning curve. Admittedly, that hesitation is understandable. Change takes time and learning a new tool while teaching full-time can feel overwhelming. But once they experiment, most discover that AI saves time, sharpens lessons, and sparks new ideas.

Another form of teachers' resistance to AI stems from identity concerns. Many teachers fear AI will diminish their value or fundamentally alter their role (European Commission, 2022). For decades, we've built our professional identities around being knowledge providers, feedback givers, and intellectual guides. Now here comes AI, seemingly able to explain concepts, generate examples, and provide feedback at lightning speed, and sometimes better than us. This creates an identity conflict that cuts to the core of how we see ourselves as educators. The traditional image of the teacher as "sage on the stage" feels threatened when students can turn to ChatGPT for instant explanations.

I've also observed an interesting generational pattern in my discussions with educators. Teachers with more years of experience often express greater skepticism about AI than newer educators. This could reflect the challenge of adapting deeply ingrained practices, or it might stem from having invested decades in perfecting approaches that now feel questioned.

While these observations would benefit from systematic research to confirm or challenge them, they highlight how our professional stage and experience shape our openness to technological change.

It is within this context that cultivating the right attitudes towards AI becomes important. Before we can effectively use AI tools, we need to examine our own attitudes and assumptions. Research increasingly highlights how attitudes and perceptions shape AI adoption in education. Studies show that teachers who perceive AI positively, focusing on its utility and collaborative potential, demonstrate a higher intention and ability to integrate it effectively (Yue et al., 2024; Oved & Alt, 2025; Velander et al., 2024).

Other research emphasizes how institutional culture and peer attitudes influence individual teachers' willingness to experiment with AI (Park et al., 2023; Karataş et al., 2025; Yue et al., 2024). When colleagues share positive experiences and administrators provide supportive frameworks, resistance tends to decrease.

Bornet (2024) discusses five key mindset principles for developing what he calls an AI mindset. These are: efficiency over effort, value over volume, collaboration over control, balance over burnout, and reflection over rush. Bornet's classification is insightful because it highlights the broad shifts in mindset needed to work productively with AI.

For our context in education, I've distilled his five principles into four core attitudes that speak more directly to teachers' realities. While efficiency, value, collaboration, balance, and reflection all remain relevant, the educational challenge is to frame them in ways that guide how we explore AI, adapt to its rapid changes, collaborate with both colleagues and AI itself, and reflect on its role in learning.

The following are the four mindsets I consider important for teachers as they navigate this new landscape:

3.1. The Exploratory Mindset

A sense of exploration lies at the heart of developing AI literacy. Think of it like learning to cook in a new kitchen. You wouldn't master every appliance at once, but you'd start somewhere, maybe with the basics, then gradually try new tools as you gain confidence. AI works the same way. Each

interaction teaches you something new about what these tools can and cannot do.

This exploratory attitude thrives on curiosity and patience. When you first use ChatGPT or Claude (or any other AI tool for that matter) you might get unexpected results. Sometimes the output will surprise you with its quality; other times it might completely miss the mark. Both outcomes are valuable data points.

I've seen teachers discover incredible uses for AI simply by playing around with different prompts asking “what if” questions and pushing boundaries. The key is treating mistakes as discoveries. When an AI tool generates something unhelpful or incorrect, that’s actually useful information. You’re learning the tool’s limitations, understanding where human judgment remains essential. This trial-and-error process builds intuition about when and how to use AI effectively. Teachers who embrace this exploratory approach often feel less anxious about AI because they’ve demystified it through hands-on experience. They know its quirks, its strengths, and its blind spots because they’ve taken the time to explore without pressure or predetermined outcomes.

3.2. The Adaptive Mindset

If there's one constant in the AI landscape, it's change. New models appear monthly, existing tools get updates weekly, and best practices evolve constantly. Just when you've figured out the optimal way to prompt ChatGPT, a new version arrives with different capabilities and quirks. This pace can feel overwhelming, but adaptability transforms it from a source of stress into an opportunity for growth.

Adaptability in the AI context means holding your expertise lightly. What you know today about AI tools will need updating tomorrow, and that's perfectly fine. Approach it as you would teaching itself: every year brings new students with different needs, new curriculum standards, new research on best practices. We've always been adapters; AI just accelerates the timeline.

This adaptable mindset also helps manage the fear of being left behind. You don't need to master every new AI tool that appears. Focus on understanding broad patterns and maintaining flexibility. For instance, some teachers designate Friday afternoons as their "AI exploration time,"

spending just 30 minutes trying something new or reading about recent developments. This regular, low-pressure engagement keeps them current without overwhelming their schedules. The teachers who struggle most with AI are often those seeking permanent mastery, wanting to learn it once and be done. But those who embrace adaptability find freedom in the fluidity. They develop what is called flexible competence Montanari, 2025), the ability to work effectively with AI tools even as those tools evolve.

3.3. The Collaborative Mindset

A collaborative mindset has become essential for thriving in our AI-enhanced educational landscape. I think about collaboration at two levels: human-to-human and human-to-AI. At the human level, no one can possibly keep pace with every AI update, trend, or tool. The landscape is too broad and moves too quickly. This is where communities of practice show their value. When teachers share how they used AI to cut grading time, or when a colleague explains how they coached students through prompt-writing, everyone benefits. The collective knowledge that emerges is far richer than anything we can achieve alone.

At the human-to-AI level, collaboration means shifting our view of AI from tool to thought partner. Think of it like a conversation: sometimes you guide the AI with a precise prompt, sometimes you let it run freely to spark ideas, and other times you push back when its answers miss the mark. This rhythm grows as you learn what AI does well and where it falters.

Additionally, successful collaboration with AI means understanding complementary strengths. AI is best at pattern recognition, can process vast amounts of information quickly, and never tires of iterations. Humans bring context awareness, ethical judgment, emotional intelligence, and creative vision. The magic happens when we orchestrate these capabilities together. For instance, you might have AI generate twenty different ways to introduce a topic, then use your pedagogical expertise to select and adapt the approaches that will resonate with your specific students and your teaching context.

The teachers who master this collaborative approach develop what Bornet (2024) calls an ideal workflow with AI. They know precisely "which tasks to automate, which to elevate, and which to eliminate" (p. 111). They might automate routine feedback on grammar, elevate their

capacity for personalized instruction, and eliminate time spent on repetitive administrative tasks. This clarity is what makes collaboration with AI productive and purposeful.

4. The Reflective Mindset

Reflection runs deep in our teaching DNA. We've always examined our lessons, analyzed student responses, and refined our approaches based on what we learn. AI adds new layers to this reflective practice requiring us to think not just about what happened but about technology's role in shaping those outcomes.

For instance, you might use AI to generate feedback on a student essay. At first, the comments seem helpful, but as you read more closely, you realize they overlook the student's creativity and focus mainly on grammar. A reflective mindset prompts you to ask why; was the AI trained to value technical accuracy over originality? That quick pause leads you to adjust how you use the tool, reminding yourself that thoughtful judgment still belongs to you, the teacher, not the algorithm.

This kind of reflection also invites us to look inward, to examine our own motivations and assumptions. Why did we turn to AI for this task? Sometimes it's a practical choice; it helps us save time or lighten the workload, and that's completely reasonable. But other times, we might notice that we're using AI simply because it feels new or exciting, even when a more traditional approach might serve students better.

Honest reflection helps us move beyond the novelty factor to make purposeful choices about when and how AI adds genuine value. We also need to reflect on equity implications. Which students benefit most from AI tools? Who might be left behind?

The reflective practice around AI should be ongoing and systematic. Some teachers keep AI reflection journals, noting what worked, what didn't, and what surprised them. Others build reflection into department meetings, regularly discussing how AI is changing their practice and their students' learning. This collective reflection becomes especially powerful when teachers share not just successes but also failures and concerns.

AI literacy, as Bornet (2024) states, is "a continuous journey, requiring regular updates and adaptation" (p. 106). This perfectly captures why these four attitudes (i.e., exploration, adaptability, collaboration, and reflection)

form the psychological foundation of AI literacy. They work in concert, each one reinforcing the others. Exploration opens the door to discovery, adaptability keeps us flexible as the landscape shifts, collaboration multiplies our collective wisdom, and reflection ensures we stay true to our educational values.

Teachers who will thrive with AI aren't necessarily the most tech-savvy or the youngest or those with the most resources. They're the ones who approach AI with curiosity instead of fear, flexibility instead of rigidity, openness instead of isolation, and thoughtfulness instead of blind adoption. As we cultivate these attitudes in ourselves and our students, we're developing the mindset needed to navigate an uncertain but exciting future where human creativity and artificial intelligence work together in ways we're only beginning to imagine.

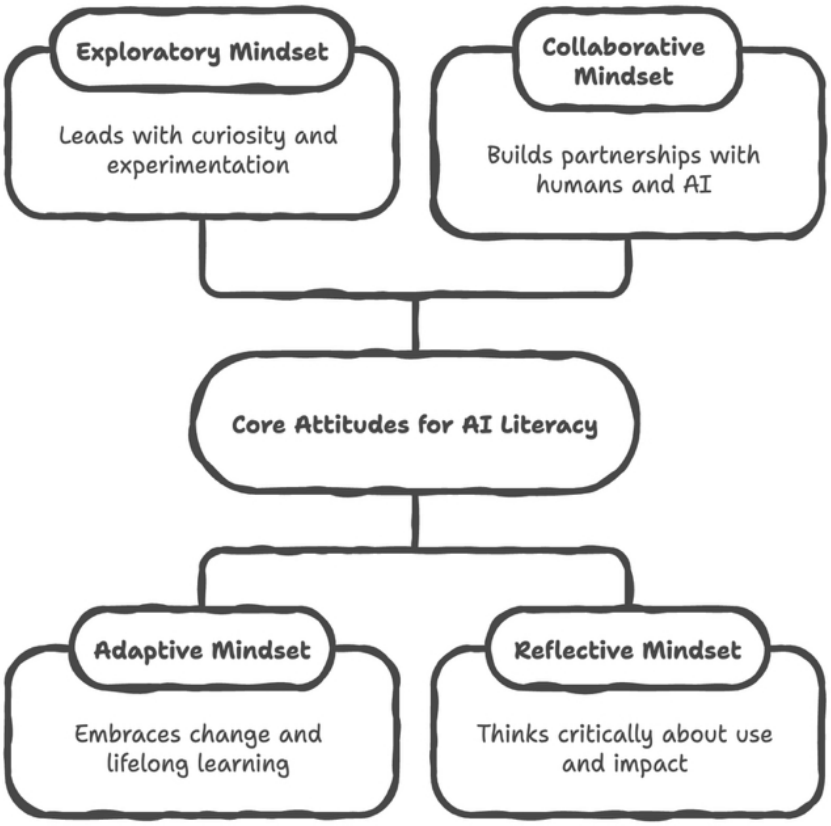


Figure 2. *Core attitudes for developing an AI-friendly mindset*

Why AI Literacy Matters?

The world is transforming before our eyes, and AI is becoming woven into the fabric of our daily life. Even the skeptics who dismissed it as another dot-com bubble now recognize that AI is here to stay. As educators, we have an ethical responsibility to prepare our students for the future that awaits them, and AI literacy has become a crucial part of that preparation.

Governments have already begun to respond. In the United States, for instance, new mandates are requiring AI literacy in K-12 schools (The White House, 2025). Several Canadian school boards are moving in the same direction (Wong, 2024) seeing AI as a core part of future-ready education. These initiatives reflect a growing consensus: students need these skills to thrive in tomorrow's world.

From an economic standpoint, we're looking at both tremendous opportunities and significant disruptions. Let's start with the positive side. The productivity gains from AI use are remarkable. Dell'Acqua et al. (2023) demonstrated through large-scale field experiments with consultants that GPT-4 boosted productivity by over 12%, improved quality by more than 40%, and sped up task completion by 25%. These aren't marginal improvements; they represent transformative potential when AI is used within its "jagged frontier."

Teachers are already experiencing these benefits firsthand. A recent Gallup survey found that educators using AI reported saving nearly six hours per week, equivalent to six weeks per year, which "they reinvest in more personalized instruction, deeper student feedback and better parent communication" (Walton Family Foundation & Gallup, 2025). The AI boom is also creating entirely new career paths, with reports predicting up to 11 million new jobs by 2030 (Capps, 2025).

But we need to be aware about the challenges ahead. AI is pushing automation to unprecedented levels and Agentic AI is accelerating this trend even further. McKinsey Global Institute (2017) warns that automation could displace up to 375 million workers globally by 2030, with advanced economies facing greater risk due to higher wage incentives for automation. Many displaced workers, it added, may struggle to find new employment quickly because of skill gaps, retraining barriers, or geographic constraints.

More recent estimates suggest that by 2040, AI could automate or transform 50% to 60% of jobs, though the impact will vary dramatically across sectors (Kelly, 2025). Customer service and routine roles will likely bear the brunt of these changes, while professions like teaching will experience disruption without disappearing entirely.

The World Economic Forum emphasizes this nuance, noting that while AI may free teachers from repetitive tasks and expand access to resources, it must not replace them (Kumar, 2025). One thing is certain: no job market will remain untouched. As Ng et al. (2021) put it, "people with AI knowledge will replace those that do not in the future of work" (p. 1).

This reality makes AI literacy essential. Students need these skills to navigate both the risks and opportunities AI presents. When we ban students from using AI tools, we actually rob them of the chance to develop competitive advantages. One teacher captured this perfectly:

> "We've worked really hard to make sure that we have those pieces that are going to allow our kids to be competitive with everybody else... If our kids aren't exposed to it and familiar with it, are they going to be at a disadvantage to those kids that are?... I want our kids to be competitive and able to chase their dreams and do all the things that they want to do and not feel like they're at a disadvantage from where they grew up" (Smith et al., 2025, p. 26).

Beyond economic considerations, AI literacy helps us grapple with critical ethical challenges. Without understanding how AI works, we can't recognize its limitations or biases. Pascal Bornet (2024) puts it bluntly: "AI literacy is essential, but many overlook its importance. Without it, you're vulnerable to cyber threats, job market disadvantages, misinformation, a widening digital divide, and an inability to fully participate in society or make informed decisions. In a world increasingly dictated by AI, understanding its impact is not a luxury but a necessity" (p. 107).

The ethical dimensions go deeper than many realize. Research shows that many teachers aren't aware that AI can be biased (Smith et al., 2025). Those without professional development in AI are more likely to hold misconceptions about its neutrality. Large language models such as ChatGPT are proved to exhibit implicit biases and discriminatory practices across multiple contexts (Warr & Heath, 2025; Kharbach, 2024; Buolamwini, 2023). For instance, findings from Warr and Heath's (2025) study are particularly troubling: "LLMs exhibit implicit biases, such as assigning lower scores when students are said to attend an 'inner-city

school' or prefer rap music" (p. 245). These biases directly impact how we evaluate and support our students.

When AI tools systematically undervalue work from certain demographic groups or perpetuate stereotypes in their responses, we risk reinforcing inequalities we're trying to eliminate. Students themselves often lack awareness of these ethical pitfalls, assuming AI outputs are objective truth when they're actually reflecting the biases present in their training data. This becomes particularly dangerous when AI is used for high-stakes decisions like grading, college admissions recommendations, or career guidance. Without proper AI literacy, both educators and students may unknowingly accept and act on biased information thus creating a cycle where technological tools meant to enhance education instead deepen existing disparities.

AI literacy also means understanding the tool's effectiveness in different contexts. Sometimes AI dramatically improves productivity, sometimes it has virtually no effect, and sometimes it actually requires more time than working without it (Smith et al., 2025). We need to teach students not just how to use AI, but when and why to use it effectively.

So, does AI literacy matter? Absolutely. We're watching the world reshape itself around AI and this isn't something we can afford to ignore. Our students will enter a job market where AI knowledge makes the difference between thriving and being left behind. They'll face ethical dilemmas we're only beginning to understand, from algorithmic bias in college admissions to AI-generated misinformation flooding their social feeds. The productivity gains are real and substantial, but so are the risks of automation displacing millions of workers. Here's what it comes down to: we can either prepare our students to work alongside AI, understand its limitations, question its outputs, and harness its power for good, or we can leave them vulnerable to a future they're not equipped to navigate. I think we already know the answer!

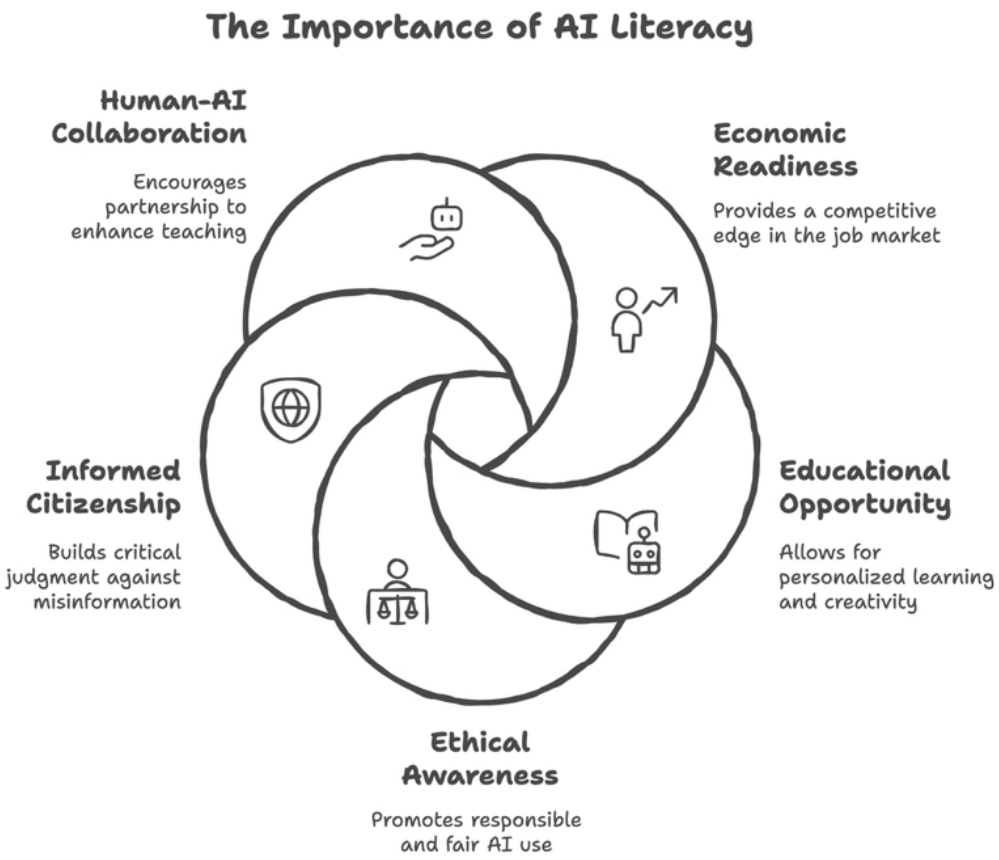


Figure 3. *Why AI literacy matters*

Conclusion

AI literacy is a vital competency for our time. AI literacy represents a dynamic interplay of knowledge, skills, and attitudes that evolve as the technology itself evolves. The definitions we've explored all point to this multifaceted nature: understanding how AI works, developing practical skills to use it effectively, and cultivating attitudes that allow us to engage thoughtfully with these powerful tools.

The three domains we've examined work together to create comprehensive AI literacy. Knowledge gives us the foundation to understand what we're dealing with. Skills provide the practical abilities to work effectively with AI tools. Attitudes shape how we approach this technology and determine whether we'll use it wisely. Remove any one of these elements, and AI literacy becomes incomplete.

The path forward requires us to weave AI literacy throughout our educational practice and not treat it as a special unit. Keep in mind that AI literacy is a pedagogical framework that is tool agnostic. This means we're not teaching students how to use ChatGPT or Claude specifically but helping them develop transferable competencies that apply across any AI system they might encounter. Today's popular AI tool will likely be replaced by something different in a year or two, but the underlying principles of critical evaluation, ethical consideration, and thoughtful application remain constant.

This tool-agnostic approach liberates us from the exhausting cycle of constantly learning new platforms. Instead of rushing to master every new AI application that appears, we focus on enduring questions: How do we evaluate AI outputs for accuracy and bias? When does AI enhance learning versus when does it shortcut critical thinking? What ethical considerations should guide our use of these tools? These questions transcend specific technologies and prepare us and our students for a lifetime of technological change.

Chapter 2: AI Literacy and Critical Thinking

We live in a world that has become thoroughly AI-mediated. You can spot AI content everywhere online. Those predictable robotic phrases jump out immediately and the suspiciously pristine prose that never stumbles or surprises has become the norm. When did you last encounter a piece of writing with an actual typo or grammatical slip. Even the early spell checkers, revolutionary as they seemed at the time, never sanitized language the way AI does today.

What troubles me most is the creeping sameness. Scrolling through LinkedIn or Substack feels like reading variations of the same post, recycled endlessly. The ideas cluster around the same talking points, expressed in the same polished, risk-free language. This uniformity pulls us away from the productive struggle that actually generates insight. That messy, sometimes frustrating process where real thinking happens is disappearing. Students today grow up in an environment where the rough edges of human thought have been smoothed away, where the wrestling match with ideas has been replaced by instant, frictionless answers.

The stylistic monotony runs just as deep. This new robotic language feels disconnected from actual human experience. It lacks those linguistic quirks that emerge from personal histories and individual perspectives. The unexpected metaphor that comes from your grandmother's sayings has vanished. The vocabulary colored by your particular obsessions and interests gets replaced by generic corporate speak.

You know that feeling when you stumble across writing that's genuinely human. It's like walking from a climate-controlled mall into actual weather. Suddenly there's texture, surprise, maybe even discomfort. But it's real. It connects. It makes you lean in because someone's actual mind is at work, grappling with something that matters to them.

Let me be clear about something here: there's a meaningful difference between using AI as an editing assistant and letting it think for you. I am all for the earlier and against the latter. In writing this book, I've used AI to catch spelling errors, smooth awkward transitions, and flag unclear

passages. Sometimes I take the suggestions AI offers; often I don't. The ideas, the arguments, the core message remain mine. I've spent tremendous amount of time drafting ideas, wrestling with concepts before I can finally get AI to help polish the final product, but the thinking happened in my own head, through my own struggle.

Using AI to generate your thoughts and package them for you is where the problem lies. This is a form of intellectual outsourcing, and it undermines everything education should accomplish. We're supposed to be developing minds that can grapple with complexity, tolerate ambiguity, and push through confusion to reach understanding. When students bypass that struggle, they miss the very experiences that build intellectual stamina and confidence.

The cost goes beyond individual development. When everyone's using the same AI tools to generate similar outputs, we lose the diversity of thought that drives innovation. Original ideas often sound wrong at first. They're awkward, unpolished, maybe even contradictory. But that's where breakthroughs come from. Polish them too early with AI, and you might polish away exactly what made them valuable.

This is why critical thinking matters more now than ever before. We need students who can recognize AI-generated content, yes, but more importantly, we need students who insist on doing their own thinking despite the temptation of instant, polished answers. We need them to value their own struggle with ideas, to trust that the mess and frustration of real thinking leads somewhere worthwhile. Because if we lose that, we lose the very capacity that makes us human: the ability to think for ourselves, originally and authentically, even when it's hard, especially when it's hard.

In this chapter, I explore how AI literacy and critical thinking intersect in education today. I trace the evolution of critical thinking as an educational goal, explain why it has become even more vital in an AI-saturated world, and show how teachers can integrate it meaningfully into their practice. The chapter introduces Ennis’s framework as a practical foundation, outlines four layers for connecting critical thinking with AI use, and ends with classroom activities that turn these ideas into everyday learning experiences.

What is Critical Thinking?

The roots of critical thinking stretch back much further than most of us assume. Many histories credit Socrates as its originator and Dewey as the one who brought it into education, but this is too simplistic. The early Greek thinkers before Socrates were already questioning tradition, testing claims, and arguing from reason (Lau, 2024). Figures like Heraclitus and Xenophanes set the groundwork for rational debate by challenging accepted stories and pushing for evidence. Later, writers and philosophers in the eighteenth and nineteenth centuries, including Coleridge and Kant, began to use "critical" thought in ways that resemble our current understanding (Lau, 2024).

Dewey's *How We Think* (1910/1933) did not invent the term but gave it educational weight, positioning it as central to how students learn. It is important to note here that Dewey used the label reflective rather than critical thinking (Lau, 2024; Gosner, 2025). The actual term gained visibility later, especially through Max Black's 1946 textbook *Critical Thinking*, and it became widely institutionalized in the early 1980s (Ennis, 2015).

At that time, the California State University system made critical thinking a graduation requirement, and the Rockefeller Commission urged the U.S. Department of Education to treat it as a "basic skill" essential for advanced learning (Ennis, 2015). Robert Ennis notes that since then, critical thinking has grown into a central educational aim, championed by both policymakers and educators (pp. 31–32).

Now let's turn to how different scholars have defined critical thinking and let's start with John Dewey.

John Dewey's classic definition in *How We Think* set the tone for much of the later discussion. He defined critical thinking (he used the term reflective thinking) as the "active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further conclusions to which it tends" (p. 9). Dewey's definition captures both the activity and the discipline of thinking. For him, critical thinking was not a casual habit but a deliberate practice: testing beliefs, weighing evidence, and considering consequences.

Later scholars refined and adapted this foundation. Robert Ennis (2015) offered a streamlined definition that many educators still cite today: "reasonable reflective thinking focused on deciding what to believe or do" (p. 32). His phrasing emphasizes judgment and decision-making, making clear that critical thinking is always purposeful. More recent perspectives keep these roots but update them for contemporary education. Gosner (2025), for instance, describes critical thinking as a "mode of cognition using deliberative reasoning and impartial scrutiny of information to arrive at a possible solution to a problem." He stresses both the skills (i.e., logical reasoning that can be taught) and the dispositions (i.e., the mindset of open inquiry) that must be cultivated.

When we zoom out and look at these definitions, we can see a line of continuity. Dewey placed the emphasis on careful reflection, Ennis sharpened it into purposeful decision-making, and Gosner highlighted the combination of skills and dispositions. For us teachers and educators working with AI, these definitions remind us that critical thinking is both a process and a posture: a set of tools for reasoning and a commitment to using them thoughtfully.

Why Does Critical Thinking Matter More in the AI Age?

Critical thinking matters because it helps us step outside the insulated box created by AI-driven content and reclaim the full range of human potential. For students, this need is even more urgent. Many spend so much time interacting with screens and much of the content on those screens is shaped or generated by AI.

Without critical thinking, they risk taking information at face value. With it, they learn to question what they read, evaluate sources, and distinguish credible voices from shallow or misleading ones. This involves looking carefully at paratextual cues (e.g., cited references, the author's background, the platform that hosts the text) all of which give context to the words on the screen. Such habits of scrutiny are essential in an age where misinformation, inaccuracies, and hallucinations circulate widely.

To illustrate the impact of technology on our cognitive habits, let's take the act of reading. In 2008, Nicholas Carr published an essay in The Atlantic titled "*Is Google Making Us Stupid: What the Internet is Doing to our brains*" and in it he shared this revealing statement:

> “Over the past few years, I’ve had an uncomfortable sense that someone, or something, has been tinkering with my brain, remapping the neural circuitry, reprogramming the memory. My mind isn’t going—so far as I can tell—but it’s changing. I’m not thinking the way I used to think. I can feel it most strongly when I’m reading. Immersing myself in a book or a lengthy article used to be easy. My mind would get caught up in the narrative or the turns of the argument, and I’d spend hours strolling through long stretches of prose. That’s rarely the case anymore. Now my concentration often starts to drift after two or three pages. I get fidgety, lose the thread, begin looking for something else to do. I feel as if I’m always dragging my wayward brain back to the text. The deep reading that used to come naturally has become a struggle.” (p. 57)

Carr was writing at the dawn of Web 2.0, when platforms like Facebook, YouTube, and Twitter began to change what reading meant in daily life. The page gave way to the feed. Skimming replaced immersion. Attention became something to be captured, not cultivated. As McMurtrie (2024) observes, this was the moment when our habits “shifted toward short and often fragmentary text.” Princeton historian Graham Burnett looked at the same pattern and saw a future where deep reading would become rare, predicting that “with the ubiquity of screens, it seems inevitable that fewer people will engage with lengthy texts” (Goldstein, 2025). The data now echo that warning. According to the National Assessment of Educational Progress, American high school seniors’ reading scores have fallen to “the worst they have been in three decades” (Goldstein, 2025).

And just as we begin to grasp what screen culture has done to attention, AI changes the terrain again. This time, the challenge isn’t just distraction but delegation. We can now ask machines to read on our behalf, to summarize chapters, extract key points, and deliver the essence of a book in seconds. It’s easy to see the appeal in a world built on speed and constant pressure to keep up. Yet, as Mark Watkins (2024) warns, “the lure of frictionless reading” risks producing “a profoundly atrophied culture of surface-level ideas.” Even everyday tools reflect this shift. Adobe Reader, once a simple PDF viewer, now comes with an AI assistant ready to condense any document, turning the act of reading itself into an optional step.

There’s nothing wrong with asking AI to help unpack a dense report or a long technical paper. In many cases, it’s a practical choice. The problem begins when summarization replaces reading altogether. I’ve found that the most productive use of these tools comes after you’ve read the text yourself. Once you’ve formed your own sense of its structure and arguments, an AI summary becomes a way to test understanding, to see what it captures, what

it misses, and where its interpretation drifts from yours. If you skip that first step, you hand over the act of judgment to the machine. The summary you receive may be polished, but it reflects the system's logic of selection and emphasis, not your own purpose as a reader.

Another cost of outsourcing reading is the loss of what I call the "productive struggle" of comprehension. Our education system has long framed reading as an analytical task aimed at arriving at predetermined outcomes. But reading is more than analysis. As Watkins (2024) reminds us, it is a socially constructed practice: a dialogue between reader and author, a chance to test arguments, imagine perspectives, and empathically share in another's thinking. This layered experience cannot be replicated by a machine-generated summary. What we want to cultivate are readers who engage with texts holistically, who experience the friction and reward of deep reading, and who bring critical thinking to every stage of that engagement.

Here is the brighter side of this discussion. The same AI we often blame for eroding attention spans or dulling originality can also be harnessed to sharpen critical thinking. The paradox is real: AI carries risks, yet it can also be the very tool that helps us develop the skills to meet those risks with confidence.

As Ned Courtemanche observed, "over two years of experimentation in the classroom has led me to believe that AI can be a force multiplier for critical thinking with the ability to enhance core skills like reading comprehension" (Kentz & Ned, 2025, n.p). When used deliberately, AI can help create opportunities to extend students cognitive efforts. For instance, having students compare AI feedback with peer and instructor feedback can spark reflection about what makes an argument strong, what counts as evidence, and why some feedback resonates while other suggestions feel mechanical or shallow. This kind of triangulation exercise does not erode thinking, it deepens it.

This is the double-edged paradox in plain sight. On the surface, AI threatens to deskill; but with careful integration, its presence can push students to engage more critically with their own ideas and with the technology itself. The reality is that students are already using AI, whether institutions permit it or not. Pretending otherwise only widens the gap

between classroom practices and students' lived realities. The question, then, is not whether they will use it but how.

That is why the benefits of critically integrating AI into teaching and learning far outweigh the inconveniences. When guided by educators, students can learn to treat AI as a sparring partner, a tool that challenges them to read more carefully, argue more persuasively, and make more thoughtful choices. Critical thinking provides the compass here. It enables students to move beyond frictionless shortcuts toward meaningful engagement, turning AI into an amplifier of human insight.

Integrating Critical Thinking into AI-Supported Learning

One of the biggest questions teachers face is how to bring critical thinking into AI-infused lessons. Do we carve out a single unit on critical thinking and then move on, hoping students carry it with them? Or do we weave it into every lesson and discussion until it becomes second nature, a habit of mind that shapes how they handle knowledge and AI-generated content? My own teaching leans strongly toward the latter. Every lesson where AI is integrated becomes an opportunity to pause, unpack how AI works, and raise ethical or interpretive questions that get students thinking more carefully about the tools in front of them.

I've found that modeling is one of the most powerful ways to make this stick. When students watch their instructor pause to question a source, test an assumption, or point out where an AI answer feels suspicious, they see critical thinking in action. That kind of modeling has a staying power no worksheet or lecture can match. It shows students not just what critical thinking looks like in theory, but how it actually plays out in real-time decision-making.

At the same time, students benefit from having a clear framework they can refer back to as they practice these skills on their own. A framework provides structure, a reminder of the questions to ask when the answers feel too smooth or too quick. One of the most useful I've worked with is Robert Ennis's framework of critical thinking. I taught it in a graduate course during the summer of 2025, and students consistently described it as both practical and eye-opening.

Ennis (2015) outlines twelve dispositions and eighteen abilities that together define the ideal critical thinker. The dispositions capture the

mindset, habits like seeking clarity, being open to alternatives, and striving for accuracy. The abilities highlight the practical skills: analyzing arguments, checking credibility, recognizing assumptions, and monitoring one's own thinking. The following are the twelve dispositions and eighteen abilities identified by Ennis (2015, pp. 32-33). Together, they outline both the mindset and the skill set of an ideal critical thinker. They also offer teachers a concrete foundation for integrating critical thinking into AI-supported learning.

Critical Thinking Dispositions

These are the attitudes or habits of mind that support critical thought. According to Robert Ennis, the ideal critical thinker is disposed to:

1. Seek and offer clear statements of the thesis or question,
2. Seek and offer clear reasons,
3. Try to be well informed,
4. Use credible sources and observations, and usually mention them,
5. Take into account the total situation,
6. Keep in mind the basic concern in the context,
7. Be alert for alternatives,
8. Be open-minded a. seriously consider other points of view, b. withhold judgment when the evidence and reasons are insufficient,
9. Take a position and change a position when the evidence and reasons are sufficient,
10. Seek as much precision as the situation requires,
11. Try to "get it right" to the extent possible or feasible,
12. Employ their critical thinking abilities.

Critical Thinking Abilities

According to Robert Ennis, the ideal critical thinker can:

1. Have a focus and pursue it,
2. Analyze arguments,

3. Ask and answer clarification questions,
4. Understand and use graphs and maths,
5. Judge the credibility of a source,
6. Observe, and judge observation reports,
7. Use their background knowledge, knowledge of the situation, and previously established conclusions,
8. Deduce, and judge deductions,
9. Make, and judge, inductive inferences and arguments (both enumerative induction and best-explanation reasoning)
10. Make, and judge, value judgments,
11. Define terms, and judge definitions,
12. Handle equivocation appropriately
13. Attribute and judge unstated assumptions,
14. Think suppositionally,
15. Deal with fallacy labels
16. Be aware of, and check the quality of, their own thinking (metacognition)
17. Deal with things in an orderly manner,
18. Deal with rhetorical strategies.

Based on Ennis's framework, I developed an adapted checklist of classroom questions that teachers can use to integrate critical thinking into AI-supported activities. You can use this list to guide student reflection, push them to interrogate AI output more carefully, and cultivate the intellectual habits that make for rigorous and responsible thinkers.

Table 4
Checklist of critical thinking questions for AI-supported activities

Critical Thinking Dimensions	Guiding Questions for AI-Supported Activities
Clarity and Focus	• What exactly is the claim or question here, and how can you say it more clearly? • If AI gave you this answer, can you explain it in your own words without looking back? • Does the response stay focused on the task, or is it drifting?
Evidence and Reasoning	• What reasons does the AI give, and do they make sense? • Which part of this answer would you need to fact-check before using it? • If you had to explain why this point is convincing (or why it isn't) what would you say?
Sources and Credibility	• Where do you think this information comes from, and how reliable is that source likely to be? • If you needed to support this idea with a credible source, what would you look for? • How would you check if this AI response is accurate or misleading?
Alternatives and Open-Mindedness	• What other possible answers could there be to this question? • If someone disagreed with this response, what would their strongest argument be? • How would you reframe the question to see a different perspective?
Precision and Depth	• Is this answer too vague, and if so, how can you make it more precise? • What details are missing that would make the explanation stronger? • How could you use a graph, example, or analogy to make this point clearer?
Inference and Assumptions	• What assumptions is this answer making? Are they fair? • Does the conclusion actually follow from the reasons given? • Can you think of an example that supports or challenges this claim?
Reflection and Self-Monitoring	• Does this explanation truly make sense to you, or are you just accepting it? • Where do you see gaps in your own understanding as you read this response? • If you had to teach this idea to someone else, what part would be hardest to explain?
Order and Rhetoric	• Is the argument structured in a way that makes sense, or is it confusing? • What rhetorical strategies (appeals to emotion, authority, logic) are at work here?

	• Does the style of this AI response sound persuasive, or does it feel flat?

Here's an example that shows how critical thinking can live at the center of a course, not just appear as a side note.

In their EdFilm class, Ali Söken and Kysa Nygreen (2024) built reflection directly into the rhythm of learning. Each week, students explored AI through questions that encouraged them to pause and think more carefully about what this technology means for education, creativity, and human agency. Critical thinking wasn't treated as a separate topic. It shaped how students read, wrote, discussed, and even questioned the purpose of their own learning.

Their approach worked because it created a steady habit of inquiry. Instead of lecturing about AI ethics or bias, they gave students recurring prompts that guided their thinking across the semester. Those questions became the backbone of the course. Students kept returning to them, refining their answers as their understanding of AI deepened.

Some of the questions included:

1. What are the limits, possibilities, and uses of generative AI?
2. Do you think using GenAI is ethical or unethical, and why?
3. Who is behind AI technology? Who benefits from it? Who profits? Who is harmed?
4. Why should you learn to do things (like write a college essay) if AI can do it for you? Is there still value in learning that skill?
5. Why are we discussing GenAI in this education class? How does it connect to teaching and learning?

These questions help students recognize that AI sits within a web of human decisions and social consequences. Teachers can adapt this model easily. Before starting a project that involves AI, you might ask students who benefits from the technology they're using. After finishing an assignment, you could invite them to reflect on how AI shaped their work and what they would do differently next time.

This kind of reflection builds habits that last. Students begin to question automatically, to look for patterns, and to consider implications beyond the task at hand. That's what genuine AI literacy looks like:

awareness grounded in curiosity and guided by questions that make learning both deeper and more human.

Four Layers for Integrating Critical Thinking With AI

I like to think of integrating critical thinking into AI in terms of layers. Each layer represents a different point of contact between students and AI: how they prompt it, how they evaluate its output, how they reflect on its influence on their learning, and how they consider its broader ecological footprint. These four layers provide a structured way to embed critical thinking into everyday classroom use of AI.

Layer 1: Critical Prompting

The first layer of critical engagement happens at the moment of prompting. Teachers and students need to learn how to craft better prompts if they want meaningful interactions with AI. Consider the difference between asking "Write an essay about climate change" versus "Analyze how rising sea temperatures specifically affect coral reef ecosystems in the Caribbean, considering both immediate biological impacts and long-term economic consequences for local fishing communities." The second prompt requires you to already understand that climate change has specific, localized effects, that ecosystems and economies interconnect, and that different stakeholders experience these changes differently. You can't write that prompt without having done some thinking first.

This process itself becomes a critical thinking exercise. Students must clarify their objectives, identify what information they need, anticipate potential complications, and structure their inquiry logically. They're essentially outlining their thinking before engaging with AI. When a student struggles to write a clear prompt, it often reveals they haven't fully understood what they're trying to accomplish.

Research shows that learning to prompt AI effectively can reveal the limits of AI systems, as students see where the AI produces irrelevant or incorrect results (Walter, 2024). This realization fosters their AI literacy and healthy skepticism about AI's reliability. Try this exercise with your students: Have them write three different prompts for the same learning objective, each with increasing specificity. Then analyze the AI's responses to each. Which prompt yielded the most useful information? Where did

added specificity help, and where did it actually constrain the AI's response in unhelpful ways? This teaches students that prompting is itself an iterative, critical process.

Layer 2: Interrogating AI Output

The second layer engages when AI generates its response. Here, critical thinking operates across several dimensions including fact-checking, examining limitations, and analyzing structure and logic.

Fact-Checking and Verification

Students must verify claims, references, and sources cited by AI against credible sources. This goes beyond simple fact-checking. When AI claims that "studies show" something, students should ask: Which studies? Conducted when? By whom? With what sample size? AI often conflates multiple sources or invents plausible-sounding citations. Teaching students to trace every claim back to its origin builds both research skills and healthy skepticism.

A simple way to help students see the limits of AI is to turn them into reviewers. Ask them to audit an AI-generated response as if it were a draft submitted to an academic journal. They mark every claim that would need a citation, circle each sweeping generalization, and underline any statement that implies cause and effect. When the page fills with notes and marks, the exercise makes something visible that’s usually hidden: the gaps in the system’s reasoning and the human judgment still required to fill them.

Examining Limitations and Biases

Critical thinking here means asking: Whose perspectives does this AI response privilege? What voices are missing? If AI describes "normal" family structures, whose normal does it mean? When it discusses historical events, from whose viewpoint? Students need to recognize that AI trained on internet text inherits all the internet's biases and blind spots.

Have students rewrite AI responses from different perspectives. How would this explanation of the American Revolution sound if written by a British historian? A Native American scholar? An economist versus a social historian? This exercise reveals how AI defaults to certain dominant narratives while ignoring others.

Analyzing Structure and Logic

Students should examine how AI constructs its arguments. Does the conclusion actually follow from the premises? Are there logical leaps? Hidden assumptions? AI often produces text that sounds coherent but lacks logical rigor. Teaching students to diagram AI's arguments, literally mapping out the logical flow, helps them spot where reasoning breaks down.

Layer 3: Reflecting on Personal Learning Impact

This the metacognitive layer requires students to examine how AI use affects their own learning and wellbeing. Students should regularly assess: Am I using AI to skip thinking or to enhance it? Do I feel more confident or more dependent after using AI? Can I still perform this task without AI if needed? This self-monitoring helps students maintain cognitive independence while benefiting from AI assistance.

One way to engage in this kind of self-monitoring is through reflection journals where students document their AI use. Teachers can guide this process by offering prompts such as:

1. What did you use AI for, and why?
2. How did you feel before, during, and after using it?
3. What challenges did you encounter while working with AI?
4. What would you do differently next time?
5. Did using AI help you understand the concept better, or just finish the task faster?
6. How did using AI affect your confidence in your own thinking and writing?
7. At what point in the process did AI feel most helpful and when did it feel unnecessary?
8. How much of the final product still feels like your own work?

Over time, these journals become a record of growth, a way for students to see patterns in their thinking and use of AI. A student might notice, for example, that they rely on AI most when they feel stuck at the beginning of a writing task, or that the feedback they get from AI feels helpful only when they already have a clear direction. Reflecting on moments like these helps them move from automatic use to intentional use.

As students reflect on how they use AI, it also helps to guide them toward noticing how these tools affect their emotional wellbeing. The goal is to help them see that AI doesn't just shape how they learn, it can also shape how they feel about learning. You might invite students to explore these questions in their journals or during group discussions:

1. How do you feel when you use AI for schoolwork: motivated, relieved, anxious, or unsure?
2. Have you ever felt dependent on AI tools, and how does that make you feel when you can't use them?
3. Do you ever question whether the work still feels like your own after using AI?
4. How does AI affect your confidence in your abilities?
5. Have you noticed any pressure to produce "AI-perfect" work?
6. Do you feel more focused or more distracted when AI is part of your learning process?

These kinds of reflections open space for conversations that go beyond productivity or accuracy. The wellbeing dimension matters too. Some students report anxiety when they can't access AI tools they've grown dependent on. Others feel impostor syndrome about AI-assisted work. Still others experience decision fatigue from constantly evaluating AI suggestions. These psychological impacts deserve serious attention and discussion.

In practice, the three layers work together by guiding students through critical prompting, output evaluation, and metacognition. Critical prompting forces them to clarify their goals and think carefully about the questions they ask. Output evaluation trains them to check the quality, accuracy, and perspective of what AI produces. Metacognition helps them reflect on how these interactions shape their own learning. These dimensions are interconnected habits of mind, each reinforcing the others in ways that help students engage with AI critically and responsibly.

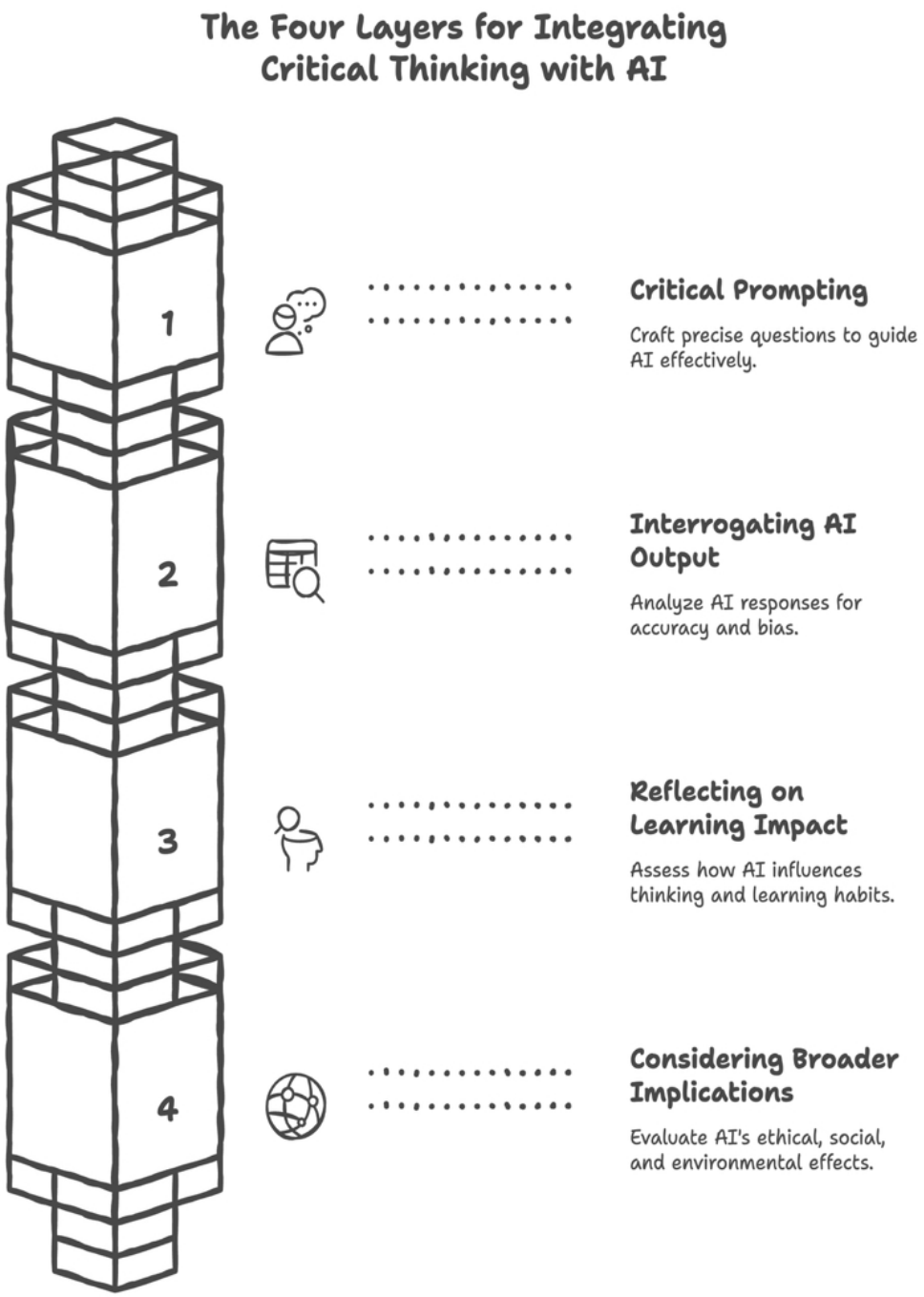


Figure 4 *The four layers of integrating critical thinking with AI*

Classroom Activities for Critical AI Engagement

In this section, I share a sample of activities that push students beyond passive consumption of AI outputs toward what Walter (2024) calls active critique and reflection. Each activity forces students to exercise their critical thinking skills while working with AI. You might even use AI to help generate additional activity ideas, then critically evaluate which ones would actually work in your specific classroom context.

These assignments serve what Mollick and Mollick (2023) call a dual purpose: "to help students learn with AI and to help them learn about AI" (p. 3). Through the metacognitive habits strengthened by critical thinking, students overcome complacency toward AI output and engage with it more thoughtfully and purposefully. They learn to benefit from AI to deepen and extend their comprehension while creating authentic and meaningful learning experiences. Critical thinking helps students develop the habits of questioning AI's output, verifying its claims, fact-checking its sources, and critically assessing its recommendations. They remain the "human in the loop" throughout every AI interaction (Mollick & Mollick, 2023).

This human-in-the-loop approach means students take an active role in knowledge building through AI use. They oversee its output, verify against credible sources, challenge its claims, and most importantly, take full responsibility for their AI-assisted work. The activities you're about to explore make this abstract concept concrete. Students experience firsthand what it means to maintain intellectual authority while using powerful technological tools. They learn through practice that AI enhances thinking but doesn't replace it, that efficiency shouldn't come at the cost of understanding, and that the most sophisticated use of AI involves knowing when not to use it at all.

1. The AI Comparison Lab

In this activity, you give students a question or task that connects directly to the lesson. For example, "Explain the causes of the French Revolution" or "Describe the process of deforestation." First, have them write their own short response. Then, generate an answer to the same prompt using an AI tool. Bring both versions into the discussion and ask students to compare the two:

1. Where does the AI answer seem clear or convincing?
2. Where does it fall short or oversimplify?
3. How does their own response differ, and why?

Encourage students to critique both texts, not just the AI's. Sometimes the AI will highlight gaps in their own writing, while other times their original response will show more nuance or accuracy. This side-by-side review often sparks lively debate about what counts as strong reasoning, credible evidence, or clear explanation.

As a whole-class activity, you can project an AI-generated response and go through it line by line. Invite students to mark where it makes claims without evidence, where the logic feels shaky, or where key details are missing. This approach turns evaluation into a shared exercise, giving everyone a chance to practice spotting strengths and weaknesses in AI output. The value here goes beyond fact-checking. Students learn to weigh arguments, recognize assumptions, and defend their own reasoning. In other words, they practice critical thinking in real time while also sharpening their awareness of how AI works and where it falters.

2. The Local Context Challenge

One of the most effective ways to push students into deeper thinking is to anchor tasks in their own communities. Give them a real problem drawn from their local context, something AI is less likely to have ready-made answers for. This could be anything from proposing ways to improve recycling in the school, to brainstorming how to make a nearby park safer, to designing a community awareness campaign around a local issue.

Students can turn to AI as a brainstorming partner, but the key expectation is that they must document and explain how they used it. For example, if AI gave them generic solutions, they need to show how they adapted or rejected those ideas in light of local realities. During presentations, each group or individual explains their proposed solution and the role AI played in shaping their thinking.

This exercise builds critical awareness on two fronts. First, it exposes the limits of AI. Students quickly realize that AI often struggles with local context, missing cultural nuances, specific regulations, or community needs. Second, it pushes them to become more reflective about their own choices: which AI-generated suggestions were useful, which were

irrelevant, and why. As AVID (n.d.) notes, activities like this encourage students to "interrogate AI's contributions" and build the habit of questioning how technology intersects with real-world challenges.

3. The AI Language Detective

In this activity, students analyze language patterns to distinguish between human and AI-generated writing. I tried this with my graduate students last summer by giving them two versions of the same post: one written by me and one written by ChatGPT. Their task was to decide which was which and explain their reasoning.

During the discussion, students pointed out what they called the "telltale signs" of AI writing: its overly neat grammar, repetitive phrasing, and predictable structures. They noticed how AI tends to flatten style and produce prose that feels polished but often lacks the quirks, metaphors, and rhythms that come from lived experience.

After sharing their judgments, we had a lively class conversation about what these differences reveal: how AI "thinks" when generating language, where it succeeds in mimicking human voice, and where it falls short. The exercise didn't just sharpen their ability to spot AI; it opened up reflection about their own writing, voice, and authenticity.

4. The Bias Detector Exercise

This activity asks students to uncover the hidden biases and stereotypes that may appear in AI-generated outputs. The purpose of this activity is to show how bias emerges even when users make neutral or straightforward requests.

Here is how it works in class:

1. Provide students with a simple, everyday prompt; something like "generate an image of a CEO" or "write a short description of a scientist."
2. Have them generate the output using an AI tool (text or image).
3. Ask students to carefully examine the response. Does the AI reproduce stereotypes? For instance, does the CEO always appear as an older white man in a suit? Does the

scientist default to a male figure, or perhaps a Western setting?

4. Facilitate a discussion about what they notice. Which perspectives are missing? How do these outputs reflect the biases embedded in the data the AI was trained on?
5. Have students re-prompt intentionally to challenge these assumptions (e.g., "create an image of a young woman CEO in Nairobi," or "write a description of an Indigenous scientist working on climate change"). Compare how the AI responds when its defaults are disrupted.

By treating bias detection as a classroom exercise, students learn two things at once: first, how to recognize stereotypes and gaps in representation, and second, how to critically question the social values that get baked into technology. This activity builds awareness that AI outputs are never neutral and they reflect cultural assumptions and training data limitations.

5. Project-based Learning with AI

Project-based learning gives students authentic ways to connect classroom knowledge with the world beyond school (Laver, 2018; Farber, 2017, Kharbach, 2025). It's a chance for them to investigate real issues, apply what they've learned, and create something with purpose. When AI enters that process, it doesn't replace inquiry, it expands it. Students can use AI to explore questions more deeply, organize research efficiently, simulate ideas before testing them, and bring creative polish to their final presentations.

Here is a suggestion for an activity that blends AI with project-based learning. First, start with organizing students into small groups and give them a long-term project tied to your subject area. In science, for instance, that could mean investigating local water quality and comparing it with national data. In history, they could document community heritage by interviewing elders and curating digital exhibits. In language arts, they might create a multimedia storytelling project that combines original writing, visuals, and recorded narration. Throughout their inquiry, students can use AI to help summarize complex readings, brainstorm directions for investigation, or generate visual and textual materials that complement their fieldwork.

Encourage students to keep a reflection journal as they work. Ask them to record how they used AI, what benefits it provided, and where it fell short. Did AI help clarify difficult information or inspire new approaches? Did it ever offer suggestions that felt off-topic, biased, or too simplistic? These reflections give students space to think critically about their own processes and to recognize AI's strengths and limits in real academic work.

By the end of the project, each group presents their findings and what they learned about collaborating with AI. They discuss where AI truly enhanced their learning and where human judgment made the difference. That dual reflection, on both the topic and the technology, helps students build a habit of mindful AI use. They begin to see AI as a companion in thinking, one that requires direction, questioning, and discernment, much like any other powerful tool for learning.

6. Visualizing History

I learned this activity from Ned Courtemanche (Kentz & Ned, 2025), who developed a classroom exercise called "Visualizing History." In this task, students read a text, choose four passages that they consider central to its meaning, and then create AI-generated images that represent those moments. The goal is to get students to approach reading like directors planning a film: they must decide which parts of the story to highlight, design prompts that capture the essence of each scene, and revise those prompts until the visuals align with their interpretation. The result is a storyboard that demonstrates both comprehension and critical decision-making about meaning and representation.

Although Courtemanche originally used this with history texts, the method can be adapted to any subject area. Here are two examples of how teachers might reframe the activity:

6.1. History Adaptation

Students reading Narrative of the Life of Frederick Douglass, for instance, could generate images to represent moments of oppression, resistance, and freedom. After creating their visuals, they would analyze how well the images captured Douglass's message and where the AI fell short. This sparks discussion about bias in AI outputs, the complexity of historical interpretation, and the importance of going beyond surface representations.

6.2. Science Adaptation

In a unit on ecosystems, students could read about energy transfer in food chains, select four passages that highlight key interactions, and generate corresponding images. Comparing the visuals to scientific diagrams or real-world data helps them critique accuracy, identify misconceptions, and reflect on the difference between AI's imaginative renderings and evidence-based explanations.

By adapting the "Visualizing History" approach, teachers in any subject can give students opportunities to think critically about texts, images, and AI itself. The activity combines creativity with analysis and help learners develop sharper interpretive and evaluative skills.

7. The AI Expert Debate

This activity, adapted from Noble (2023), invites students to engage with historical or intellectual figures through AI chat tools such as HelloHistory. The goal is to deepen understanding of complex ideas by simulating debates with influential thinkers while also reflecting critically on how AI shapes those conversations. Steps for the classroom:

1. **Choose a figure or theme:** Assign students a figure related to your curriculum, for instance, Socrates for philosophy, Marie Curie for science, Frederick Douglass for history, or Ada Lovelace for computing. You might also let students choose based on their own interests.
2. **Prepare guiding questions:** Before engaging with the AI, students develop 4–5 thoughtful questions. For example, in philosophy, one might ask Socrates about the role of questioning in acquiring knowledge. In science, a student might ask Curie how she balanced discovery with safety.
3. **Engage in AI debates:** Students interact with the AI system, posing their questions and recording responses. Encourage them to probe deeper, asking follow-ups when the AI provides vague or simplistic answers.
4. **Reflect on the exchange:** Students write a short reflection or journal entry answering prompts like:

    a. What did I learn from this simulated dialogue?
    b. How accurate or credible did the responses seem?
    c. What perspectives were missing, and how might this reflect the AI's training data?
    d. How did this experience compare with engaging in a class debate or reading primary texts?
5. **Classroom debrief:** As a group, discuss what students discovered, both about the historical or intellectual content and about AI's strengths and weaknesses as a medium for debate.

"Chatting" with figures like Socrates or debating alongside simulated experts, students get a chance to test ideas against diverse standpoints. At the same time, they build AI literacy: they see how AI constructs answers, where it falters, and why human interpretation remains essential.

8. AI and Redefining Concepts

This is an activity I learned from Dumin (2024). She asked her students to write a definitional argument paper that examined how AI has changed the meaning of a familiar concept. For example, she pointed to "customer service" and how it once meant talking to a person but now often involves interacting with a chatbot until the issue becomes complex enough to reach a human agent. That simple shift in experience becomes a window into how AI quietly reshapes language and social norms.

Students then choose their own concepts and built arguments showing how AI has redefined them. The assignment didn't just ask for definitions, it asked students to examine cultural change through the lens of AI. What made the project especially rich was the feedback phase. Dumin asked students to seek three kinds of feedback: one from a peer, one from her (the instructor), and one from ChatGPT. They then compared the three responses, noting how each source approached their writing differently. Was the AI's feedback more general or overly polite? Did the human readers catch nuances that AI missed? Students reflected on these differences, assessing which feedback was most useful and why.

This exercise turned feedback itself into a lesson in critical literacy. Students began to see AI as one more perspective to weigh, interpret, and question. We can also create variations of this activity. For instance, instead of definitional arguments, students might generate images with an AI tool to visualize how a concept is represented, then critique the biases or stereotypes in the images compared to real-world examples. Another option is to hold a structured classroom debate where one team uses AI to generate arguments and the other team relies on their own reasoning, followed by a reflection on the differences in depth, originality, and persuasiveness between AI-supported and human-developed positions.

9. Pre-mortem

This activity is inspired by Ethan Mollick and Lilach Mollick's (2023) article '*Assigning AI: Seven Approaches for Students with Prompts*'. The idea of a pre-mortem is to anticipate failure before it happens. Students are asked to imagine that their project, paper, or solution has completely failed, then work backward to identify the reasons why. By predicting pitfalls, they practice foresight, analytical reasoning, and critical evaluation of their own plans.

Here is how it works in class:

1. Present students with a task (e.g., designing an experiment, writing an essay, creating a group project).
2. Ask them to imagine the task has failed spectacularly.
3. Using AI, students generate a list of possible reasons for failure.
4. Students then refine that list by critiquing AI's suggestions, adding their own insights, and grouping the causes into categories (e.g., lack of evidence, unclear structure, overlooked counterarguments).
5. As a class, they discuss which risks are most likely and how to guard against them.

This process moves students beyond blind optimism and helps them anticipate challenges with a critical eye. Here are some variations of this activity:

- **Essay Writing:** Students draft a thesis statement and then run a pre-mortem on it. They ask AI to "explain why this argument would fail to convince an audience." Students refine the feedback, discuss the weak spots, and then revise their thesis.
- **Debate Preparation**: Before holding a debate, students imagine their team lost. They prompt AI to generate reasons the opposing side won, then use those points to strengthen their rebuttals.
- **STEM Projects:** In science or engineering, students propose a solution (e.g., a design for reducing energy use) and then conduct a pre-mortem to predict why the solution might not work in real-world conditions. This sharpens attention to variables, assumptions, and feasibility.
- **History or Literature**: When analyzing a historical decision or a character's choice, students ask: "If this decision failed, what might have caused the failure?" AI can generate possibilities, and students then evaluate which explanations align with historical context or textual evidence.

10. The Devil's Advocate

Mollick and Mollick (2023) originally presented the Devil's Advocate as a prompting technique, where students could ask an AI system to challenge their assumptions or argue against their position ("Devil's Advocate Prompt"). For them, it was a way of showing how AI can surface counterarguments quickly and push students to consider perspectives they might otherwise ignore.

I've adapted this into a classroom activity that students can use to strengthen their critical thinking. Instead of relying only on AI's output, students are guided to actively compare and evaluate arguments from both human and AI sources. They start by drafting their own position, then use AI in Devil's Advocate mode to generate counterarguments. After that, they reflect on the quality of those counterarguments, refine them with peer input, and finally adjust their own reasoning in response. This turns the Devil's Advocate from a single AI prompt into a structured process of interrogation, debate, and reflection that helps students practice intellectual humility, anticipate opposition, and strengthen their reasoning.

11. Reflective Memos

Reflective journals are a powerful way to strengthen students' critical thinking while also giving them space for metacognition. I used this approach in the graduate course I taught in the summer of 2025. After each class, students wrote a 300–400 word entry reflecting on what they learned, how they engaged with the material, and where they still had questions. The class was online, and entries were submitted the following day, but this can work just as well in person.

The key Is to frame the journal as more than a summary. Students are encouraged to treat it as a self-assessment, an honest account of their evolving understanding, challenges they encountered, and the connections they made during class. To strengthen the habit, you can reserve time at the end of a session for in-class reflective writing. Collecting the memos before students leave ensures the reflection is immediate and authentic.

This activity can also be adapted for AI literacy. Dumin (2024) asked her students to reflect specifically on their use of AI in assignments: how they incorporated AI, what kind of feedback it provided, and how they evaluated that feedback against peer and instructor comments. I recommend, as she did, that reflective memos be AI-free. Writing without AI ensures that students slow down, think for themselves, and develop confidence in their own voices. You can keep the prompts open-ended. Students might write about what surprised them in class, which ideas challenged their assumptions, or how they might apply what they learned beyond the classroom. The goal is not polished prose but honest engagement. Over time, these memos create a record of intellectual growth and give both students and teachers insight into how learning unfolds.

So, as you might have noticed, all of the activities I featured in this section share a common thread: they position students as active investigators who question, verify, and build upon AI outputs. Each exercise strengthens the intellectual muscles students need to maintain agency in an AI-saturated world. When students compare their work with AI output, solve local problems, detect bias, and synthesize multiple sources, they develop what we might call "cognitive sovereignty." This means they can think independently while using powerful tools, maintaining their intellectual authority even as they leverage AI's capabilities.

Conclusion

As we close this chapter on AI literacy and critical thinking, one idea keeps resurfacing: AI has arrived in our classrooms, and as Walter (2024) observes, it can either undermine or enhance critical thinking depending on how it is integrated. The difference lies entirely in our approach. Throughout this chapter, we've seen this paradox play out. AI threatens cognitive abilities through intellectual outsourcing, yet the same technology, approached critically, strengthens thinking skills. When students learn to craft precise prompts, interrogate outputs, and reflect on their AI use, they develop stronger critical capacities.

The frameworks and activities shared here are meant as practical entry points. Ennis's framework gives us a common language for describing the kinds of thinking we want to nurture. The four layers translate that vision into classroom practice, and the sample activities show what this looks like when it comes alive with students. At the heart of it all is mindset. Stay curious about AI, but keep a healthy dose of skepticism. Treat every AI interaction as a learning opportunity for yourself and your students.

Critical thinking thrives in the tension between confidence and doubt, between efficiency and reflection. Our goal as educators is to protect that space. The tools will keep changing, but the need for discernment will not. AI is here to stay, yet the distinctly human ability to reason, to judge, and to wonder remains irreplaceable. In the end, teaching with AI is about helping students stay intellectually sovereign, to think for themselves while learning how to work intelligently alongside technology.

Part II: AI Integration Frameworks

Introduction

Recent data from a Gallup survey reveals a striking pattern in how teachers currently use AI (Malek Ash, 2025). While 60% of U.S. teachers have adopted AI tools, with 32% using them weekly, their applications remain largely confined to basic tasks. The most common uses include preparing lessons (37%), creating worksheets (33%), and modifying existing materials (28%). More sophisticated applications like analyzing student data (7%), providing tutoring (6%), or grading complex work (7%) remain rare.

From a pedagogical lens, these uses fall mainly within the lower levels of both the SAMR model and Bloom's Revised Taxonomy. In SAMR, teachers' AI practices cluster around Substitution and Augmentation, replacing or enhancing existing routines like lesson planning or content preparation. In Bloom's terms, these correspond to Remember and Understand levels, where AI supports recall, summarization, and explanation. The challenge ahead is to move toward Modification and Redefinition in SAMR, and toward Analyze, Evaluate, and Create in Bloom's; levels where AI becomes a partner in inquiry, critical thinking, and creative production.

This part aims to help you build a sound AI pedagogy anchored in well-established educational frameworks. The frameworks I focus on are SAMR, Bloom's Revised Taxonomy, TPACK, and Webb's Depth of Knowledge (DOK). These frameworks provide different yet complementary entry points for this reflection. The purpose of examining AI through these frameworks is to build a pedagogically sound approach to AI integration that goes beyond surface-level applications.

The frameworks help us envision and implement more ambitious possibilities. What if AI could enable entirely new forms of learning that weren't possible before (SAMR's redefinition)? How might we use AI to support creative work and critical evaluation (Bloom's higher levels)? What knowledge do teachers need to integrate AI effectively while maintaining ethical standards (Intelligent-TPACK)? How can we ensure AI-supported activities maintain appropriate cognitive rigor (Webb's DOK)?

Each framework offers a different lens for examining these questions. SAMR provides a ladder from enhancement to transformation, helping teachers gradually expand their practice. Bloom's ensures we support the

full spectrum of cognitive processes, not just lower-order thinking. TPACK grounds technology use in the complex interplay of content, pedagogy, and technology knowledge, with new emphasis on ethical considerations. DOK maintains focus on cognitive demand, ensuring that impressive-looking AI products reflect genuine thinking and learning.

Anchoring AI integration in these established frameworks will enable teachers to make pedagogically grounded decisions that serve student learning. Needless to mention that the frameworks provide shared vocabulary for professional conversations, criteria for evaluating AI tools and applications, and pathways for systematic professional development. And more importantly, these frameworks can help teachers move confidently from where they are now (i.e., saving time on routine tasks) to where they could be: using AI to create learning experiences that develop students' full cognitive potential.

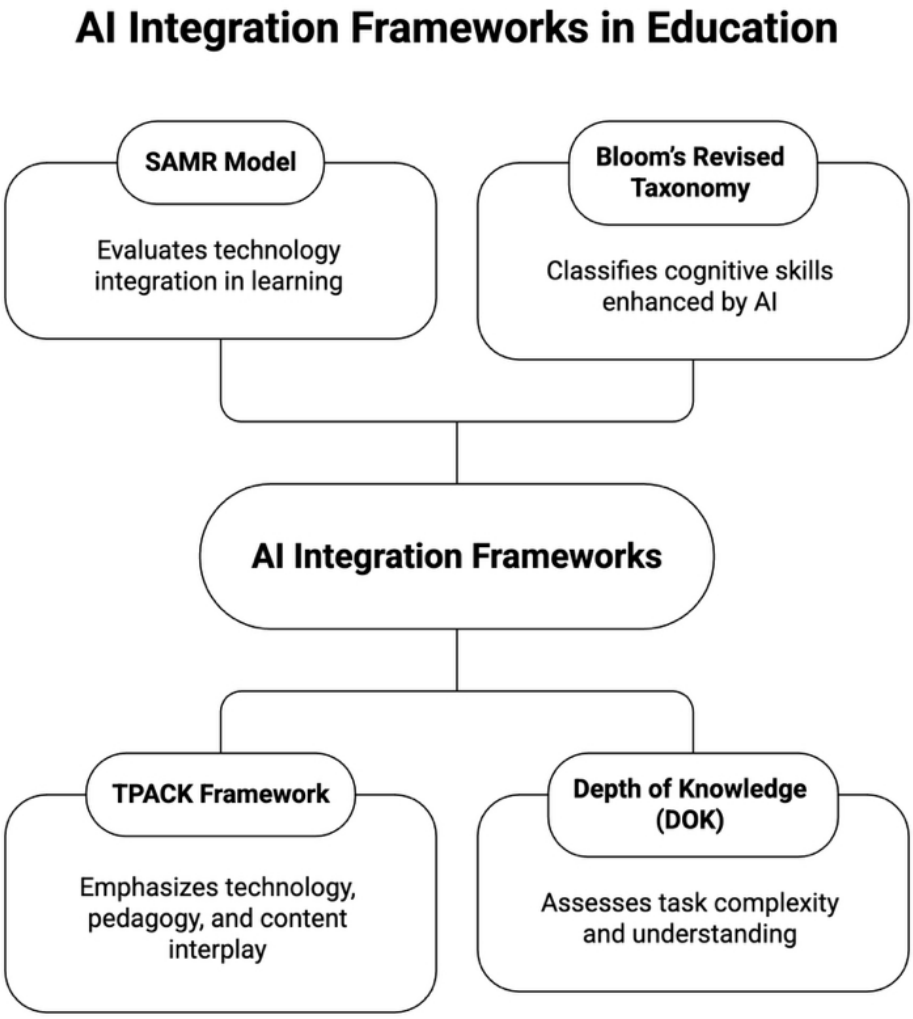


Figure 5 *Adapted AI integration frameworks*

Chapter 3: The SAMR Model

The SAMR model, developed by Dr. Ruben Puentedura (2014), has become one of the most widely used frameworks for thinking about how technology fits into teaching and learning. The name SAMR comes from its four levels: Substitution, Augmentation, Modification, and Redefinition. Each level describes a different way technology can be used, ranging from a simple replacement of traditional tools to the creation of entirely new learning experiences.

What makes SAMR appealing is its clarity. It pushes teachers to reflect on the different ways they integrate AI and technology in their teaching. At the lower levels, technology may simply act as a substitute (e.g., typing an essay instead of handwriting it). At the higher levels, it allows us to rethink tasks altogether thus creating projects and experiences that wouldn't have been possible before. As Puentedura argued, moving upward on the model tends to open up richer opportunities for teaching and learning (Hamilton et al., 2016, p. 434).

I chose SAMR as one of the guiding lenses for AI integration because it helps us avoid a trap I've seen in many conversations around AI: treating AI only as a time-saver or a flashy add-on. AI certainly can speed up routine tasks, but SAMR reminds us that the real potential lies in how we use AI to reshape instruction. It gives us a way to ask: Am I simply using AI to generate a worksheet faster, or am I pushing toward more creative, collaborative, and meaningful learning opportunities?

In this chapter, I explore how the SAMR model can guide teachers in making thoughtful and purposeful choices about AI integration. We begin by revisiting the four SAMR levels (Substitution, Augmentation, Modification, and Redefinition) and unpack what each looks like in practice when AI enters the classroom. From there, I share classroom-based examples, tool suggestions, and workflow ideas that show how AI can range from saving time on routine tasks to reimagining learning in ways previously impossible. You'll see how each step up the SAMR ladder invites deeper engagement and creativity, and how even small, well-considered uses of AI can lead to meaningful gains in teaching and

learning. By the end, the framework will feel less like a hierarchy to climb and more like a reflective map for choosing how and when AI best serves your students' learning goals.

The Four Levels of the SAMR Model

The SAMR framework is built around four levels of technology use, arranged in a ladder-like progression. Each level represents a different degree of change in how technology shapes learning tasks.

1. Substitution

At this level, technology acts as a direct replacement for a traditional tool, but without any functional improvement. The task stays the same, only the medium changes.

2. Augmentation

Here, technology still substitutes for a traditional approach, but now with added functionality that improves the task in some way. The learning goal remains the same, but the process becomes more efficient or flexible.

3. Modification

At this stage, technology begins to reshape the task. It allows for meaningful redesign, where the way students engage with content, demonstrate understanding, or collaborate is significantly changed.

4. Redefinition

This is the highest level in SAMR. Here, technology enables entirely new tasks that were not possible before. Redefinition expands what teaching and learning can look like, opening up possibilities for creativity, connection, and problem-solving that go beyond the traditional classroom.

Enhancement vs. Transformation

The SAMR model is often grouped into two broad categories: Enhancement (Substitution and Augmentation) and Transformation (Modification and Redefinition). Enhancement makes existing practices smoother or more efficient, while transformation pushes instruction into new territory by fundamentally reimagining the task.

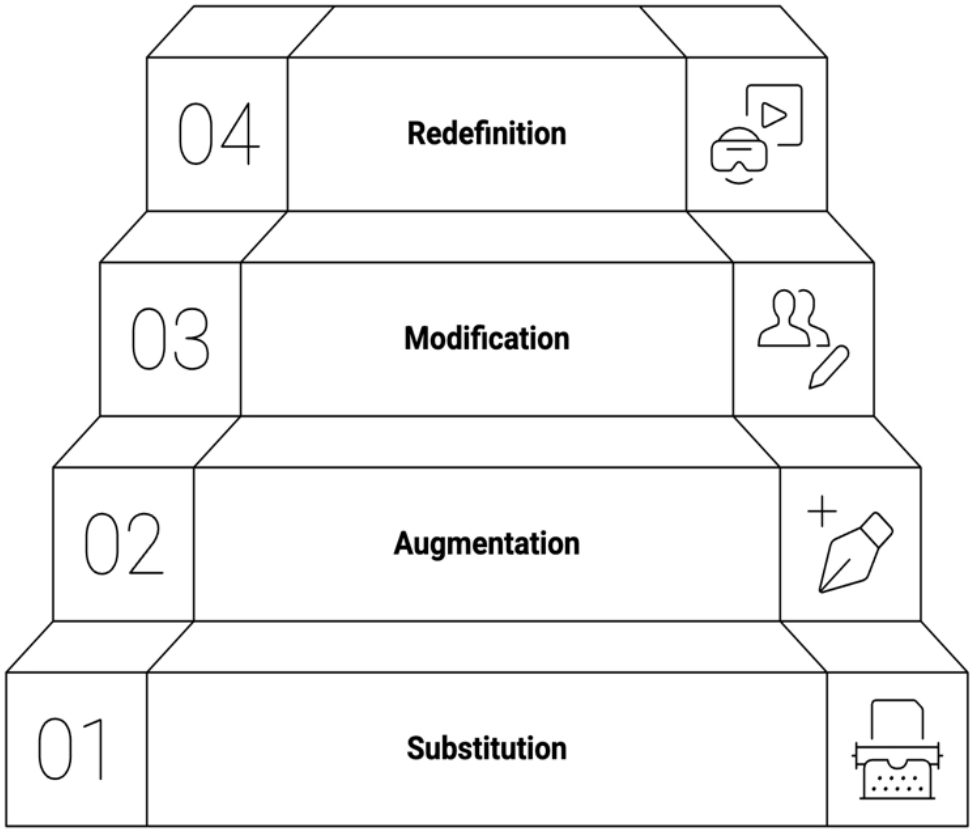


Figure 6 *The four levels of the SAMR framework*

Examples of AI Integration Across SAMR Levels

In the next section, we'll explore how each of these levels can serve as a guide for integrating AI into lesson planning and classroom practice.

1. Substitution Level: AI as Direct Replacement

In each of the following examples, AI replaces manual work but doesn't change the fundamental learning task, student engagement method, or assessment approach. The technology serves as a time-saving substitute without functional improvement to the learning experience itself.

Activity 1: Vocabulary List Creation

Teachers traditionally spent time typing up vocabulary lists with definitions for upcoming reading assignments. Now they paste a text passage into an AI tool and request "extract 10 vocabulary words with definitions from this passage." The AI generates the same formatted list teachers would have created manually. Students still receive a printed or digital handout, look up words, and memorize definitions for Friday's quiz. The task and learning process stay exactly the same; only the list creation method changed.

Possible AI Tools:

1. List Generation: ChatGPT/Claude with simple extraction prompts
2. Basic Formatting:
    a. Google Gemini in Docs for instant list creation
    b. **Microsoft Copilot in Word for formatted vocabulary tables**
    c. **Quizlet for turning lists into printable study sheets**

Teacher Workflow

Teachers copy and paste their chosen reading passage into ChatGPT or Claude with a straightforward prompt: "Extract 10 challenging vocabulary words from this text and provide simple definitions." The AI generates a numbered list with words and definitions that teachers can copy directly

into a Word document. Teachers quickly review the list to ensure appropriateness for their grade level, then distribute copies. Students receive the same handouts they always have, use dictionaries to verify or expand definitions, and study for the traditional vocabulary quiz. The only change is that teachers save the 20-30 minutes they previously spent identifying words and typing definitions, time they can redirect to other teaching tasks. The learning experience for students remains completely unchanged from pre-AI methods.

Activity 2: AI-Assisted Math Worksheet Generation

Every math teacher knows the quiet grind of preparing practice sheets: aligning equations, spacing problems evenly, and double-checking for typos that students will inevitably find first. With AI, that repetitive setup fades into the background. A teacher can describe the kind of problems they want and within seconds receive a clean, ready-to-print worksheet. The AI can even include an answer key and a variation for early finishers. The activity itself stays traditional: students work through the problems on paper, show their steps, and submit their work for feedback. What changes is the preparation time and the flexibility teachers gain to adjust difficulty or topic on the fly.

Possible AI Tools

1. ChatGPT/Claude/Gemini for creating math problems.
2. Edcafe, Eduaide, or MagicSchool for formatted worksheet templates
3. Canva for adding basic worksheet design elements
4. Quizlet for turning lists into printable study sheets

Teacher Workflow

Teachers open ChatGPT and type a simple prompt: "Generate 20 two-digit multiplication problems arranged in two columns." The AI instantly creates problems like "34 × 67" and "82 × 45" that teachers copy and paste into a Word document. They add a name/date line at the top and print 30 copies for the class. Students complete the problems at their desks using the same paper-and-pencil method they've always used, showing their work in the margins. Teachers collect and grade the worksheets with an answer key (also generated by AI if desired). The entire classroom experience mirrors

traditional worksheet practice. The only difference is the teacher spent one minute generating problems instead of searching through workbooks or writing problems by hand. No technology touches the student experience at all

2. Augmentation Level: AI with Functional Enhancement

At the Augmentation level, AI enhances traditional tasks such as solving problems, reading texts, writing essays, learning vocabulary, or taking quizzes by adding functional improvements like immediate feedback, personalization, adaptive practice, and variation without fundamentally changing the activity itself.

Activity 1: Differentiating Reading Passages with AI

Traditionally, teachers manually rewrote reading passages to suit different ability levels, a process that was time-consuming and often inconsistent. With AI, teachers can instantly generate multiple versions of the same text at varied reading levels. Students still read and discuss the same content, but now every learner can access the material in a form that matches their reading ability. The task remains the same, reading and comprehension, but the accessibility and preparation process are significantly enhanced.

Possible AI Tools

1. Text Adaptation: Diffit, ChatGPT, Gemini for instant differentiation & text simplification.
2. Reading Level Analysis: Hemingway Editor to check readability scores
3. Enhancement Features: Immersive Reader (Microsoft) for additional support. Natural Reader for text-to-speech options.

Teacher Workflow

Teachers start by selecting or uploading their source text (e.g., about the Civil War) into an AI tool which automatically generates versions at different Lexile levels (e.g., Diffit, MagicSchool, Brisk Teaching, etc.). Alternatively, they can use ChatGPT with specific prompts like "Rewrite this Civil War article at a 4th-grade reading level, maintaining all key facts but using simpler vocabulary and shorter sentences." Teachers verify

reading levels using Hemingway Editor or Lexile Analyzer to ensure appropriate differentiation. They then distribute texts through Google Classroom or similar platforms, with each student receiving their appropriate version. Students can use Immersive Reader for additional support like syllable breaks or picture dictionaries. During class discussion, all students contribute insights from the same content, but the differentiated texts ensure everyone arrives prepared to participate. Teachers can quickly generate comprehension questions at different complexity levels to match each text version thus aligning assessment with the provided materials.

Activity 2: Grammar & Writing Feedback with AI

In the traditional classroom, teachers provided grammar feedback after collecting student drafts, sometimes days or weeks later. AI writing assistants like Grammarly, Hemingway Editor, and QuillBot now offer immediate, contextual feedback as students write. The learning task (i.e., drafting, revising, and improving writing) has not changed, but the immediacy and personalization of feedback make the process more interactive and efficient. Students learn from mistakes in real time, strengthening both accuracy and confidence in their writing.

Possible AI Tools

1. Primary Writing Assistants:
    a. Grammarly for comprehensive grammar, clarity, and tone checking.
    b. ChatGPT/Claude for detailed style and structure analysis.
    c. Microsoft Editor (built into Word/Edge) for basic corrections
2. Specialized Feedback:
    a. Hemingway Editor for sentence complexity and readability.
    b. QuillBot for paraphrasing and vocabulary enhancement.
    c. Wordtune for sentence-level rewrites and tone adjustment
3. Learning Support:

a. Khan Academy’s Khanmigo for explanations of grammar rules.
b. **NoRedInk for targeted grammar practice based on errors.**

Teacher Workflow

Students begin drafting in Google Docs with Grammarly extension activated, receiving immediate feedback as they type. The color-coded underlines help them distinguish between critical errors (red), clarity issues (blue), and enhancement suggestions (purple). When students hover over suggestions, they see explanations of the grammar rule, not just corrections. For more complex writing issues, students can paste paragraphs into Hemingway Editor to identify overly complex sentences or passive voice patterns. They can also use QuillBot (or AI chatbots) to explore alternative phrasings when stuck on expression. Throughout the writing process, students keep a personal error log noting recurring mistakes the AI catches, helping them recognize patterns in their writing challenges. Teachers can access Grammarly's weekly progress reports to identify common class-wide issues for mini-lessons. The immediate feedback loop means students learn from mistakes in context rather than weeks later when they've forgotten their original thinking.

3. Modification Level: AI Enabling Task Redesign

At the Modification level, AI use goes beyond improving existing tasks to reshaping them enabling significant task redesign. Here are two examples that illustrate the use of AI at the modification level:

Activity 1: Collaborative AI-Assisted Research Projects

This activity moves beyond traditional research by combining multiple AI tools for inquiry, analysis, and synthesis. Students learn to evaluate information critically, triangulate data from diverse sources, and construct coherent arguments supported by verified evidence. The process emphasizes discernment and collaboration, turning fragmented research steps into an integrated, inquiry-based experience

Possible AI Tools

1. Research Tools:

a. Perplexity AI for sourced research with citations.
b. **Google Scholar or Elicit for academic sources.**

2. Data Analysis:
   a. Julius AI for dataset analysis and visualization.
   b. **Napkin AI or Mylens AI for custom graphs.**
3. Collaboration:
   a. Notion AI or Google Docs with Gemini for synthesis.
   b. **Miro for visual connection mapping.**
4. Presentation: Gamma or Canva for multimedia presentations.

Teacher Workflow

Students begin with Perplexity for broad research, then use Julius AI to analyze any datasets they find. They collaborate in Notion (or Google Docs with Gemini on), where the AI helps them organize findings and identify patterns across team members' research. For verification, they cross-reference claims using Consensus and Google Scholar. Finally, they use Gamma or Canva to create their multimedia presentation. The key is teaching students to use these tools complementarily. No single AI tool does everything well but combining them creates a powerful research toolkit. Students should document which tools they used for what purposes, maintaining transparency about their AI-assisted research process.

Activity 2: Real-Time Language Exchange with AI

This activity transforms language learning from static drills into dynamic interaction. Students practice authentic communication in simulated, real-world scenarios guided by AI partners. The experience blends conversational fluency, cultural awareness, and self-correction, giving learners personalized feedback in real time. It supports risk-free practice and builds confidence before engaging with human speakers.

Possible AI Tools

1. Character.AI with language-specific bots for immersive roleplay
2. ChatGPT/Claude with custom language prompts and proficiency settings
3. HelloTalk AI for structured language exchange scenarios
4. Support Tools:
    a. DeepL Write for real-time grammar suggestions
    b. Reverso Context for contextual translations and examples
    c. Google Translate conversation mode for quick phrase checks
5. Practice Extensions:
    a. Duolingo Max for AI-powered roleplay scenarios
    b. Speechling for pronunciation practice post-conversation
    c. Quizlet for vocabulary review from conversations

Teacher Workflow

Students configure their AI conversation partner with specific parameters like proficiency level, scenario, and formality register. They engage in conversations while keeping DeepL or Reverso accessible for quick translations without interrupting the flow. Students can pause to ask the AI about cultural nuances or phrase explanations. After completing the exchange, they copy their conversation into ChatGPT or Claude to request personalized grammar analysis and targeted practice exercises. Throughout the process, students maintain a language journal documenting new expressions and cultural insights. This approach enables unlimited judgment-free practice, allowing students to repeat scenarios until confident. Teachers review conversation logs to identify common challenges and design mini-lessons addressing actual student needs.

4. Redefinition Level: AI Creating Previously Impossible Tasks

At the Redefinition level, AI opens doors to learning experiences that were previously unimaginable. Here are two examples that illustrate the use of

AI at the redefinition level:

Activity 1: Personalized Learning Simulations

This activity transforms traditional experimentation into an adaptive, inquiry-based process. Students use AI to extend standard simulations beyond preset conditions, testing “what if” scenarios and exploring complex variables that would be impossible to replicate in a physical lab. The focus shifts from following instructions to generating and investigating their own hypotheses, strengthening conceptual understanding through experimentation, visualization, and verification.

Possible AI Tools

1. PhET Simulations + AI assistant (ChatGPT, Claude, or Gemini) for guided inquiry.
2. Wolfram Alpha for precise calculations.
3. Desmos/GeoGebra for visual modeling.
4. Labster for immersive virtual labs.

Teacher Workflow

Students begin with standard PhET simulations to grasp basic concepts, then formulate "what if" questions about extreme conditions. They input queries into ChatGPT or Claude ("How would projectile motion change on Jupiter?") and receive mathematical explanations. Students verify calculations using Wolfram Alpha and input modified parameters into Desmos or GeoGebra for instant visualizations. They compare multiple scenarios side-by-side, documenting surprising discoveries in digital lab notebooks. For complex investigations, they use Labster's virtual labs to test impossible scenarios with AI guidance. The AI suggests edge cases they haven't considered and helps identify patterns across experiments. Students create visual presentations showing how variable changes affect entire systems, using their generated simulations as evidence. This cycle of questioning, testing, and visualizing continues until students develop intuitive understanding of physics principles across different conditions.

Activity 2: Immersive Historical Reconstructions with Multiple Perspectives

This activity transforms traditional experimentation into an adaptive, inquiry-based process. Students use AI to extend standard simulations beyond preset conditions, testing "what if" scenarios and exploring complex variables that would be impossible to replicate in a physical lab. The focus shifts from following instructions to generating and investigating their own hypotheses, strengthening conceptual understanding through experimentation, visualization, and verification.

Possible AI Tools:

1. TimeLooper or ClassVR for immersive VR.
2. Canva Magic + ChatGPT/Gemini for perspective-based narratives.
3. Character.ai or SchoolAI for role-based dialogues.
4. Labster-style history simulations (emerging tools).
5. Custom GPT trained on primary sources for historically accurate Q&A.

Teacher Workflow

Students begin by choosing a historical role (perhaps Rosa Parks, a bus driver, a minister, or a journalist) and enter a VR environment through TimeLooper or ClassVR. Inside, they encounter pivotal moments brought to life with AI-generated dialogue and context tailored to their perspective. At key decision points, they make choices that influence how the story unfolds, while ChatGPT draws on primary sources to generate historically grounded responses.

After exploring one role, students shift viewpoints to experience the same events through different eyes, observing how position and perspective shape understanding. To deepen inquiry, they interact with a Custom GPT trained on historical documents, asking questions and verifying details. Their observations are recorded in a perspective journal, where they compare interpretations across roles and moments.

As the activity progresses, the AI helps students connect past events to present-day issues, inviting reflection on recurring social and ethical patterns. The unit culminates with each student creating a perspective narrative in Canva, illustrating how individual experiences can influence collective history. Teachers close the cycle with a guided debrief,

encouraging students to share insights about complexity, bias, and empathy gained through inhabiting multiple viewpoints.

Conclusion

The SAMR framework gives us a practical way to think about AI integration that goes beyond the initial excitement of new technology. As we've seen through these examples, AI can operate at every level of the model, from simple substitution that saves teachers time to complete redefinition that creates learning experiences we couldn't have imagined just a few years ago.

The journey through SAMR's levels reveals something important about AI in education. At the substitution level, AI functions as a helpful assistant, generating worksheets and vocabulary lists that free up teacher time for more meaningful work. These uses have immediate value; those saved minutes add up to hours that teachers can redirect toward student relationships and instructional planning. But if we stop there, we miss AI's deeper potential.

As we move up through augmentation and modification, AI begins to change the learning experience itself. Students receive immediate feedback that helps them learn in the moment. They engage in conversations with AI language partners that adapt to their proficiency level. Research projects become multimedia investigations where students learn to evaluate and synthesize AI-assisted findings. The traditional boundaries of what's possible in a classroom start to expand.

At the redefinition level, AI enables experiences that would have been pure fantasy a decade ago. Students explore physics by testing scenarios across different planets. They experience historical events through multiple perspectives, building empathy and understanding complexity in ways that textbooks never could. These aren't just enhanced versions of old activities; they're entirely new forms of learning.

What's crucial to remember is that movement through SAMR isn't automatic or always necessary. Sometimes a substitution-level use of AI is exactly what's needed. A teacher overwhelmed with grading might find the most value in AI that quickly generates quiz questions, giving them breathing room to focus on student needs. There's no shame in using AI for efficiency when efficiency creates space for human connection.

Chapter 4: Bloom's Revised Taxonomy

Bloom's revised taxonomy offers teachers a practical framework for thinking about how AI can support different types of learning. It provides a valuable lens for designing lessons that move students beyond surface memorization into deeper understanding and creative work. The framework highlights the fact that learning happens in layers. Students need opportunities to remember and understand concepts, certainly, but they also need structured chances to apply their knowledge, analyze information, evaluate claims, and create something new. These stages align naturally with AI capabilities where various tools can now support both teachers and learners at each level when we use them intentionally.

In this chapter, I explore how Bloom's revised taxonomy can serve as a guide for thoughtful AI integration across different levels of learning. We begin by revisiting the evolution from Bloom's original taxonomy to the revised version and unpack how its two-dimensional model (i.e., the knowledge and cognitive process dimensions) helps teachers design balanced, intentional instruction. Then, I show how AI can enhance each stage of learning, from remembering and understanding to applying, analyzing, evaluating, and creating. I conclude with practical examples, ready-to-use prompts, and classroom scenarios that illustrate how AI can extend students' thinking while keeping teachers firmly in control of the learning process.

The Evolution from Original to Revised

The original Bloom's Taxonomy, published in 1956, gave educators a common language for describing learning goals. Benjamin Bloom and his colleagues organized cognitive skills into six hierarchical levels: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The framework moved from simple recall of facts to complex, abstract thinking and quickly became foundational in teacher education, helping design test items, plan lessons, and ensure students faced appropriate challenges.

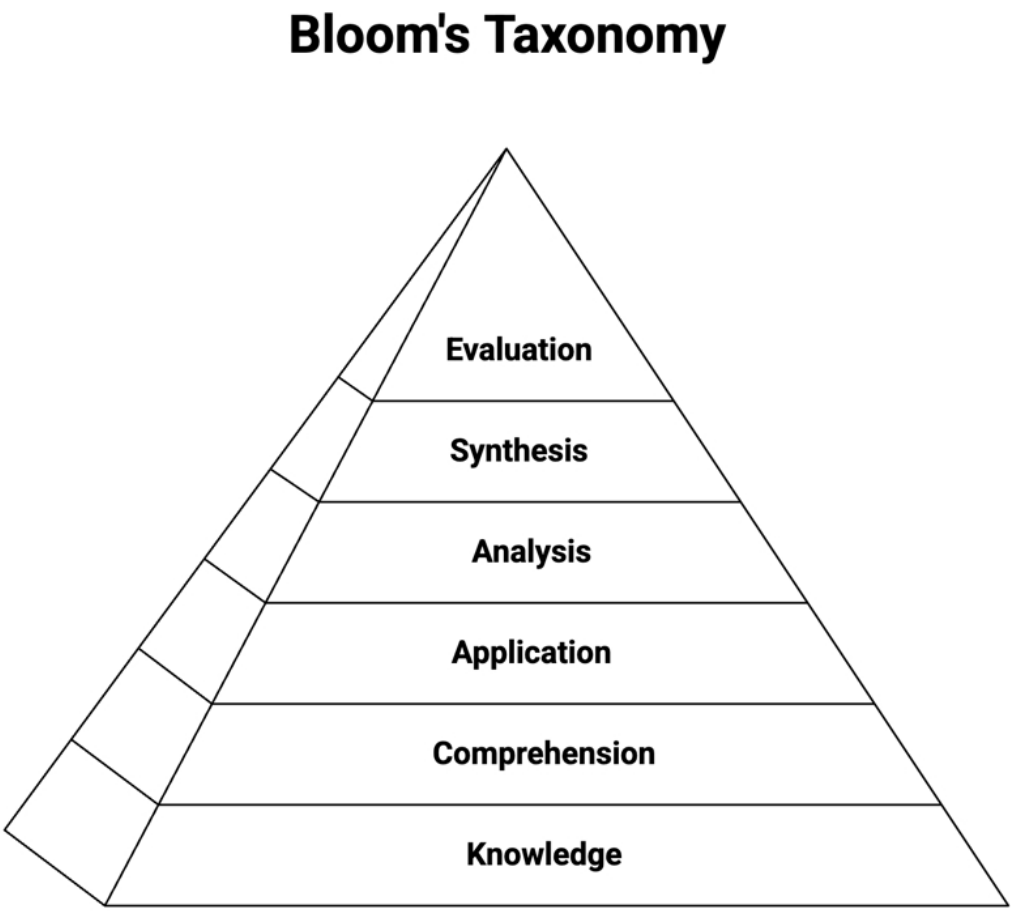


***Figure** 7 Bloom's taxonomy*

Over decades of use, several limitations became clear. Analyses of curricula and tests revealed an overemphasis on the Knowledge category, with far fewer objectives requiring higher-order thinking. The "Knowledge" category itself mixed content (what students should know) with cognitive processes (what students should do with that knowledge), creating conceptual confusion (Krathwohl, 2002). The rigid hierarchy implied students had to master each lower level before advancing, even though these levels often overlap in actual learning (Berger, 2018). Teachers also found the language sometimes disconnected from how they naturally described learning goals (Krathwohl, 2002).

The revised Bloom's taxonomy, published in 2001 by Anderson and Krathwohl, addressed these concerns through significant restructuring. The framework now operates in two dimensions: a knowledge dimension covering factual, conceptual, procedural, and metacognitive knowledge; and a cognitive process dimension containing remember, understand, apply, analyze, evaluate, and create. The categories became verbs to reflect active thinking processes. "Synthesis" was renamed and repositioned as "Create," now recognized as the highest and most complex form of thinking.

This two-dimensional approach allows teachers to classify objectives, activities, and assessments with greater precision. A single learning activity might involve remembering factual knowledge while applying procedural knowledge or understanding conceptual knowledge while creating something based on metacognitive awareness. The framework became a tool for curriculum alignment and instructional planning, not just measurement.

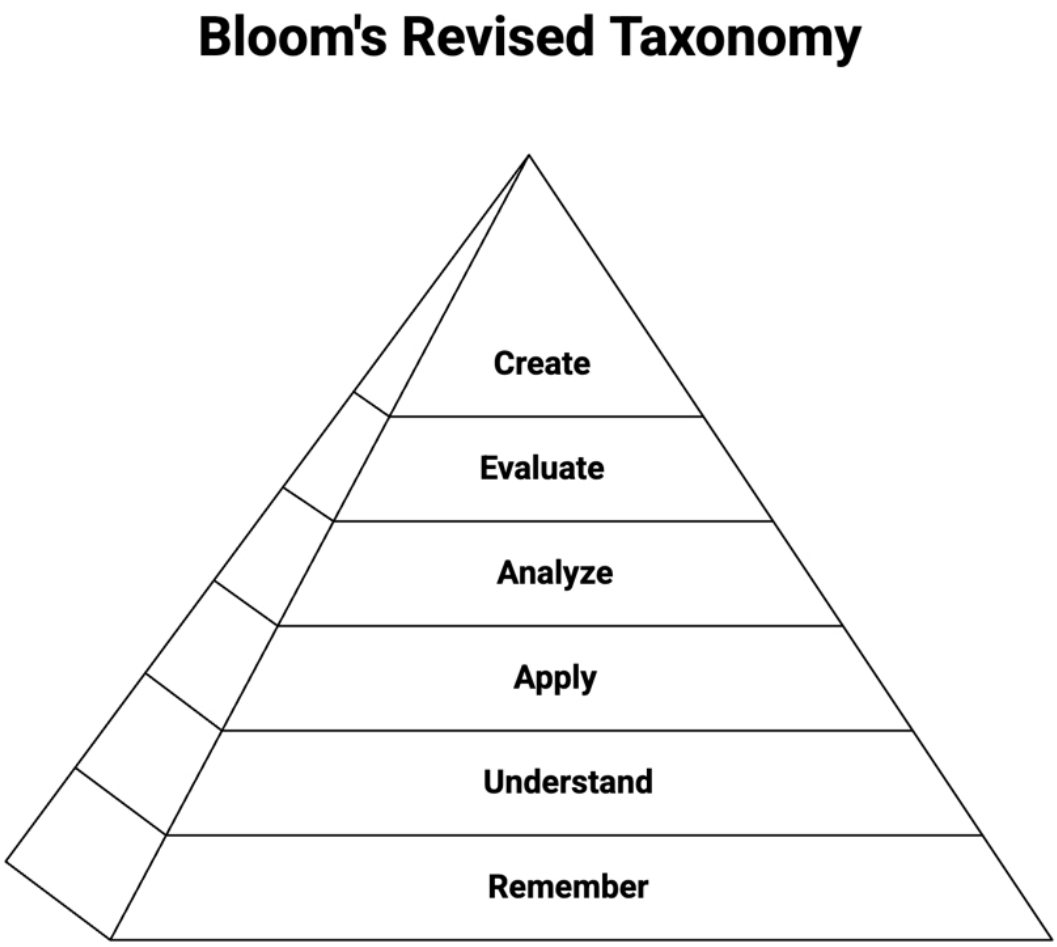


Figure 8 *Bloom's revised taxonomy*

Bloom's revised taxonomy and AI Integration

The revised taxonomy, as I mentioned earlier, helps us see where AI can genuinely enhance learning at each cognitive level. For instance, at the remembering and understanding levels, AI can generate practice questions, create summaries, or provide alternative explanations when students struggle with concepts. For application tasks, AI can simulate real-world scenarios or provide immediate feedback as students practice new skills. When students reach analysis and evaluation levels, AI becomes a thought partner to help them examine patterns in data or consider multiple

perspectives on complex issues. At the creation level, AI can serve as a collaborative tool that helps students generate ideas, iterate on designs, or produce sophisticated final products.

The framework also helps us recognize what AI shouldn't replace. While AI can efficiently handle factual recall or generate initial drafts, the human elements of teaching become even more vital at higher cognitive levels. Teachers guide students through the messy process of analysis, help them develop evaluative judgment, and support their creative vision. AI handles the mechanical aspects while teachers focus on developing students' critical thinking and creative capabilities.

Teachers using Bloom's with AI might often discover unexpected opportunities. A history teacher might use AI to help students remember key dates and facts (remember level), then have the AI generate primary source perspectives for students to analyze (analyze level) and finally support students in creating their own historical fiction that demonstrates deep understanding (create level). The taxonomy provides a roadmap for progressively sophisticated AI use that matches cognitive development.

The revised Bloom’s Taxonomy operates as a two-dimensional framework combining the knowledge dimension (what students know) and the cognitive process dimension (what they do with that knowledge). Within the knowledge dimension lie four categories: factual, conceptual, procedural, and metacognitive knowledge. Each knowledge type represents a distinct kind of learning target. Together, these two dimensions create a coordinate system that helps teachers plan instruction and identify how AI can genuinely enhance learning and teaching. To see this in action, let’s look at how AI can support each type of knowledge in practical classroom contexts.

When students are working with factual knowledge (e.g., specific facts, terminology, or basic elements) AI becomes a tireless practice partner. Beyond generating flashcards, AI tools can create varied retrieval practice formats that prevent pattern memorization. A history teacher might use AI to generate timeline exercises where students sequence events, or a language teacher could have AI create contextual fill-in-the-blank exercises using target vocabulary. The key advantage here is AI's ability to generate endless variations which prevents students from simply memorizing answer patterns and rather learn the actual content.

For conceptual knowledge, AI can help students see connections they might miss. It can generate concept maps that reveal relationships between ideas, but more powerfully, it can create unexpected analogies that make abstract concepts concrete. A physics teacher working with electromagnetic waves might have AI generate analogies to water waves, sound waves, and even crowd behavior at concerts. Students can then critique these analogies and identify where they work and where they break down, a process which deepens their conceptual understanding far more than memorizing definitions.

With procedural knowledge, AI can be approached as a process coach. Rather than just offering step-by-step guidance, AI can provide adaptive troubleshooting support that responds to specific student errors. In a chemistry lab, for instance, AI might help students diagnose why their titration results differ from expected values and even walk them through potential sources of error. In mathematics, AI can generate worked examples that gradually fade scaffolding and move from fully solved problems to problems with strategic hints.

Finally, metacognitive knowledge (awareness and regulation of one's own thinking and learning strategies) represents AI's most sophisticated educational role. AI can prompt reflection through questions that students might not think to ask themselves: "What made this problem harder than the last one?" or "Which strategy worked better and why?" Teachers can use AI to help students track learning patterns over time and identify when they typically struggle and which approaches consistently help them breakthrough.

The real power, I argue, emerges when teachers layer these knowledge dimensions with cognitive processes (Kharbach, 2025e). Creating factual knowledge might involve AI generating study materials, but evaluating factual knowledge could mean students fact-check AI outputs against primary sources. Analyzing conceptual knowledge might have students identify patterns across AI-generated examples, while creating with procedural knowledge could involve students teaching AI a new procedure and debugging its attempts.

This dimensional thinking prevents the common trap of using AI as a fancy worksheet generator. Instead, teachers can ask themselves: What type of knowledge am I targeting? What cognitive process do I want students to

practice? How can AI specifically support that intersection? The answer shapes everything from prompt design to assessment strategies and ensures that AI serves deep meaningful learning processes.

AI-Powered Learning Activities for Bloom's Levels

In the sections that follow, we'll explore specific examples (together with sample prompts) of how AI can support learning at each level of Bloom's revised taxonomy. The goal is to help you see possibilities for using AI to support the full range of cognitive development, from basic recall to creative innovation, always keeping student learning at the center of our decisions.

1. Remember Level: Building Foundational Knowledge

At the Remember level of Bloom's revised taxonomy, students focus on recalling facts, basic concepts, and procedures. This foundational level might seem straightforward, but it's essential for building the knowledge base students need for higher-order thinking. AI tools like Quizlet, QuizGPT, Study Mode, Kahoot, Quizizz, and Khanmigo can make this process more engaging and efficient and help students move beyond rote memorization to active recall that sticks.

The Remember level is all about helping students establish mental anchors they'll use to understand, apply, and eventually create. AI can support this by presenting information in multiple formats, generate varied practice opportunities, and provide immediate feedback that helps students recognize what they know and what needs more work. Examples of the AI powered activities at this level include:

1.1. Generate flashcards for key vocabulary terms, dates, or formulas

Sample prompt:

> "I'm teaching 9th grade biology, currently on the cell structure unit. Create 20 flashcards for Quizlet covering essential cell organelles and their functions. For each flashcard include:
>
> - Front: The organelle name
> - Back: A simple definition (under 15 words), its main function, and a memory aid or analogy students can relate to.

> Focus on these organelles: nucleus, mitochondria, chloroplast, cell membrane, cell wall, ribosomes, endoplasmic reticulum (rough and smooth), Golgi apparatus, lysosomes, and vacuoles. Use comparisons to everyday objects or systems teenagers understand (like comparing mitochondria to phone batteries). Format the output as: Term | Definition | Function | Memory Aid."

This activity turns a basic recall exercise into something more meaningful. Asking AI to create flashcards with short definitions and simple analogies helps students link abstract ideas to familiar objects. When mitochondria become “the battery of the cell” or the Golgi apparatus acts like a delivery center, facts take on clearer shape in memory. The teacher’s role is to review, adjust, and personalize the output. Once refined, the cards can be used for quick quizzes, partner reviews, or spaced recall sessions. What begins as a vocabulary task becomes an active process of connection and understanding.

1.2. Create quiz questions for factual recall

Sample prompt

> "Create a 15-question quiz for 4th grade students on multiplication facts (6s, 7s, 8s, and 9s). Include:
>
> - 5 multiple choice questions with 4 options each
> - 5 fill-in-the-blank questions
> - 5 true/false questions with multiplication facts
>
> Make some questions straightforward (7 x 8 = ?) and others word problems using contexts kids enjoy (video games, sports, pets). Include at least 3 questions that address common mistakes (like confusing 7x8 with 7x6). Provide an answer key with brief explanations for the tricky questions."

This activity shows how AI can make simple recall work feel more dynamic. Asking it to create a quiz with mixed question types (e.g., multiple choice, fill-in-the-blank, and true-false) keeps students alert and interested. The prompt’s details, like using video games or pets as contexts, pull math out of the abstract and into something children recognize from daily life.

You can review the generated questions, adjust difficulty, and use the answer explanations to model clear reasoning. Including a few predictable errors, such as mixing up 7×8 with 7×6, helps students confront common misconceptions directly. The result is a short, purposeful assessment that checks factual recall while nudging students toward more confident, accurate thinking.

2. Understand Level: Making Meaning from Information

The Understand level of Bloom's revised taxonomy moves students beyond simple recall to actually grasping what information means. This is where students interpret, explain, and make connections. AI tools like ChatGPT, NotebookLM, Gemini, Brisk Teaching, Otter AI, and Elicit can serve as interpretation partners and help students bridge the gap between knowing facts and truly comprehending concepts.

At this level, students demonstrate understanding by explaining ideas in their own words, find patterns, and connect new information to what they already know. AI excels here because it can present the same concept through multiple lenses, generate analogies that resonate with different learners, and break down complex ideas into digestible pieces. The key is crafting prompts that push AI to explain, not just restate. Here are two examples illustrating how we can use AI at the understand level:

2.1. Summarize complex readings in student-friendly language

Sample prompt

> "I'm teaching 11th grade US History and my students are struggling with this 3-page primary source about the Industrial Revolution's impact on workers. Please summarize this text for high school juniors by:
>
> - Reducing it to 4-5 main points in modern language
> - Explaining any historical terms or concepts they might not know
> - Highlighting the author's perspective and potential bias
> - Including 2-3 specific examples from the text that illustrate key points
> - Ending with why this document matters for understanding the period
>
> Keep the summary under 300 words and write at a 9th-grade reading level. Maintain historical accuracy while making it accessible. [Paste primary source text here]"

This activity helps students bridge the gap between reading and understanding. When AI summarizes a dense primary source in student-friendly language, it turns a challenging text into something approachable without losing its substance. Breaking the material into key points and explaining unfamiliar terms lets students focus on meaning rather than getting stuck on wording.

2.2. Explain difficult concepts using analogies or metaphors

Sample prompt

> "You're explaining photosynthesis to 7th grade students who struggle with abstract science concepts. Create 3 different analogies that explain how photosynthesis works:
>
> - A cooking/recipe analogy that shows ingredients and products
> - A factory/business analogy showing inputs, processes, and outputs
> - A technology analogy using concepts like charging batteries or solar panels
>
> For each analogy, explain: what represents sunlight, what represents carbon dioxide and water, what represents glucose, and what represents oxygen. Include one sentence about what each analogy helps clarify and what it might oversimplify. End with which analogy would work best for visual learners versus logical thinkers."

This activity captures the essence of the Understand level by helping students move from knowing a concept to grasping how it works. When AI generates analogies for processes like photosynthesis, it gives teachers fresh ways to make abstract ideas visible. Comparing the process to cooking, running a factory, or charging a battery invites students to connect science to familiar experiences. These mental links deepen comprehension and make it easier to recall relationships among key elements such as sunlight, water, and glucose.

To demonstrate understanding, students can discuss which analogy makes the most sense and why. They might point out what each comparison clarifies and where it falls short, showing that they can interpret meaning and evaluate representation. You can extend the activity by asking students to invent their own analogies, confirming that they not only recognize how photosynthesis functions but can explain it in their own terms, a clear sign of learning at the Understand level.

3. Apply Level: Putting Knowledge into Practice

The Apply level of Bloom's revised taxonomy is where learning becomes active. Students take what they've learned and use it to solve problems, complete tasks, and work through new situations. This is where concepts move from theoretical to practical. AI tools like ChatGPT, Claude, MagicSchool, Gemini, Photomath, and Gamma can all provide endless practice opportunities, demonstrate procedures, and guide students through the application level.

At this level, students show they can use knowledge in concrete situations. They implement procedures, solve problems using learned methods, and transfer skills to new contexts. AI serves as a practice partner that can generate unlimited examples, walk through solutions step-by-step, and provide scaffolding that helps students build confidence in applying their knowledge independently. Here are two examples to demonstrate how AI can be integrated into the apply level.

3.1. Demonstrate how historical patterns apply to current situations

Sample prompt

> "My 11th grade history students studied the causes of the American Revolution. Show them how to apply this historical pattern analysis to a modern independence movement. Using South Sudan's independence in 2011:
>
> - List 5 causes of the American Revolution we studied
> - For each cause, identify if a parallel existed in South Sudan's situation
> - Show specific evidence for each parallel or explain why it doesn't apply
> - Demonstrate how to write a paragraph comparing the two using the CEERC format (Claim, Evidence, Explanation, Relevance, Conclusion)
>
> Then provide 2 other modern examples students could analyze using the same framework (Scotland's independence movement, Catalonia) with guiding questions for each."

This activity, which exemplifies the Apply level, turns historical knowledge into a tool for reasoning about present-day issues. When students compare the causes of the American Revolution with movements like South Sudan's independence, they begin to see history as a set of transferable ideas and AI supports this by organizing parallels, providing evidence, and modeling how to write comparative analyses through structured formats such as CEERC. Students demonstrate application when they use what they already know (i.e., the language of causes, effects, and motivations) to interpret new situations. Your role is to help them question the strength of each parallel and discuss where history resists easy comparison.

3.2. Execute writing techniques in different styles

Sample prompt

> "My 9th grade students learned five techniques for writing effective introductions: starting with a question, using a surprising fact, beginning with a quote, opening with an anecdote, or presenting a problem. Demonstrate how to apply each technique to the same essay topic: 'The importance of financial literacy for teenagers.'
> For each introduction type:
>
> - Write a complete 3-4 sentence introduction paragraph
> - Highlight the technique being used
> - Include a clear thesis statement
> - Explain why this opening would appeal to a teenage audience
>
> Then create a practice prompt about social media's impact and ask students to apply three of these techniques. Include a checklist they can use to verify they're correctly applying each technique."

This activity moves the Apply level into the writing classroom, where ideas take form through practice. When AI produces introductions using a question, a quote, or a brief story, students can read them side by side and notice how structure affects engagement. You can use these examples as starting points for experimentation. Students might critique which introductions feel most natural for their peers or rewrite the AI samples in their own voices. The checklist encourages reflection as they apply techniques to new topics, helping them track how intentional choices shape writing.

4. Analyze Level: Breaking Down Complexity to Find Meaning

The Analyze level of Bloom's revised taxonomy asks students to break information into parts, examine relationships, and understand organizational principles. This is where students learn to see how pieces fit together, identify patterns, and distinguish between different types of information. AI tools like ChatGPT, Claude, Elicit, Perplexity, Scholarcy, and Gemini are good fit for this level because they can process large amounts of information, identify connections, and help students see structures they might miss on their own.

At the Analyze level, students move beyond using information to actually examine how and why it works. They differentiate, organize, and attribute, developing the critical thinking skills essential for deeper learning. AI becomes an analytical partner that can help students dissect complex materials, recognize patterns, and understand the underlying structures of

knowledge. And as we did withe previous levels, here are two illustrative examples merging AI with the analyze level:

4.1. Compare and contrast different historical perspectives

Sample prompt

> "My 10th grade history students are studying the American Civil War. Analyze these two accounts of the Battle of Gettysburg - one from a Union soldier's diary and one from a Confederate officer's letter home [provide excerpts]. Create a comparison that:
>
> - Identifies 3 factual points both sources agree on
> - Lists 4 key differences in how they describe the same events
> - Analyzes what factors might explain these different perspectives (rank, location, timing, audience)
> - Identifies emotional language vs. factual reporting in each
> - Notes what each source emphasizes or omits
> - Explains how personal bias affects historical accounts
>
> Format as a three-column chart: Union Perspective | Shared Facts | Confederate Perspective. Then provide 3 questions students should ask when analyzing any primary source with conflicting accounts."

This activity takes analysis out of abstraction and into lived history. When students compare a Union soldier's diary with a Confederate officer's letter, they begin to see how perspective shapes every account of an event. AI helps organize the material into clear patterns (e.g., shared facts, differences in tone, and variations in detail) but the real insight comes from discussion. Students notice that what each writer chooses to emphasize tells as much about their position and audience as it does about the battle itself.

The process sharpens judgment. Students aren't memorizing information; they're questioning it. They learn to weigh evidence, detect bias, and recognize emotional framing in historical writing. As they fill out the comparison chart and respond to AI-generated guiding questions, they start building habits of critical reading that reach beyond history class, skills that apply wherever evidence and perspective intersect.

4. 2. Organize and identify patterns in assessment data

Sample prompt

> "Analyze this class data from our recent unit test on fractions (30 students, 20 questions across 4 learning standards). Here are the results by question and standard [provide data table]. Help me identify:

- Which standard showed the lowest mastery and specific question types students struggled with
- Patterns in errors (conceptual misunderstandings vs. procedural mistakes)
- Correlation between different standards (did struggling with Standard 1 predict issues with Standard 3?)
- Which 5 students need immediate intervention based on pattern of errors
- Which questions might have been poorly written based on response patterns
- Groups for differentiated reteaching based on error analysis

Create a summary showing: overall class performance by standard, top 3 misconceptions to address, and recommended groupings for remediation."

This activity shows how analysis can guide real classroom decisions. When teachers use AI to study assessment data, patterns that once took hours to uncover appear in minutes. The AI can group errors by type, flag weak standards, and even suggest where a test question might have caused confusion. That quick feedback gives teachers a clearer picture of how students are learning, not just what they scored. What makes this process valuable is the reflection that follows. Teachers can discuss with students why certain mistakes keep appearing and what kinds of practice might help. The suggested groupings for reteaching also make differentiation more manageable.

5. Evaluate Level: Developing Critical Judgment

The Evaluate level of Bloom's revised taxonomy represents sophisticated thinking where students make judgments based on criteria and standards. This is where students learn to critique, defend positions, and assess value based on evidence. AI tools like ChatGPT, Claude, Scite AI, Gemini, Consensus, and Eduaide can model evaluation processes, provide frameworks for judgment, and help students develop their critical assessment skills.

The Evaluate level requires students to make informed judgments about quality, accuracy, and value of the information they generate through AI. They learn to support their opinions with evidence, recognize bias, and assess competing claims. At this level, AI serves as a critical thinking partner that can demonstrate evaluation techniques and provide structured

frameworks for making judgments. Here are two examples showing how AI can be used to engage students at the evaluate level:

5. 1. Model how to critique creative work

Sample prompt

> "Show my 9th grade art students how to critique their peer's digital photography project. The assignment was to capture 'isolation in urban spaces.' Demonstrate a constructive critique that:
>
> - Evaluates technical execution (composition, lighting, focus) with specific examples
> - Assesses how well the photos address the theme
> - Identifies 3 strengths with explanations of why they work
> - Suggests 2 areas for improvement with specific recommendations
> - Judges originality while acknowledging artistic influences
> - Evaluates the cohesiveness of the photo series as a whole
>
> Create a critique sandwich structure students can follow. Include sentence starters for giving feedback like 'The use of... effectively...' and 'Consider how... might strengthen...' Show the difference between subjective preference and objective critique."

This activity gives evaluation a clear and creative purpose. In an art classroom, students often hesitate to critique a peer's work because they fear sounding harsh or unsure of what "good" means. With AI modeling the process, they see how to balance sensitivity with precision. The generated critique outlines both strengths and areas for improvement while using accessible language that students can adapt. It helps them recognize that judgment in art comes from attention to evidence (e.g., composition, lighting, and focus) not personal taste.

Once students study the AI example, they can try writing their own reviews of classmates' work using the same structure. Through this, students begin to evaluate thoughtfully and with purpose, moving from vague opinions to reasoned judgments supported by observation. That's what the Evaluate level looks like when thinking becomes both analytical and empathetic.

5.2. Appraise credibility and bias in news articles

Sample prompt

> "My 12th grade government students need to evaluate this news article about proposed education policy changes [provide article]. Demonstrate comprehensive evaluation:

- Assess author credentials and publication reputation
- Identify specific examples of loaded language or bias
- Evaluate quality and diversity of sources quoted
- Check for missing perspectives or context
- Assess use of statistics (misleading vs. accurate representation)
- Identify logical fallacies if present
- Rate overall credibility on a scale with specific justification
- Suggest additional sources to consult for balanced understanding

> Create a 'Bias Detection Toolkit' with specific indicators students should look for, including subtle forms of bias. Provide sentence templates for writing evaluative statements about media sources."

This activity fits naturally into civics and media literacy lessons. Asking students to evaluate a news article through AI's guidance helps them slow down and look beneath the surface of language. When they analyze author credentials, check the reliability of sources, and spot loaded phrasing, they begin to see how influence operates in subtle ways.

6. The Create Level: Where AI Becomes a Design Partner

At the pinnacle of Bloom's Revised Taxonomy sits "Create," the cognitive level where students synthesize knowledge, skills, and understanding to produce something original. The Create level asks students to move beyond consuming and analyzing information to actually producing something new. This might mean designing a solution to a community problem, developing an original artistic work, or constructing a new way to explain a complex concept.

When teachers use AI at the Create level, they're not asking for finished products but for collaborative support. You might prompt ChatGPT to help structure a lesson plan for teaching fractions to third graders, then adapt its suggestions based on your students' specific needs. Claude could help generate original problem-solving scenarios that reflect your local community context. Canva AI assists in producing professional-looking instructional materials without requiring graphic design expertise. Gemini might help develop a parent communication strategy tailored to your subject area and school culture. These tools become thought partners in the creative process.

Here are two Create-level activities where AI can support educational design:

6.1. Create a lesson plan for teaching a concept to younger students

Sample prompt

> "You are an experienced 2nd grade teacher planning a 45-minute lesson on comparing and ordering numbers up to 100. My class has 24 students with varying math confidence levels, 5 students struggle with number recognition, most are at grade level, and 3 are ready for enrichment. Our classroom has limited manipulatives but good access to printed materials. Create a lesson plan that includes:
>
> - A 5-minute warm-up using movement or hands-on activity
> - B 10-minute mini-lesson with visual representations
> - C 20-minute differentiated practice activity with three complexity levels
> - D 5-minute closure with formative assessment
> - E 5-minute buffer activity for early finishers
>
> Include specific examples of numbers to use, questions to ask, and how to group students. Our school emphasizes collaborative learning and growth mindset language."

This activity reflects the Create level in action. The teacher begins with a clear goal, designing a lesson that fits real students, and invites AI into the process as a thinking partner. The tool responds with structure, examples, and options, but the creativity lies in what happens next. The teacher reviews, reshapes, and adapts those ideas until the plan feels alive and connected to the class. The act of creation here is not mechanical; it's iterative and deeply reflective.

At this level, AI supports synthesis. The teacher blends knowledge of content, pedagogy, and learners into something new and purposeful. The lesson plan becomes a product of collaboration between human insight and digital suggestion. That is the essence of the Create level, using understanding and skill to produce original work that serves a specific learning context.

6.2. Design an assessment that measures student understanding in a new way

Sample prompt

> "I teach 8th grade science and need to assess student understanding of the water cycle beyond traditional testing. My 28 students just completed a three-week unit on Earth's water systems. Design a performance-based assessment where students demonstrate their knowledge through a real-world application. The assessment should:
>
> - Connect to our local environment (Pacific Northwest with frequent rainfall)
> - Allow students to work individually or in pairs
> - Take no more than two class periods (90 minutes total)
> - Include options for different learning styles (visual, verbal, kinesthetic)

- Address these standards: water cycle processes, human impact on water systems, and data analysis
- Provide a detailed task description, student instructions, materials list, and a rubric with 4 performance levels for each criterion. Include accommodations for my 3 ELL students and 2 students with processing delays."

This activity brings the Create level into the realm of assessment design. It asks the teacher to imagine new ways for students to show understanding, moving beyond recall or explanation toward authentic demonstration. When AI joins that process, it helps shape possibilities the teacher can refine, projects that connect local rainfall patterns to science standards, tasks that invite choice and creativity, and rubrics that make expectations clear.

The creative act lies in synthesis. The teacher combines curriculum goals, classroom realities, and AI-generated ideas into an assessment that feels relevant and fair. It measures learning through doing, inviting students to analyze, represent, and apply knowledge in ways that mirror real inquiry. This is what creation looks like in teaching: building experiences that reveal understanding through originality, context, and purpose.

Conclusion

Bloom's Revised Taxonomy provides a clear structure for thinking about AI integration across all levels of cognitive development. The framework reveals that AI's value extends far beyond generating flashcards or quiz questions. When we map AI capabilities to each cognitive level, we see opportunities for supporting student learning from foundational knowledge through creative innovation.

The prompts and examples throughout this section demonstrate a crucial principle: the quality of AI output depends entirely on the quality of our instructional design. A vague prompt produces generic results, while a carefully crafted prompt that specifies context, student needs, and learning objectives yields materials genuinely useful for teaching.

Teachers who provide clear parameters, request specific formats, and maintain high expectations get AI-generated content that actually serves their students. The taxonomy helps us ask the right questions at each level and in doing so ensures that AI is being used to enhance the appropriate cognitive processes.

What becomes clear through the different examples I shared in this chapter is that AI serves different purposes at different cognitive levels. At the Remember and Understand levels, AI shows tremendous capabilities at creating varied practice materials and alternative explanations. Moving up to Apply and Analyze, AI becomes a practice partner and analytical tool. At Evaluate and Create levels, AI shifts to being a thought partner that helps students develop judgment and produce original work. This progression mirrors good teaching: we provide more structure at foundational levels and gradually release responsibility as students develop expertise.

The real power of combining Bloom's Taxonomy with AI lies in how it keeps learning objectives at the center of technology integration. Each level of the taxonomy reminds us what students should be able to do, and AI simply becomes one tool among many for helping them get there. Teachers remain essential for guiding students through cognitive development, providing feedback that only humans can offer, and creating the relationships that make learning meaningful.

CHAPTER 5: THE TPACK FRAMEWORK

Technological, pedagogical, and content knowledge, or what is conventionally known by the acronym TPACK, is another framework I recommend teachers use to help guide their AI integration. TPACK is arguably one of the most practical frameworks for educational technology integration, particularly because it recognizes teachers as the central decision-makers in their classrooms. As Mishra, Warr, and Islam (2023) note, TPACK "recognizes that the teacher plays a pivotal role in the educational context" (p. 244). This focus on teacher agency makes the framework especially valuable for AI integration, where teachers must constantly navigate choices about when, how, and why to use these powerful new tools.

TPACK has proven its pedagogical versatility through extensive research and adaptation across diverse educational settings, from K-12 classrooms to university lecture halls, from fully online courses to traditional in-person teaching (Mishra et al., 2023; Heering et al., 2016; Niess et al., 2018).

In this chapter, I walk you through how the TPACK framework helps teachers make thoughtful, context-aware decisions about using AI in the classroom. We start by revisiting the foundations of TPACK and unpacking its main knowledge domains. From there, we look at how the framework evolves in the age of AI, including the growing role of contextual knowledge in shaping ethical and practical decisions. I then introduce Celik's Intelligent-TPACK model, which extends the original framework to include AI-specific competencies and ethical awareness. By the end of the chapter, you'll see how TPACK, and its intelligent extension, can serve as a roadmap for integrating AI in ways that are intentional, responsible, and grounded in sound pedagogy.

Revisiting the Foundations of TPACK

In their foundational paper, Mishra and Koehler (2006) argue that "thoughtful pedagogical uses of technology require the development of a complex, situated form of knowledge that we call Technological

Pedagogical Content Knowledge (TPCK)" (p. 1017). In this framework, teachers, as the authors contend, are positioned as designers who work at the intersection of three essential dimensions: content knowledge (what we teach), pedagogical knowledge (how we teach), and technological knowledge (the tools we use).

TPACK builds on Lee Shulman's (1986) earlier concept of pedagogical content knowledge (PCK). Shulman had shown that effective teaching requires more than knowing your subject; you need to understand how to teach that specific content to your particular students. Mishra and Koehler (2006) extended this insight into the digital age by adding technological knowledge creating what they describe as "a scaffold for considering what teachers need to know to use any technology effectively" (Mishra, Warr, & Islam, 2023, p. 238).

The framework acknowledges that technology integration happens in specific contexts with unique constraints and opportunities. For instance, your school's Wi-Fi reliability, your students' device access, your district's AI policies, and your available planning time all shape how you might integrate AI tools. As such, TPACK provides a lens for making contextually appropriate decisions. Teachers who successfully integrate AI through a TPACK lens often describe a gradual evolution in their practice. They might start by using AI to enhance their content knowledge, perhaps asking AI to explain a complex scientific concept in multiple ways. Then they explore pedagogical applications, like using AI to generate differentiated practice problems. Eventually, they reach the sweet spot where all three domains intersect, for example, using AI to create interactive historical simulations that teach specific content through pedagogically sound methods that wouldn't be possible without the technology.

And like SAMR and Bloom’s revised taxonomy, the TPACK framework helps teachers avoid common pitfalls in technology adoption like using tools for their novelty rather than their purpose, focusing on flashy features instead of meaningful learning outcomes, or treating technology as an add-on instead of an integrated part of pedagogy and content.

TPACK’s main knowledge domains (pedagogy, content, and technology) act as signposts that guide teachers in designing learning

experiences where technology meaningfully supports both what is taught and how students learn it. Without considering pedagogy, we might use AI just because it's novel. Without considering content, we might generate engaging but educationally hollow activities. Without considering the intersections, we miss opportunities for truly innovative teaching. TPACK keeps all these considerations in productive tension ensuring that technology serves learning goals.

The Components of TPACK

TPACK is composed of the following knowledge domains:

1. Content Knowledge (CK)

This is your grasp of the subject matter, what students are expected to learn. It means understanding the big ideas, the common misconceptions students bring, and the disciplinary ways of thinking that experts use. For example, a math teacher with strong content knowledge knows why students confuse the distributive property with the associative property and can anticipate where conceptual breakdowns typically occur. When working with AI, this depth becomes crucial for evaluating AI-generated explanations and identifying when the tool might be technically correct but pedagogically misleading.

2. Pedagogical Knowledge (PK)

Pedagogical knowledge encompasses the art and science of teaching itself. This includes understanding how students learn at different developmental stages, managing diverse classroom dynamics, designing assessments that actually measure learning, and knowing when to use direct instruction versus discovery learning. Teachers with strong pedagogical knowledge recognize that a strategy that works brilliantly in third period might fall flat in fifth period, and they adjust accordingly. They understand cognitive load, scaffolding, and the importance of wait time after asking questions.

3. Pedagogical Content Knowledge (PCK)

Pedagogical content knowledge, popularized by Shulman, sits at the intersection where teaching expertise meets subject expertise. PCK connects what you teach with how you teach it. It's knowing how to explain

complex ideas in accessible ways like using analogies, examples, and scaffolding to help students grasp difficult concepts.

4. Technological Knowledge (TK)

Technological knowledge focuses on understanding digital tools and platforms: how they function, how to troubleshoot them, and how to choose the right ones for your teaching context. Teachers with solid TK can troubleshoot basic issues without IT support and can quickly evaluate whether a new tool deserves classroom time or represents another shiny distraction.

5. Technological Content Knowledge (TCK)

Technological content knowledge involves recognizing which technologies best represent or enhance specific content. For example, a geography teacher might see how GIS mapping tools reveal patterns invisible in traditional atlases. A music teacher understands how digital audio workstations allow students to compose without years of instrumental training. This knowledge helps teachers choose tools that genuinely enhance content exploration, not just digitize existing practices.

6. Technological Pedagogical Knowledge (TPK)

Technological pedagogical knowledge is about knowing how technology can support different teaching approaches. It’s the awareness of when technology strengthens discussion, facilitates collaboration, or personalizes learning experiences. For example, breakout rooms in video conferencing enable small group work in ways physical classrooms cannot. Digital portfolios allow ongoing assessment that paper folders never could. Teachers with strong TPK understand that technology can shift their role from information deliverer to learning facilitator, but they also recognize when low-tech approaches work better.

7. TPACK

Finally, TPACK represents the intersection of all three domains. A teacher operating with full TPACK weaves these domains seamlessly. They might use AI to generate personalized word problems that connect to each student's interests (combining technology with pedagogical understanding

of motivation and content knowledge of mathematical structures). Or they might have students use AI to explore historical perspectives, then critically analyze the biases in AI's responses, merging technological tools with content understanding and pedagogical strategies for developing critical thinking.

TPACK's real value lies in helping teachers diagnose their own growth areas. A teacher confident in content and pedagogy but uncertain about technology knows exactly what professional development to seek. Someone comfortable with technology and pedagogy but teaching outside their expertise can focus on deepening content knowledge. This self-awareness becomes especially important with AI, which demands not just technical skill but the pedagogical and content expertise to use it wisely

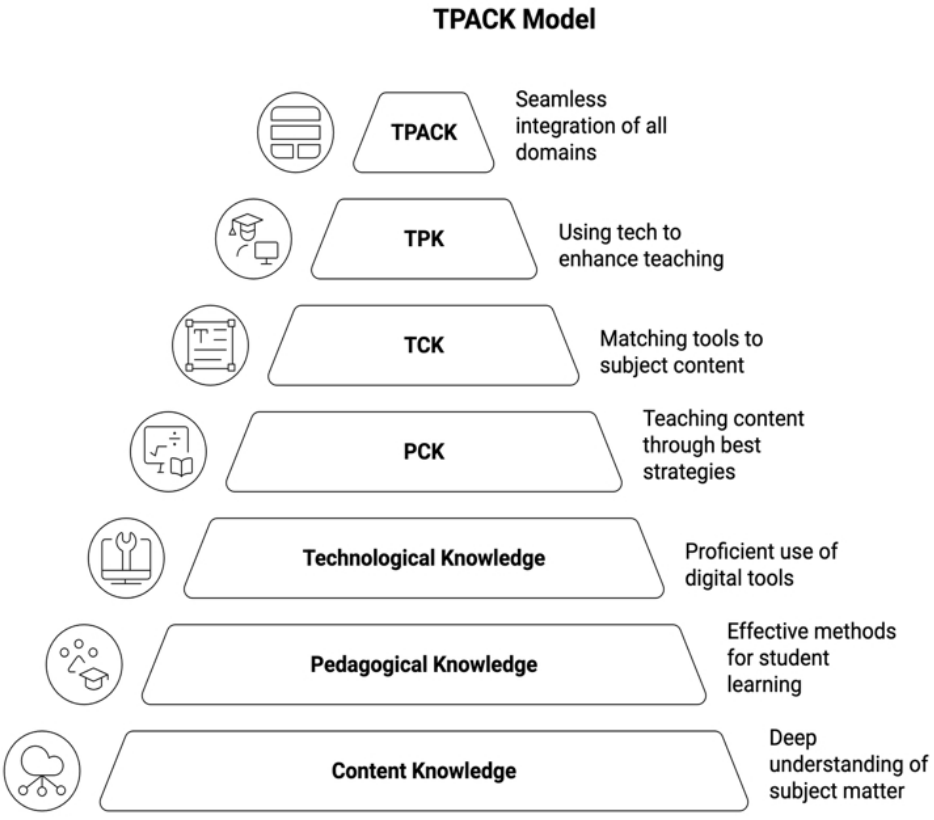


Figure 9 *TPACK model*

Rethinking TPACK in The Age of AI

The arrival of generative AI has fundamentally changed what we mean by "technology" in education. TPACK remains, as Mishra, Warr, and Islam (2023) describe it, "the defining framework for teacher knowledge for intelligent and intentional technology integration in teaching" (p. 244). Yet AI's unique capabilities demand that we expand and deepen our understanding of the model (Kharbach, 2025f). These tools don't just display information or run simulations; they generate content, engage in dialogue, and adapt to user input in ways that blur traditional boundaries between tool and collaborator.

Mishra and colleagues (2023) recently revisited TPACK specifically to address AI's impact on teaching and learning. Their most significant insight centers on the growing importance of Contextual Knowledge (XK), the understanding of institutional policies, ethical considerations, and social conditions that shape how we can and should use technology. This dimension has always existed in TPACK but often remained implicit. AI makes it impossible to ignore.

Consider what contextual knowledge means when you're using AI in your classroom. You need to understand your school's AI policy (if one exists), navigate student privacy concerns, address parents' questions about AI-generated content, and help students develop critical AI literacy. You must also consider equity issues: which students have access to AI tools at home? How do you ensure fair assessment when some students might use AI assistance outside class? All of these contextual factors directly influence every decision about AI Integration.

Needless to mention that the ethical dimensions of contextual knowledge become even more complex with AI. Teachers now grapple with questions previous generations never faced. When is AI assistance appropriate for student work? How do we maintain academic integrity while teaching students to use AI as a legitimate tool? What biases might AI introduce into our teaching materials? A teacher with strong contextual knowledge doesn't just know the technical answers to these questions; they understand how different stakeholders in their community might view these issues and can navigate these perspectives thoughtfully.

AI also challenges the traditional boundaries between TPACK's core components. Technological knowledge now includes understanding AI's capabilities and limitations, recognizing hallucinations, and knowing how

to prompt effectively. Pedagogical knowledge expands to include strategies for teaching with and about AI. Content knowledge might involve using AI to explore your subject more deeply or to generate examples you wouldn't have thought of independently. The intersections become even more critical: how do you use AI to teach specific content (like molecular biology) through particular pedagogical approaches (like inquiry-based learning) in your unique context (a rural school with limited internet)?

The speed of AI development adds another layer of complexity to TPACK. Traditional educational technologies evolved slowly enough that teachers could develop expertise over years. AI tools update constantly, with new capabilities appearing monthly. This rapid change means that technological knowledge becomes less about mastering specific tools and more about developing adaptive expertise, that is, the ability to quickly evaluate and integrate new AI capabilities into your teaching practice.

Teachers working with AI through a TPACK lens should always be aware of how contextual knowledge acts as a filter for every decision they make. Let me give you an example. Imagine you know that AI can generate differentiated reading passages for your students, that's your technological knowledge at work. You also understand how differentiation supports learners with varying reading levels, that's your pedagogical knowledge. But then your school policy prohibits uploading student work to AI platforms. That's contextual knowledge, and it changes how you apply the other two. Instead of discarding the idea altogether, you might adapt by using AI to create generic templates or examples that you later personalize offline.

Now, if we zoom out and look at the bigger picture, the same idea holds true. What works for one teacher might not work for another, and that's exactly the point. The framework shows us that AI integration always depends on context. An AP Computer Science teacher in a well-equipped suburban school has different possibilities than an elementary teacher in an under-funded district. Therefore, a TPACK framework enriched with contextual awareness helps teachers design AI integration that fits their unique teaching environment.

In the end, rethinking TPACK for the age of AI is about staying grounded while the ground itself keeps shifting. The framework gives you a way to think and reminds you that every AI decision sits at the crossroads

of what you teach, how you teach, the tools you use, and the context you work in. Those intersections will keep changing as AI evolves, but your professional judgment remains the constant. When teachers approach AI through this lens (i.e., curious, critical, and context-aware) they move beyond simply using technology to truly shaping how it serves learning.

Intelligent-TPACK

One of the most interesting updates to the TPACK model comes from Ismail Celik, who argues that today's classrooms need a version built specifically for the AI era. He calls it Intelligent-TPACK or AI-TPACK. As Celik (2023) puts it, "the advent of generative AI requires that teachers develop AI-specific technological and pedagogical knowledge with a specific focus on the ethical aspects of this integration process." In other words, the traditional TPACK framework, already powerful for guiding technology use, needs an upgrade to reflect the reality of teaching with intelligent systems that learn, predict, and sometimes even make decisions.

Celik's version introduces a new layer: ethical knowledge. This addition recognizes that using AI in education is, besides being a technical and pedagogical choice, is also a moral one. Every time we use an AI tool for grading, feedback, or student analytics, we're making decisions that touch fairness, privacy, and accountability. Teachers now need to know both how to use AI and when and why to use it responsibly.

Here's how Celik breaks down the updated framework in plain terms:

1. Intelligent-TK

Intelligent technological knowledge means you know how to actually interact with AI tools effectively. You understand what different models can and can't do, how to craft prompts that get useful responses, and when an AI is hallucinating versus providing reliable information. A teacher with strong Intelligent-TK recognizes that ChatGPT might write beautiful prose but struggle with current events, or that image generators can create stunning visuals but might add extra fingers to hands. You know which tools require student accounts, which ones retain conversation history, and how to adjust settings for different educational contexts. The goal here is confidence, not mastery, that is, being comfortable enough with AI to experiment while staying aware of its limits.

2. Intelligent-TPK

Intelligent technological pedagogical knowledge focuses on how AI connects to teaching itself. You might use it to give personalized feedback on writing, summarize student reflections, or analyze quiz results to spot learning gaps. Teachers strong in this area see AI as a teaching assistant that can handle certain tasks, freeing them to do what only humans can do: build relationships, inspire curiosity, and respond to the emotional dimensions of learning.

3. Intelligent-TCK

Intelligent technological content knowledge connects AI capabilities directly to your subject matter needs. A chemistry teacher, for example, might know that certain AI tools excel at generating molecular diagrams and predicting reaction outcomes, while a history teacher discovers which AI platforms can analyze primary sources for bias and perspective. Language teachers might find AI tools that can simulate conversations in target languages at appropriate proficiency levels. This knowledge helps you choose tools that actually makes content more accessible and deepen its understanding.

4. Intelligent-TPACK

This represents the integrated knowledge that ties everything together: technology (AI), pedagogy, and content all working in harmony. It's when you intentionally select AI tools that strengthen how and what you teach. For instance, you might design a unit where students use AI to draft scientific hypotheses (content), work in collaborative groups to test these hypotheses (pedagogy), and then return to AI to help analyze their data and identify patterns (technology), all while teaching them to question AI's statistical interpretations (critical thinking). The AI becomes woven into the learning experience in ways that feel natural and purposeful, not forced or gimmicky.

5. Ethical Knowledge

This final element deserves special attention because AI raises questions traditional educational technology doesn't. You need to consider what

happens to student data fed into these systems. Can the company use student writing to train future models? Does the AI reinforce stereotypes in its responses? A teacher with strong ethical knowledge also thinks about equity: if some students have unlimited ChatGPT access at home while others don't, how does that affect homework design? You develop classroom policies about citation, about when AI assistance is appropriate and when it crosses into academic dishonesty. Ethical knowledge keeps your teaching grounded in care, responsibility, and professional integrity.

Intelligent-TPACK gives teachers a fresh way to think about AI in their daily practice. It shows that using AI in the classroom is a matter of professional judgment shaped by care, reflection, and awareness of context. The framework keeps ethics at the center, guiding teachers to make decisions that serve students' learning and well-being. More importantly, the model shows us that the "intelligent" part of teaching with AI doesn't come from the technology itself, it comes from the thoughtful, human decisions teachers make every day about how that technology is used.

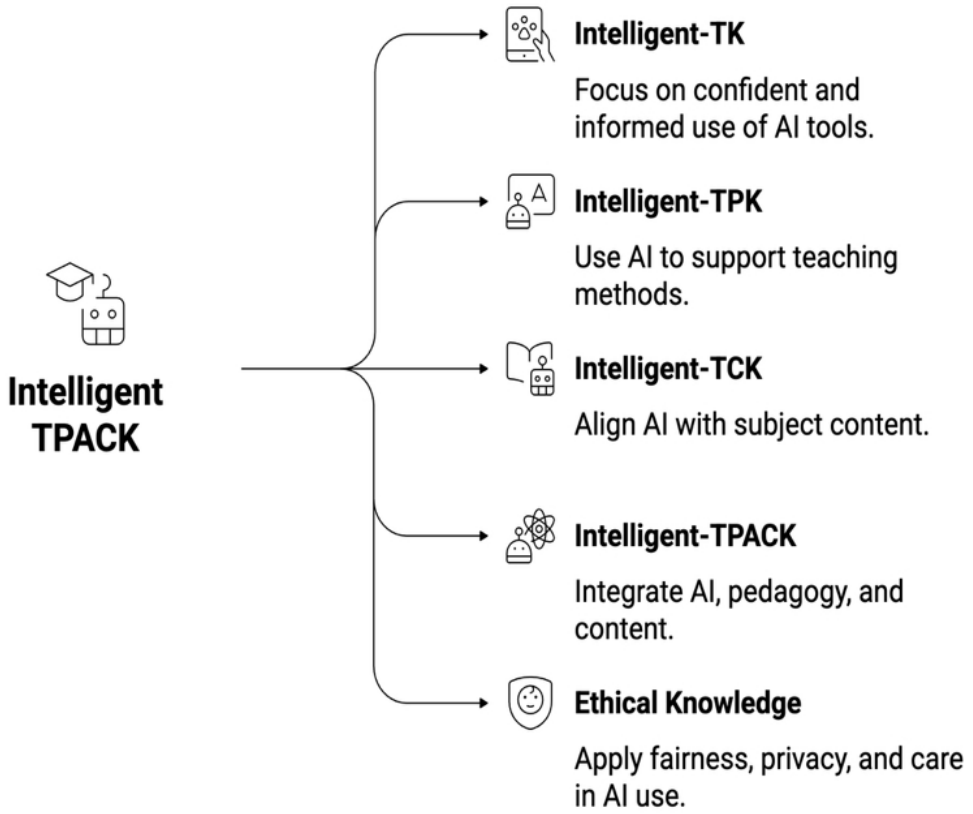


Figure 10 *Intelligent TPACK based on Celik's (2023) work*

AI-TPACK Sample Questions

The transition to AI-integrated teaching requires honest self-reflection about your current knowledge and comfort levels across multiple dimensions. The following assessment questions are meant to help you identify where you're already strong and where you might benefit from targeted professional development. These questions progress through each component of Intelligent-TPACK, from technical knowledge through ethical considerations. You might find yourself confident in some areas while recognizing gaps in others. This is completely normal and expected. Few teachers enter AI integration with expertise across all dimensions. The value lies in understanding your starting point and charting a path forward that builds on your existing strengths while addressing areas for growth.

Consider using these questions as a pre- and post-assessment tool. Review them now to establish your baseline, then revisit them after a semester of AI integration to measure your progress. You might also use them as discussion starters with colleagues or as a framework for requesting specific professional development support from your administration.

Intelligent-TK (Technical Knowledge of AI Tools)

1. Can I explain how AI tools like ChatGPT or Gemini generate their responses (e.g., from training data)?
2. Do I know how to log in, set up, and access the basic features of at least one AI tool for education?
3. Can I adjust settings (e.g., prompt style, model output length) to get more useful results?
4. Do I know how to input my own material (lesson plans, rubrics, student work) into an AI tool?
5. Can I troubleshoot common issues like unclear outputs or factual errors?
6. Do I understand the limitations of AI (e.g., hallucinations, lack of live knowledge)?
7. Can I compare different AI tools (e.g., ChatGPT vs. Gemini) based on what they do best?

8. Do I know which AI tools can generate text, images, quizzes, or lesson plans?
9. Can I save, export, or share AI outputs in a format I can use in class?
10. Do I regularly explore new AI tools and stay updated on their capabilities?

Intelligent-TPK (Pedagogical Affordances of AI)

1. Can I identify how AI can give students personalized feedback?
2. Do I know how AI tools can help me monitor student progress over time?
3. Can I use AI to create differentiated learning activities for students at different levels?
4. Do I understand when AI-generated explanations or examples might confuse rather than help students?
5. Can I design AI-supported group work or peer review activities?
6. Do I use AI to save time on routine tasks so I can focus on higher-order teaching activities?
7. Can I use AI tools to generate questions that align with Bloom's taxonomy?
8. Do I know how to scaffold student use of AI tools to support independent learning?
9. Can I evaluate when AI is pedagogically valuable versus when it might create dependency?
10. Do I integrate AI into formative assessment (e.g., low-stakes quizzes, practice exercises)?

Intelligent-TCK (Field-Specific AI Knowledge)

1. Do I know which AI tools are designed specifically for my subject area (e.g., math, science, language learning)?
2. Can I use AI to generate domain-specific examples, problems, or scenarios for my students?
3. Do I understand how AI can help me stay updated on new developments in my field?

4. Can I guide students to use AI to explore subject content more deeply?
5. Do I know which AI tools have the best datasets for my content area?
6. Can I evaluate whether an AI tool is accurate for my discipline's standards or curriculum?
7. Do I use AI tools to adapt my subject content to different grade levels?
8. Can I generate subject-specific visuals, simulations, or models using AI?
9. Do I know which AI tools offer field-specific analytics (e.g., reading level, science simulations)?
10. Can I integrate AI outputs into my content lessons while ensuring alignment with learning goals?

Intelligent-TPACK (Integrated Application)

1. Can I select AI tools that align with a specific learning objective?
2. Do I plan lessons where AI is meaningfully embedded rather than an add-on?
3. Can I blend AI outputs with my own teaching strategies to improve student engagement?
4. Do I use AI in ways that promote critical thinking, not just content delivery?
5. Can I design full lesson cycles (introduction, practice, assessment) supported by AI tools?
6. Do I know how to combine multiple AI tools for a single instructional goal (e.g., ChatGPT for ideas + Canva AI for visuals)?
7. Can I adapt AI use to the needs of diverse learners (ELLs, students with disabilities)?
8. Do I evaluate the impact of AI integration on student outcomes and adjust accordingly?
9. Can I teach students to critically reflect on AI outputs and compare them with human-created resources?

10. Do I collaborate with colleagues to share AI integration strategies and reflect on results?

Ethical Knowledge

1. Can I explain to students how AI systems make decisions (e.g., based on training data)?
2. Do I consider issues of bias in AI outputs, especially for my subject area?
3. Can I evaluate whether an AI tool respects student privacy and complies with school policy?
4. Do I know how to check if an AI tool is transparent about how it works?
5. Can I identify when an AI tool's output might reinforce stereotypes or exclude certain groups?
6. Do I discuss with students the ethical implications of relying on AI?
7. Can I judge whether an AI-generated assessment is fair and valid?
8. Do I choose AI tools that allow teacher oversight and control of outputs?
9. Can I model responsible use of AI (e.g., citing AI-generated work, avoiding over-reliance)?
10. Do I stay informed about new policies, laws, and guidelines related to AI in education?

Conclusion

The evolution from TPACK to Intelligent-TPACK reflects the profound shift AI brings to educational technology integration. While the original framework helped teachers navigate the integration of relatively stable digital tools, AI demands a more nuanced approach that explicitly addresses ethical considerations and rapidly evolving capabilities. The addition of ethical knowledge as a distinct component acknowledges that AI integration involves value-laden decisions at every turn, from protecting student privacy to ensuring equitable access to maintaining academic integrity.

What emerges from exploring Intelligent-TPACK is a portrait of the contemporary teacher as a sophisticated decision-maker who must balance multiple, sometimes competing, considerations. You're not just selecting tools; you're evaluating their pedagogical value, content accuracy, ethical implications, and contextual appropriateness simultaneously. This complexity might feel overwhelming, but the framework provides structure for what could otherwise be chaotic experimentation. Each component of Intelligent-TPACK offers a lens through which to examine AI integration, ensuring no critical aspect gets overlooked.

Intelligent-TPACK will likely continue evolving as AI capabilities expand and our understanding of its educational impact deepens. New components might emerge, existing ones might merge or split, and the relationships between them might shift. What will remain constant is the framework's core insight: effective technology integration requires teachers who can thoughtfully combine multiple types of professional knowledge while keeping student learning at the center.

Chapter 6: Webb's Depth of Knowledge (DOK) and AI Integration

Webb's Depth of Knowledge framework offers another valuable lens for understanding how AI can support learning at different cognitive levels. The framework, developed by Norman Webb in the 1990s, focuses on the complexity of thinking students engage in when they work with content (Webb et al., 2023). While many educators already know DOK well, examining it through the perspective of AI integration reveals new possibilities for supporting, extending, and enriching learning experiences across all levels of cognitive demand.

The main strength of DOK lies in its focus on cognitive rigor. Unlike some frameworks that emphasize what students produce, DOK examines the mental processing required to complete a task. This distinction becomes particularly important when we consider AI integration. A student might use AI to produce a sophisticated-looking essay (a complex product), but if they simply copied AI output without engaging in deep thinking, the cognitive demand remains low. DOK helps us design AI-enhanced activities that genuinely challenge students' thinking, not just their ability to prompt a chatbot.

In preparing this section on DOK and AI, I've drawn on several key resources that have shaped educators' understanding of the framework: Nancy Boyles' Reading, Writing, and Rigor (2018), Michael Martin's Blending Instruction with Technology (2016), Karin Hess's DOK Flip Chart (2013), the WebbAlign DOK Primer (2025), and curriculum studies such as Karuguti, Phillips, and Barr's (2017) analysis of inter-professional education.

In this chapter, I cover how Webb's Depth of Knowledge framework can help teachers think more clearly about the cognitive depth behind AI-supported learning. We start by exploring the purpose and power of DOK and why it remains one of the most practical frameworks for understanding the rigor of student thinking. From there, we move through the four DOK levels (recall, skills and concepts, strategic reasoning, and extended thinking) showing how AI can support each stage without diluting the

challenge. Along the way, I offer classroom examples, tool suggestions, and reflective prompts to help you design AI activities that truly stretch students' minds. By the end, you'll see how DOK, especially when combined with Bloom's Taxonomy and TPACK, becomes a compass for keeping cognitive rigor and human judgment at the heart of AI integration.

Understanding DOK's Purpose and Power

Depth of Knowledge serves as both a taxonomy and a practical tool for analyzing cognitive rigor. Martin (2016) describes it as a system for differentiating levels of cognitive demand and describing how students engage with content. The WebbAlign team (2025) emphasizes its role as an evaluative tool for content analysis, providing educators with a common language to distinguish among different levels of complexity in student tasks, questions, and assessments.

As I mentioned earlier, what makes Depth of Knowledge unique is the way it focuses on how much thinking a task demands, not how hard the content feels or how complicated the final product looks. A task at Level 1, for instance, stays at that level even when the content changes. A kindergartner naming colors and a graduate student recalling the date of a historical event both perform the same cognitive process: recall. The difference lies in the content, not in the kind of thinking involved. This distinction matters because it helps teachers look beyond content difficulty and see what kind of mental work students are actually doing. It brings much-needed clarity when designing lessons that stretch students' reasoning without overwhelming them.

In practice, teachers and curriculum designers rely on DOK for a wide range of uses. It helps ensure that what we teach and what we assess stay aligned, preventing the all-too-common mismatch between instruction and evaluation. It also serves as a guide for crafting questions that move students from simple understanding to deeper analysis and application.

More broadly, DOK offers a language for planning instruction that steadily strengthens students' capacity to reason, explain, and transfer their learning to new situations. As the WebbAlign primer (2025) explains, Dr. Norman Webb created the DOK framework to connect the complexity of academic standards with the complexity of the tasks and assessments we use. That connection is what makes DOK such a powerful tool; it turns

“rigor” from a vague idea into something you can see, measure, and build over time.

The Four Levels of DOK

The DOK framework organizes cognitive demand into four distinct levels, each representing a qualitative shift in how students interact with content. These levels build upon each other and create a progression from simple recall through extended problem-solving and creation.

Level 1: Recall and Reproduction

At this foundational level, students retrieve and repeat basic information without changing or analyzing it. The cognitive demand is straightforward: you either know the fact or you don't. There's typically one correct answer and finding it requires minimal mental processing beyond memory retrieval.

Level 1 tasks in the classroom look like naming state capitals, defining vocabulary terms, solving single-step math problems with a memorized algorithm, or identifying parts of speech in a sentence. Students might label a diagram, recite a poem, or match terms to definitions. The key characteristic is that students work with information exactly as it was presented to them, without interpretation or analysis.

When we integrate AI at Level 1, we can use it to create varied practice opportunities that make recall less tedious. AI can generate flashcards, create matching exercises, or produce simple quiz questions that help students memorize essential facts. The cognitive level remains basic, but AI adds variety and personalization to what might otherwise be repetitive drill work.

Level 2: Skills and Concepts

Level 2 requires students to process information beyond simple recall. They must engage with content by making decisions, organizing information, or showing relationships between ideas. Tasks at this level involve multiple steps or require students to apply conceptual understanding. Students operating at Level 2 might compare and contrast two characters in a story, organize historical events into categories, explain cause-and-effect relationships, or solve multi-step math problems. They summarize texts,

identify patterns in data, or predict what might happen next based on established patterns. The distinguishing feature is that students must do something with the information beyond merely retrieving it.

AI becomes particularly useful at Level 2 for providing scaffolding and feedback. An AI tool might help students identify key similarities and differences, suggest organizational structures for their comparisons, or provide immediate feedback on their explanations. The cognitive work still belongs to the student, but AI can support their thinking process and help them recognize connections they might miss on their own.

Level 3: Strategic Thinking and Reasoning

Level 3 marks a significant leap in cognitive complexity. Students must plan their approach, consider multiple variables, and use evidence to support their reasoning. These tasks often have multiple valid solutions or interpretations, requiring students to justify their thinking and defend their conclusions.

At this level, students analyze author's purpose across multiple texts, design experiments to test hypotheses, solve non-routine problems that require them to develop new strategies, or evaluate the credibility of sources. They might create models to explain complex phenomena, develop arguments supported by evidence, or critique proposed solutions to real-world problems. The hallmark of Level 3 is that students must think strategically about how to approach the task and provide reasoning for their choices.

AI integration at Level 3 shifts toward partnership. Students might use AI to help identify potential evidence, explore alternative perspectives, or test their reasoning against different scenarios. A student analyzing a historical event might prompt AI to provide multiple viewpoints, then evaluate and synthesize these perspectives into their own argued position. The AI doesn't do the strategic thinking but provides material and feedback that enriches the student's analytical process.

Level 4: Extended Thinking

The highest level of DOK involves sustained investigation and the application of knowledge and skills in authentic contexts. Level 4 tasks typically extend over time, require synthesis of information from multiple

sources, and result in original products or solutions. Students working at Level 4 might conduct original research projects, write essays that synthesize ideas across multiple disciplines, design solutions for community problems, or create artistic works that demonstrate deep understanding of complex themes. These tasks require students to initiate, design, and carry out extended investigations. They must make connections across time, texts, and disciplines while managing the complexity of multi-faceted projects.

At Level 4, AI serves as a research assistant and creative collaborator. Students might use AI to help manage large amounts of information, identify patterns across multiple data sources, or generate initial ideas that they then develop into original work. A student creating a documentary about climate change might use AI to analyze interview transcripts, identify themes, and suggest narrative structures, but the creative vision and critical decisions remain firmly with the student.

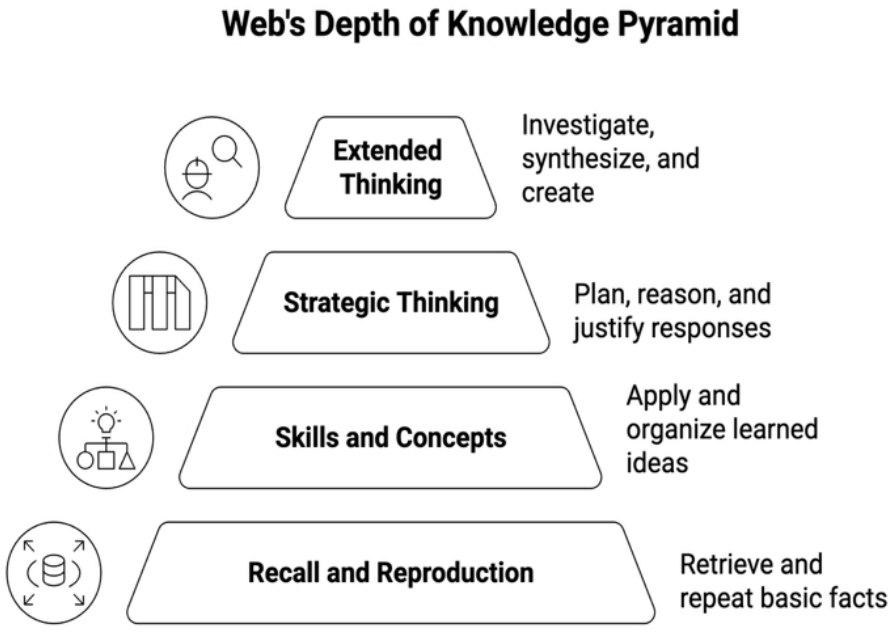


Figure 11 *Web's DOK framework*

Bloom's Taxonomy vs. DOK

Bloom's Taxonomy and Webb's Depth of Knowledge often get compared as if they're competing frameworks, but they actually serve different purposes and work beautifully together. Bloom's provides a hierarchy of cognitive processes and organizes thinking skills from remembering through creating. DOK examines the complexity and depth of thinking required for specific tasks, focusing on how students engage with content and the type of reasoning involved (Martin, 2016).

The key distinction lies in what each framework measures. Bloom's categorizes the type of thinking involved: Are students remembering, understanding, applying, analyzing, evaluating, or creating? DOK asks about the depth of that thinking: Is it automatic recall, conceptual processing, strategic reasoning, or extended investigation? A single Bloom's level can span multiple DOK levels depending on the task's complexity. For example, "applying" knowledge might be DOK Level 1 if students use a memorized formula, or DOK Level 3 if they must determine which approach to use for a novel problem.

Consider how this plays out in a history classroom. A teacher might ask students to "analyze" the causes of World War I (Bloom's Analyze level). If students simply list pre-memorized causes, that's DOK Level 1 despite being analysis. If they must examine evidence and identify cause-effect relationships, that's DOK Level 2. If they evaluate conflicting historical interpretations and develop their own argued position, that's DOK Level 3. The cognitive process remains "analysis" in Bloom's terms, but the depth of thinking varies dramatically.

Both frameworks offer essential perspectives for educational planning. Bloom's helps teachers ensure students experience the full range of cognitive processes, from building foundational knowledge to producing original work. DOK helps ensure that whatever cognitive process students engage in, they do so with appropriate depth and rigor. A curriculum strong in Bloom's but weak in DOK might have students creating products without deep thinking. A curriculum strong in DOK but weak in Bloom's might have students thinking deeply but only within limited cognitive processes.

When planning AI-integrated lessons, these frameworks provide different but equally valuable guidance. Bloom's helps us consider what cognitive skills we want AI to support: Should AI help students remember facts, understand concepts, or create original work? DOK helps us

determine the appropriate complexity: Should AI provide simple recall practice, support multi-step problem-solving, or assist with extended research projects?

The complementary nature of these frameworks becomes especially clear in assessment design. Bloom's ensures we assess various cognitive processes, while DOK ensures we assess them at appropriate depths. A comprehensive assessment might include remembering questions at DOK 1 (recall facts), understanding questions at DOK 2 (explain relationships), analyzing questions at DOK 3 (evaluate evidence), and creating tasks at DOK 4 (design solutions). This combination provides a nuanced picture of student learning that neither framework alone could capture.

Pairing DOK with AI

When paired with AI tools, the Depth of Knowledge framework offers teachers a practical way to see how technology can support learning at different levels of cognitive rigor (Kharbach, 2025g). From quick recall to extended projects, AI can serve as a reference, a thinking partner, or a research assistant, always with teachers guiding students to use it critically and responsibly.

The following are suggestions on different ways to pair DOK with AI. Let's start with the first level.

Level 1: Recall and Reproduction with AI

At this level, AI works like a helpful study buddy that reinforces the basics. You can use it to create quick quizzes, generate flashcards, or offer instant feedback when students practice vocabulary or math facts. Students might turn to AI to check spelling, confirm a date in history, or review a definition before a test. The goal here is accuracy and recall: using AI to strengthen foundational knowledge so students can build on it later. Think of it as giving them a smart reference tool that supports quick learning checks without taking over the learning process.

AI Tools:

- Quizlet: Generates flashcards and practice quizzes for quick recall.
- Wayground: Creates simple interactive drills and exercises.

- Grammarly: Checks spelling, grammar, and basic writing mechanics.
- QuizGPT: Builds auto-generated quizzes for fact-based review.
- Kahoot: Provides gamified quizzes for memorization practice.

Level 2: Skills and Concepts with AI

At this stage, AI helps students move from memorizing facts to making sense of them. You can encourage your students to use AI to compare ideas, organize notes, or explain how one concept connects to another. For example, they might ask AI to summarize a chapter, group related themes from a story, or explain the chain of events that led to a historical outcome. Here, AI helps students notice relationships and patterns they might otherwise miss. Your role is to show them how to ask the right questions so that AI gives thoughtful explanations instead of shallow summaries.

AI Tools:

- Notion AI: Organizes and summarizes notes into clear structures.
- ChatGPT: Compares ideas, explains connections, and provides summaries.
- Claude: Breaks down complex texts into simpler explanations.
- Gemini: Generates cause-effect explanations and highlights patterns.
- Latimer AI: Summarizes reading material into key points.
- Perplexity AI: Supplies contextual explanations with supporting evidence.

Level 3: Strategic Thinking and Reasoning with AI

At this level, AI becomes a partner in deeper reasoning. You can invite students to use it when they need to plan, analyze, or solve complex problems that don't have one right answer. They might ask AI to suggest possible solutions, weigh different perspectives, or give feedback on the logic behind their arguments. The key is teaching them to question what AI says, to look for gaps, test ideas, and explain their own reasoning. When you frame AI as a collaborator instead of an authority, students start

thinking more critically and learn how to build sound arguments backed by evidence.

AI Tools:

- NotebookLM: Analyzes documents and connects ideas across sources.
- ChatGPT: Brainstorms approaches, evaluates reasoning, and analyzes perspectives.
- Ideogram: Visualizes ideas and arguments for clearer reasoning.
- MirrorTalk: Engages in reflective dialogue to test reasoning.
- Claude: Assists with structuring arguments and exploring perspectives.
- Elicit: Extracts insights and evidence from research papers.

Level 4: Extended Thinking with AI

At this stage, AI supports students through sustained, in-depth projects that unfold over time. You can guide them to use AI as a research helper, writing partner, or brainstorming ally while keeping full ownership of their ideas. They might work with AI to shape research questions, organize data, or refine arguments as their projects evolve.

Your role as a teacher is to help them balance support and independence using AI to stretch their thinking without letting it do the thinking for them. The goal is authentic learning, where students apply knowledge, make creative decisions, and produce original work that reflects their own voice and understanding.

AI Tools:

- NotebookLM: Supports long-term projects with research and synthesis.
- Elicit: Collects and analyzes data from multiple academic sources.
- SciSpace: Simplifies and explains complex research papers.
- QuizGPT: Generates practice questions tailored to project content.

- Scholarlcy: Assists with academic writing and research support.
- Jenni: Acts as an AI writing partner for drafting and refining essays.
- DocAnalyzer: Analyzes lengthy documents and extracts insights for research.

Conclusion

Webb's Depth of Knowledge framework provides teachers with a practical structure for understanding and implementing AI across different levels of cognitive complexity. The framework's emphasis on cognitive demand helps educators make strategic decisions about when and how AI can genuinely support learning.

The framework also helps teachers address one of the central challenges of AI integration: ensuring that technology enhances rather than replaces student thinking. DOK provides clear criteria for evaluating whether an AI-supported activity genuinely engages students' cognitive abilities.

When students use AI to generate flashcards for Level 1 recall, the cognitive demand remains appropriately basic. When they collaborate with AI on Level 4 research projects, teachers can structure the interaction to maintain high cognitive engagement while leveraging AI's capabilities for managing information and generating initial ideas.

Perhaps most valuable is how DOK helps teachers communicate about AI integration with students, parents, and administrators. The framework provides concrete language for explaining why certain uses of AI are appropriate while others aren't.

Parents concerned about AI doing students' thinking for them can understand that Level 3 and 4 activities require students to evaluate AI output critically and synthesize original conclusions. Students can better grasp why copying AI-generated text fails to meet the cognitive demands of their assignments. In fact, the combination of DOK with other frameworks like Bloom's Taxonomy and TPACK creates a comprehensive approach to AI integration that addresses cognitive processes, depth of thinking, and the intersection of technology with pedagogy and content. Together, these frameworks give teachers a clear structure for using AI in ways that genuinely deepen learning, promote critical thinking, and keep human judgment at the center of the classroom.

Part III: Applying AI in Practice

Chapter 7: AI in Lesson Planning

In the last few years, AI has begun to take a visible place in teachers' daily work. According to the Walton Family Foundation and Gallup (Malek Ash, 2025), six in ten U.S. teachers used an AI tool during the 2024–25 school year, and about three in ten relied on it weekly. The most common use was lesson-related: 37% turned to AI at least monthly to prepare for teaching, 33% used it to create worksheets or activities, and 28% leaned on it to adapt materials to student needs. These numbers suggest that lesson planning is often the entry point where teachers first test the value of AI.

The impact is not only a matter of convenience. Cognitive load theory reminds us that the human brain has limited working memory (Sweller et al., 2019). Offloading routine or time-consuming tasks to AI can lighten this load, leaving teachers with more capacity for higher-order thinking and instructional design. As Hertz (2024) put it, "I find that LLMs allow me to save time brainstorming so that I can focus my attention on creating deeper ways for my students to engage with the unit."

Teachers who engage with these tools regularly are beginning to see what the Gallup–Walton (2025) report calls an "AI dividend." On average, weekly users saved nearly six hours each week, time that adds up to the equivalent of six weeks over a school year. Just as important, most of them reported improvements in the quality of their work. Between 57% and 74% said AI enhanced tasks ranging from grading and feedback to administrative duties, and only a small fraction felt their work quality declined. Many described reinvesting the time they saved into areas that matter most: giving richer feedback, tailoring lessons more closely to students, staying in touch with families, or even leaving school on time with more energy for the next day. These patterns matter for any discussion of AI in lesson planning. They show that teachers are not only open to AI but already finding it useful in ways directly tied to planning and preparation.

In this chapter, I look at how AI can make lesson planning more thoughtful, efficient, and creative without losing the human touch that makes teaching meaningful. I start by unpacking the habits that lead to successful AI use in planning. I then share practical ways teachers can use

both general-purpose chatbots and dedicated planning platforms to design, adapt, and enhance their lessons. At the end of the chapter, I feature a handy collection of ready-to-use prompt templates that show how to guide AI effectively for different subjects and grade levels.

Important Tips for AI-Powered Lesson Planning

Before we get into specific tools and strategies, it helps to pause and think about how to work with AI in lesson planning. My work with teachers shows me that those who get the most value from AI aren't necessarily the most tech-savvy. They're the ones who approach these tools thoughtfully. They start with clear intentions about what they want to accomplish and maintain healthy skepticism about what AI produces. These teachers have learned to delegate the right tasks to AI while reserving the irreplaceable aspects of teaching for themselves. Most importantly, they've discovered that AI works best as a collaborative tool that amplifies their expertise.

In this section, I share with you a collection of tips I've gathered from years of reviewing AI tools on my blog and from my ongoing work with teachers experimenting with these technologies in real classrooms. Some are about practical steps like giving AI the right context or fact-checking its output while others are about professional judgment and protecting student privacy.

1. Start with the Big Picture

When you use AI for lesson planning, don't jump straight into asking for a single lesson. Begin with the whole unit. Upload the materials you've already used or plan to use such as previous lessons, visuals, slides, PDFs, extra readings, or any supporting resources. You can do this by creating your own custom teaching assistant in ChatGPT or by using the built-in features in ChatGPT, Gemini, or Claude (I go over those in the next section).

The advantage of giving AI the big picture is that it helps the tool see how lessons connect. It can spot links across topics, point out themes you might not have noticed, and suggest ways to tie activities together. When you later ask it to help with a specific lesson, it will design that lesson with the larger unit in mind. That way, the activities feel less like stand-alone pieces and more like parts of a coherent journey for your students.

2. Provide Essential Context

AI tools work best when they understand your classroom reality so make sure you include your subject area, grade level, the specific topic you're

teaching, and how much time you have available. The more specific your context, the less time you'll spend modifying the results. Many teachers find it helpful to create a standard template with their classroom details that they can reuse and adjust for different topics.

3. Request Specific Support

Think of AI as your teaching assistant who's eager to help but needs clear directions. You might ask for creative activity ideas, clearer explanations of complex concepts, alternative assessment methods, or administrative support like rubric creation. Be specific about what you want: "Suggest three hands-on activities for teaching fractions using everyday objects" yields more useful results than "help with math activities."

4. Design for Active Learning

Push AI to suggest activities that get students moving, thinking, and connecting to real-world situations. Prompt it specifically: "Include a gallery walk component" or "Connect this to current events students care about." AI defaults to traditional activities unless you guide it toward more dynamic options. Ask for activities that require students to create, debate, build, or investigate. The best AI-generated lessons come from teachers who insist on engagement: "How can students physically model this concept?" or "What local examples connect to this topic?"

5. Plan for Every Learner

Your classroom includes students with varying abilities, interests, and learning styles. Share these specifics with AI: "Include modifications for two students reading below grade level and enrichment for advanced learners." AI can generate differentiated materials quickly, but only if you describe your students' needs. Consider requesting multiple entry points to the same content, varied assessment options, or scaffolded instructions. Teachers find this particularly valuable for creating tiered assignments that challenge every student appropriately without requiring hours of additional planning.

6. Review and Personalize

AI-generated lesson plans are starting points, not finished products. Read through suggestions with your specific students in mind. That creative activity might need adjustment for your classroom's limited space. The discussion questions might need simplification for your English learners. This review process typically takes just minutes but makes the difference between generic and genuinely useful plans. Think of AI output like a colleague's lesson plan, helpful, but needing your expertise to fit your unique classroom context.

7. Protect Student Privacy Above All

Never upload any documents containing student names, grades, IEP details, or other personally identifiable information (PII) to AI tools. This isn't just good practice, it's essential for protecting your students and maintaining professional standards. When you need help with differentiation or specific student needs, describe situations generically: "I have three students who need reading support" instead of naming them. Create sanitized versions of documents before uploading, replacing real names with "Student A" or removing identifying information entirely. Many teachers keep a separate folder of "AI-safe" templates and examples with all personal data removed. Privacy protection should be your first consideration, not an afterthought.

8. Trust Your Professional Expertise

The internet contains plenty of questionable teaching advice, and AI models learn from that same internet. Your years of classroom experience and deep content knowledge matter more than any AI-generated text. When AI suggests something that conflicts with proven pedagogical practices or your understanding of how students learn, trust your instincts. Use AI as you would advice from an eager but inexperienced colleague. Consider the suggestions but filter them through your professional judgment. If an AI-generated explanation seems oversimplified or a suggested activity feels developmentally inappropriate, it probably is.

9. Build a Prompt Library That Works

Create a collection of prompts that consistently deliver good results for your teaching style. Save the ones that generate useful content: "Create a warm-up activity that reviews yesterday's lesson on [topic] in 5 minutes" or

"Design exit ticket questions that check understanding of [concept] at three difficulty levels." Having a prompt library will definitely help you save time as you can quickly adapt proven prompts for new topics. Keep these in a simple document you can copy from, noting which prompts work best for different purposes. Over time, you'll develop a personalized toolkit that makes AI integration seamless.

10. Generate Multiple Versions Before Choosing

Don't settle for the first response. Ask AI to create three different approaches to the same lesson objective, then pick elements from each that work best. Request variations: "Show me a hands-on version, a discussion-based version, and a technology-integrated version of this lesson." This strategy helps you see possibilities you might not have considered and often produces hybrid lessons that are stronger than any single suggestion.

11. Fact-Check Everything

AI can confidently present incorrect information or hallucinations. Always verify facts, formulas, and scientific explanations before using them in your classroom. Run math problems through your own calculations, check historical dates against reliable sources, and verify scientific claims with trusted resources. This is especially critical for specialized content where errors might not be immediately obvious. Consider AI-generated content as a first draft that requires your subject matter expertise for accuracy.

12. Collaborate with Colleagues

Share successful prompts and strategies with other teachers in your department or grade level. When someone discovers a prompt that generates excellent discussion questions or finds a creative way to use AI for assessment design, spread that knowledge. This collective wisdom helps everyone improve faster and prevents each teacher from having to discover everything independently. Consider dedicating a few minutes of department meetings to sharing AI wins and challenges.

13. Keep the Human Connection Central

Remember that AI can’t understand the moment when your class needs a brain break, recognize when a student’s question reveals a deeper

misunderstanding, or sense when to abandon the lesson plan for a teachable moment. Use AI to handle logistics and content generation but never let it replace your ability to read the room and respond to your students' immediate needs. Use AI as a tool to create more space for human connections, not as a substitute for them. Your students need your empathy, encouragement, and ability to see them as individuals, things no AI can provide.

Practical Ways to Use AI in Lesson Planning

There are various ways to use AI to make lesson planning faster, more flexible, and more engaging for students. Below I've grouped some of the most practical strategies, each with a slightly different purpose, but all aimed at saving time and opening up new possibilities in the classroom.

1. Generating Ideas and Inspiration

One of the hardest parts of planning is staring at a blank page. AI can help break that block by offering fresh examples, activities, or cross-curricular links. For instance, it might suggest how a history theme could weave into a math lesson, or how a current event could spark discussion in English. These prompts don't replace your own creativity, but they can jumpstart the process when time is short.

2. Adapting and Differentiating Materials

AI tools make it much easier to adjust content for different learners. You can ask for simplified versions of a text, alternative explanations of a concept, or even audio versions for students who benefit from listening. This flexibility supports students with diverse needs and ensures everyone has access to the core ideas in a way that works for them.

3. Building Out Lesson Components

Beyond big ideas, AI can help with the smaller building blocks of a lesson: summaries of key points, discussion questions, sample problems, scripts for activities, or analogies to clarify a concept. Some teachers use it to turn a lesson into a story or even a mock interview with a historical figure, making the material more memorable. You can also use AI to generate teaching aids like worksheets, rubrics, quizzes, or presentations in minutes.

4. Aligning to Standards and Curriculum

Many dedicated lesson plan platforms now include options to check that a lesson aligns with district, state, or national standards. This feature takes away some of the guesswork and helps teachers ensure lessons stay on target. Even if you still edit and adapt, it saves the time of manually cross-referencing every objective.

5. Enhancing Existing Lessons

You don't always have to start from scratch. Upload a lesson plan you've already created and ask AI to suggest improvements. Maybe it will point out gaps, propose alternative activities, or highlight areas that could be more engaging. You can refine the feedback and use the polished version as a stronger template for future lessons.

6. Creative Hooks and Engagement

AI can suggest unique ways to capture students' attention. You might use an image generator to create a surprising visual hook, or turn a key concept into a podcast segment or short video overview. NotebookLM, for example, lets you generate study guides, mind maps, video or audio overviews from your own lesson notes, which can double as review materials. These creative twists help lessons stick.

Creating AI-Assisted Lesson Plans

There are several ways you can bring AI into your lesson planning. In general, you'll either use general-purpose chatbots like ChatGPT, Gemini, or Claude, or you'll turn to dedicated platforms designed specifically for lesson planning. Many teachers end up using both, chatbots for flexible idea generation and specialized platforms for structure and organization.

Let's look at each in turn.

General-Purpose AI Chatbots

General-purpose AI chatbots can be remarkably capable when guided well. With a clear, detailed prompt, they can produce complete lesson outlines, activity ideas, scaffolds, and even differentiated assessments in a single conversation. The key is knowing how to direct them. Over time, I've found

two particularly effective ways to use chatbots like ChatGPT for lesson planning: creating your own custom teaching assistant and organizing your work through the Projects feature. Let's look at how each of these approaches can simplify and strengthen your planning process.

1. Creating a Teaching Assistant Using Custom GPT

One of the most practical ways to use AI and more specifically ChatGPT for lesson planning is by creating your own teaching assistant using the Custom GPT feature. Think of it as training a digital colleague to plan lessons the way you do. You don't need coding skills or special software, just your teaching materials and a clear sense of what you want it to help with.

Unlike a regular chatbot that gives generic answers, a Custom GPT learns from the resources you upload like your lesson plans, unit guides, curriculum standards, and examples of student work. The more you feed it, the more it begins to reflect your planning style. Over time, it feels less like a random tool and more like a reliable co-planner that understands your teaching voice, your goals, and your students' needs.

Here's how you to set one up in ChatGPT. Let's call it 'My Lesson Plan Generator':

- Open ChatGPT and click on Explore GPTs in the sidebar.
- Click Create a GPT to start building your own assistant.
- In the Name field, type My Lesson Plan Generator.
- In the Description box, write something like:
- "Create well-structured lesson plans with clear objectives, timing, activities, assessments, and accessibility notes."
- In the Instructions for the assistant section, add clear details about how you want it to behave. For example: "You are a Grade [number] [subject area] teacher with years of classroom and curriculum design experience. Your role is to help me create engaging lesson plans for my [class]. Lesson plans should follow the model lesson plans I've uploaded here. They should include clear objectives, timed activities, and formative assessments."

- Upload your knowledge files. These might include sample lesson plans, unit plans from previous years, curriculum guides, accessibility checklists, or even a standards map. I would also recommend turning off web search and image generation so the assistant stays focused on the materials you provide.
- Once everything looks ready, click Save and Publish (Private) so only you can access it.

Once created, your custom GPT will appear in the sidebar of your ChatGPT interface, ready for use whenever you need it. Each time you produce a lesson plan that works well, upload it to the assistant's knowledge base. Over time, it grows into a practical archive of your best work. In this way, you will be able to save significant preparation time and will also help you maintain consistency across units and school years. In short, a custom GPT brings AI closer to the way you already teach. It becomes a tool that reflects your voice, your classroom, and your students' needs.

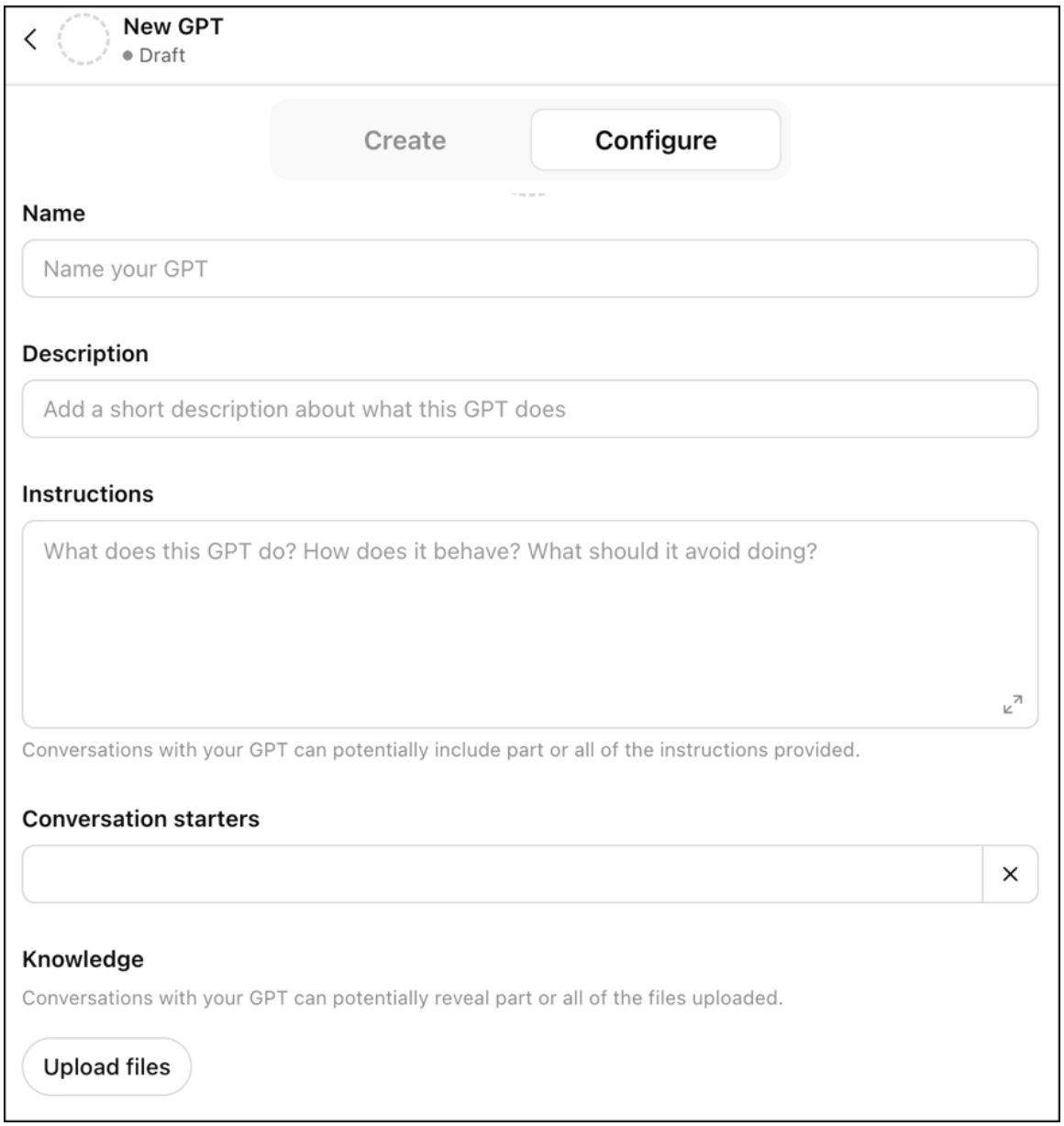


Figure 12 *Interface for creating a custom GPT model in ChatGPT*

2. Projects

Projects is one of the most useful features for teachers who want to keep their AI work organized and meaningful. You'll find it in ChatGPT, Claude, and Gemini, while Perplexity AI offers something similar called Spaces. The idea is simple but powerful: Projects act as dedicated workspaces where you can store your files, chats, and AI instructions in one place. Think of it as a digital binder that keeps everything related to a specific topic neatly organized.

Let's take lesson planning as an example. You could create a project in ChatGPT called "Lesson Planning." Inside it, upload the materials you already use: curriculum maps, past lesson plans, unit outlines, accessibility checklists, even templates for objectives or assessments. Then, add custom instructions about your teaching style and classroom context. From that point on, whenever you ask the AI for help, it draws from those uploaded sources and instructions instead of starting from a blank slate. The responses you get will sound much closer to your own voice and reflect your specific curriculum.

This setup is especially helpful for teachers who work across multiple grades or subjects. You might have one project for Grade 6 Language Arts, another for Science, and another for professional development. Each project becomes its own hub, storing all the lesson ideas, drafts, and resources tied to that topic. It's efficient, consistent, and easy to revisit when you want to refine or reuse your materials.

Another big advantage is how tidy it keeps your workflow. No more scrolling endlessly through past conversations to find that one good idea you remember. Everything related to lesson planning sits in one place, organized, searchable, and ready to build on. Over time, your project becomes a growing library of your best work, shaped by both your experience and the AI's support.

Here's how you can create a Project in ChatGPT for lesson planning:

- **Open ChatGPT:** Log into your ChatGPT account and make sure you're using the ChatGPT Pro or Team plan, since Projects are available on those tiers.

- **Click on ‘Projects’:** Look at the sidebar on the left side of your ChatGPT screen. You’ll see a new tab labeled Projects (just below your custom GPTs). Click on it.
- **Create a New Project:** Click New Project and give it a clear name, for example, “Lesson Planning”.
- **Add Instructions for the AI:** In the Instructions field, write your guiding statement. You can use the same one you created for your Custom GPT so the AI responds with the same tone and focus. For example: “You are a Grade [number] [subject area] teacher with years of classroom and curriculum design experience. Your role is to help me create engaging lesson plans for my [class]. Lesson plans should follow the model lesson plans I’ve uploaded here. They should include clear objectives, timed activities, and formative assessments.”
- **Upload Your Files:** Add any documents you want the AI to reference (e.g., lesson plans, rubrics, standards, worksheets, or guides). You can upload PDFs, Word files, or text documents. These become the “knowledge base” the AI draws from whenever you ask a question.
- **Start Your First Chat**: Click New Chat inside the project. Now, every time you chat, the AI automatically considers your uploaded materials and project instructions.
- **Organize and Revisit Your Work:** Each chat stays inside that same project, so you can return anytime to find your drafts, lesson ideas, or resources. You can also create folders within a project to separate units, themes, or assessment materials.
- **Iterate and Expand:** As you create new lessons or refine old ones, upload them to the same project. Over time, it becomes your personalized teaching hub; a collection of lesson plans, AI chats, and reference materials all in one place.

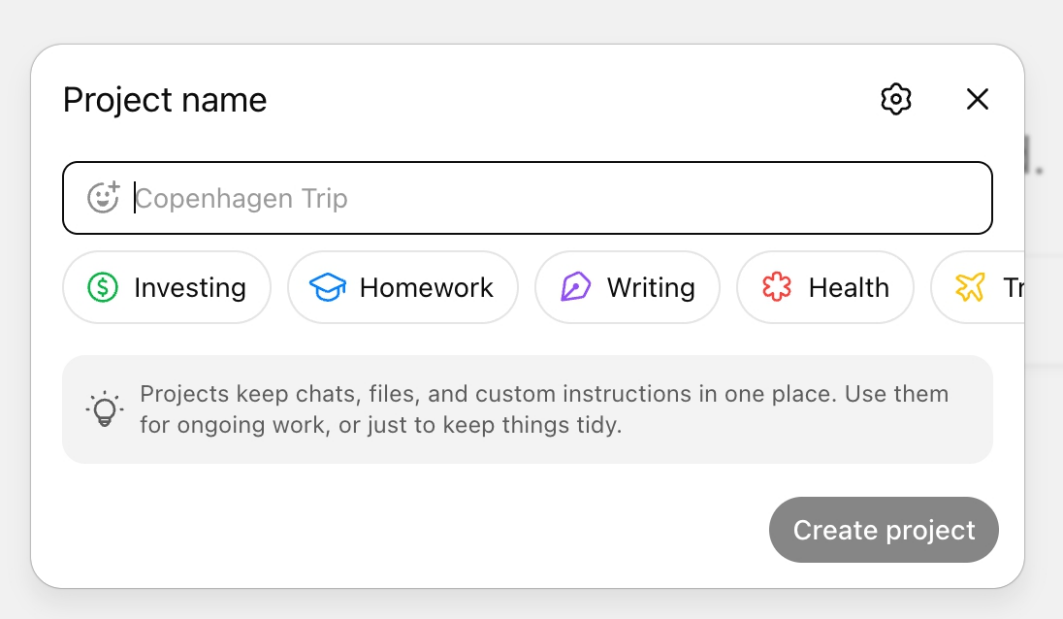


Figure 13 *Interface for creating a new project in ChatGPT*

Dedicated AI Lesson Planning Platforms

Alongside the general-purpose AI chatbots, there's now a growing set of platforms built specifically for teachers and educators that offer various lesson planning features. These tools usually provide ready-made templates where you plug in your details, and in a few clicks you have a structured lesson plan. Many align directly with curriculum standards and even integrate assessments, saving you the step of linking everything back manually. Some go further and offer built-in quiz generators, lesson material banks, or student tracking dashboards.

These platforms are excellent for speed and structure. They're especially helpful when you're pressed for time or when you need to ensure alignment with district or state requirements. But they come with a trade-off. Because they make things so easy, there's a risk of sliding into what is known as "automation complacency" (Baraniuk, 2021), taking whatever the system produces at face value. Over-reliance on these generators can also slow the development of your own prompting skills, which are increasingly important in an AI-rich classroom.

Caveats aside, here are some of the most practical and teacher-tested AI lesson planning platforms available today.

1. Edcafe.ai

Edcafe AI is a complete teaching toolkit that lets you create and organize classroom resources with ease. It includes tools for lesson planning, slides, quizzes, flashcards, reading activities, grading, and even building custom chatbots from your own materials. Teachers can upload their files and have Edcafe generate content aligned with their curriculum. It also supports collaboration, giving staff a shared space to store and refine resources.

2. Eduaide.ai

Eduaide is an AI-powered workspace designed for teachers. It brings together over 150 tools that support lesson planning, assessment, activity design, and classroom management. You can generate lesson seeds, unit plans, scaffolding strategies, engagement activities, and tailored assessments, all organized into categories like instructional design, cooperative learning, gamification, and question generation.

3. BriskTeaching.com

Brisk Teaching is a Chrome extension that turns online content into ready-to-use lessons, quizzes, or presentations. It also supports grading in Google Docs with rubric-based, personalized feedback, and includes tools to adjust reading levels or translate texts. With its “Brisk Boost” feature, teachers can create interactive activities like debates, inquiries, or role-play chats, making lessons more engaging and accessible.

4. Curipod.com

Curipod helps you turn topics, documents, or slides into interactive lessons in minutes. You can generate a lesson by entering a topic with details like objectives and standards, or upload existing slides and have Curipod add interactive activities including drawing breaks and comprehension checks. It also offers pre-made lessons for test prep, daily routines like bell ringers and exit tickets, and writing skills practice.

5. Almanack.ai

Almanack helps you quickly create full lesson plans complete with slides, worksheets, rubrics, activities, and games. It also offers generators for feedback, report card comments, and classroom resources. Teachers can select their course and lesson, and the platform produces a full set of materials that can then be customized.

6. MagicSchool.ai

MagicSchool gives teachers access to more than 60 AI tools, including lesson plan generators, assessment creators, and a teacher-focused chatbot called Raina. With it, you can generate lesson plans, rubrics, quizzes, report card comments, worksheets, and even choice boards. Raina provides quick ideas and suggestions which makes it feel like having a planning assistant built for educators.

7. SchoolAI.com

SchoolAI is another classroom-focused AI platform that enable teachers to create lesson plans, rubrics, assessments, and interactive lessons in minutes. Teachers can see real-time student progress, identify struggles early, and step in with targeted support. The platform also includes a Chrome extension, a vast library of teacher-created lessons ("Spaces"), and productivity tools for planning, assessment, and communication.

8. Diffit.me

Diffit is an AI platform that generates classroom-ready resources tailored to grade levels and standards. Teachers can create lesson materials, simplify or adapt texts to different reading levels, and even turn YouTube videos into structured learning activities with summaries, vocabulary lists, and comprehension questions. One interesting feature is its library of activity templates (covering reading, writing, vocabulary, collaboration, and critical thinking) that instantly adapt to your content. All resources can be exported as PDFs, Google Slides, or PPTs, making Diffit a versatile tool for differentiated instruction and engaging student activities.

9. Monsha.ai

Monsha is an all-in-one AI platform that helps teachers plan curriculum, design lessons, and create classroom resources in minutes. It can generate lesson plans, worksheets, rubrics, quizzes, slides, reading passages, and even IEP goals. Teachers can also map entire courses, build unit outlines, and adapt resources to different student needs.

10. NotebookLM

NotebookLM is a tool from Google. It's mostly marketed as a research assistant, but I think it can be really handy for lesson planning too. The idea is pretty straightforward: you upload your own materials, and the AI only uses those materials when answering your questions.

The nice part is that you're not limited to just text. You can add PDFs, Word files, web pages, YouTube videos, audio recordings, even images. So, for lesson planning, you could set up a notebook called My Lesson Plan Generator. In it, you might upload things like model lesson plans, curriculum guides, activity templates, or any materials you usually turn to when planning.

Once that's done, you can chat with the notebook and ask for exactly what you need. The AI will pull from the files in your notebook, so the output feels much closer to your style and needs than a random chatbot answer. Over time, you can keep adding more of your own files. That way, the notebook becomes a growing bank of your teaching resources, something you can lean on again and again when planning new lessons.

So, that was just a sample of some of the dedicated AI tools that teachers and educators are currently experimenting with in their teaching. However, whether you want to use general-purpose AI chatbots or dedicated lesson generators, the real value comes from balance. Chatbots give you flexibility and creative breadth, while dedicated generators give you structure and efficiency. Used together, they can complement each other: brainstorm with a chatbot, then refine and format in a planning platform. The key is to keep your professional judgment at the center. AI can save you time, but it's your insight that makes a lesson meaningful for your students.

Let's now turn to practical examples of prompts teachers can use to plan lessons more efficiently and thoughtfully with AI.

Prompts for Lesson Planning

Prompt engineering is an important skill teachers should develop as part of their broader AI literacy. The way we frame prompts shapes the quality of responses we get from AI. In teaching, that difference can be huge: a vague request might give you something generic, while a carefully written prompt can produce lesson ideas that fit your students, your objectives, and your style.

Some describe prompt engineering as an art. In my view, it's more like a craft, one that combines structure, practice, and refinement. In *ChatGPT for Teachers* (Kharbach, 2024), I argued that prompts can be learned the

same way we learn other professional skills: by trying, reflecting, and iterating until we reach something that works.

In this section, I'll share several lesson-planning prompts that I developed with the help of AI. None of them worked perfectly on the first try. Each took multiple revisions before I arrived at a version worth keeping. I encourage you to use them as starting points, but even more importantly, to notice how they're structured so you can adapt them and eventually create your own.

Before we get into specific prompt templates for lesson planning, let's take a step back and quickly talk about what makes a good prompt.

The Anatomy of an Effective Prompt

A prompt is any input you give an AI be it text, image, file, or other data, that guides how it responds. While this definition sounds straightforward, the reality is that not all prompts are created equal. Some yield vague or generic responses, while others unlock thoughtful, tailored output that feels ready to use in the classroom. The difference often lies in the structure.

When you look closely at effective prompts, you start to see a pattern. They aren't random questions tossed into a chat box. They have a clear purpose, include just the right amount of context, and set boundaries for the response. In other words, a strong prompt has a well-defined structure that guides the AI much like good instructions guide our students.

Based on insights I shared in my book *ChatGPT for Teachers*, here are some of the key elements that make a prompt work well in educational settings:

1. **Clarity:** State your task in simple, direct language. Avoid vague instructions.
2. **Context:** Add helpful details: subject, grade level, time limits, goals. The more relevant context, the better the output.
3. **Be specific:** Say exactly what you want. "Create three exit ticket questions for Grade 6 math" works better than "Give me some questions."
4. **Assign a role:** Ask the AI to act as a "history teacher," "writing coach," or "curriculum designer" to shape its voice and perspective.

5. **Break big tasks down**: Complex projects work best when you prompt in steps (objectives first, then activities, then assessments).
6. **Guide the reasoning:** Use cues like “explain step by step” or “show your thinking” for deeper, more accurate answers.
7. **Use examples:** Show a sample response, format, or style to help the AI mirror what you want.
8. **Set boundaries:** Tell it how long you want the output to be, or use delimiters to mark the exact text you want it to work with.
9. **Provide reference text:** Copy in the source material you want summarized or analyzed instead of relying on the model’s memory.
10. **Iterate and refine:** Treat prompting as practice. Adjust, re-run, and tweak until the response fits your classroom needs.

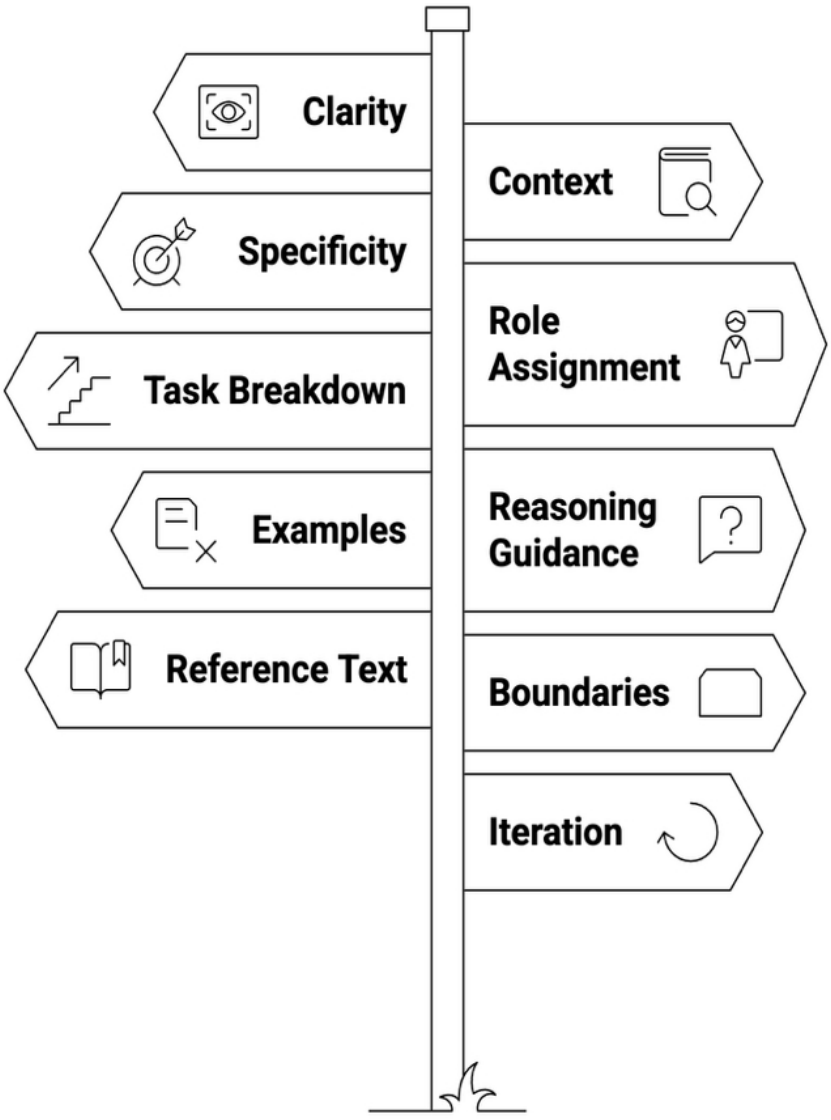


Figure 14 *The anatomy of an effective prompt*

Lesson Planning Prompt Templates for Teachers

Here are some sample prompt templates that incorporate the elements of effective prompting we've discussed. Each template demonstrates clear structure, specific requirements, and appropriate context-setting.

Elementary Mathematics

Prompt sample:

> "I'm a 3rd grade teacher planning a lesson on measuring and comparing lengths using standard units. My class has 22 students with varying math confidence levels: 5 struggle with basic number sense, while 3 are ready for enrichment. Create a 45-minute lesson plan that includes:
> - A. 5-minute warm-up using everyday classroom objects
> - B. 15-minute guided practice with rulers and yardsticks
> - C. 20-minute partner activity where students measure and record at least 8 items
> - D. 5-minute closure with data comparison
>
> Include differentiation strategies and specify which common objects students will measure. The lesson should connect to our previous work on estimating lengths."

2. Middle School Language Arts: Character Analysis

Prompt sample:

> "I teach 7th grade language arts and need a lesson on analyzing character motivation in contemporary fiction. My 28 students just finished reading 'Ghost' by Jason Reynolds. Design a 50-minute lesson that:
> - Opens with a 7-minute quick-write on a character's pivotal decision
> - Includes 20 minutes of small group work examining textual evidence
> - Features 15 minutes of groups creating character motivation maps
> - Closes with 8 minutes of gallery walk sharing
>
> Provide specific page references from chapters 4-6, three discussion prompts that move beyond surface-level analysis, and a rubric for the motivation maps. Include modifications for my 4 ELL students who need sentence frames."

High School Science: Chemical Reactions

Prompt sample:

> "I'm teaching 10th grade chemistry, focusing on types of chemical reactions. My students understand balancing equations but struggle with identifying reaction types. Create a 90-minute block schedule lesson that includes:
> - 10-minute demonstration of 3 different reaction types using safe household materials
> - 25-minute lab activity where students perform and categorize 5 reactions
> - 20-minute collaborative problem-solving with reaction prediction
> - 15-minute individual practice with immediate feedback mechanism
> - 10-minute synthesis connecting reactions to real-world applications

- 10-minute assessment check
Include specific chemical equations, required materials list assuming a standard high school lab, safety protocols, and common misconceptions to address. My class has 24 students working at 6 lab stations."

Elementary Social Studies: Community Economics

Prompt sample:

"I teach 2nd grade and am introducing basic economics concepts through our local community. My 20 students have diverse socioeconomic backgrounds. Design a week of 30-minute lessons (5 total) covering:
- Monday: Needs vs. wants using examples from our school neighborhood
- Tuesday: Goods and services in our community
- Wednesday: Jobs and specialization
- Thursday: Making economic choices
- Friday: Creating a classroom economy
Each lesson should include a 5-minute hook, 15-minute active learning component, and 10-minute application. Provide specific local business examples I can reference, hands-on materials needed, and home connection activities that are sensitive to different family situations."

Middle School History: Primary Source Analysis

Prompt sample:

"I'm an 8th grade history teacher teaching students to analyze primary sources about the Industrial Revolution. My students have limited experience with historical documents. Create a lesson for my 55-minute period that:
- Introduces the OPCVL method (Origin, Purpose, Content, Value, Limitations) in 10 minutes
- Guides analysis of two contrasting factory accounts (owner vs. worker) for 20 minutes
- Includes 15 minutes of partner work comparing perspectives
- Concludes with 10 minutes of writing claims with evidence
Provide excerpts of appropriate length (100-150 words each), scaffolding questions for struggling readers, and extension tasks for advanced students. Include a graphic organizer for the OPCVL method."

Conclusion

Lesson planning has always been one of the most time-consuming parts of teaching, but it's also where your creativity and professional insight come through most clearly. AI doesn't replace that, it simply gives you new ways to approach it. As we've seen in this chapter, teachers are already using AI to lighten the workload, think through lesson design, adapt materials for different learners, and align plans with standards. Some use chatbots like ChatGPT or Claude to brainstorm and refine ideas. Others turn to dedicated tools that help them organize, structure, and polish full lesson plans in minutes.

The real value, though, isn't just in speed, it's in focus. When AI handles the repetitive or mechanical parts, you regain time and mental space for the parts of teaching that matter most: understanding your students, crafting meaningful questions, and finding those teachable moments that no algorithm could ever predict.

AI can create a quiz, generate a lesson outline, or summarize a reading passage, but it can't sense when your class is restless, or when one student needs encouragement to take a risk. That's where your professional judgment remains irreplaceable. So, as you bring AI into your planning, see it as an assistant. Let it handle the setup while you shape the learning experience. The minutes it saves will add up, but what you do with those minutes (e.g., reflecting, connecting, and teaching with presence) is what truly defines great teaching.

Chapter 8: AI Tools for Teachers

The field of educational AI has expanded dramatically with new tools appearing almost weekly. Teachers face an overwhelming array of options, each promising to revolutionize some aspect of their practice. This chapter cuts through the noise to provide you with two essential resources: a practical evaluation framework for assessing any AI tool, and a curated collection of tools that have proven their worth in education.

We begin with a comprehensive evaluation checklist because not all AI tools deserve your limited time and energy. The framework synthesizes insights from leading educational organizations including aiEDU, ISTE, and TeachAI. It organizes evaluation into three critical domains: Usability (will this actually work in my classroom?), Pedagogy (does this support real learning?), and Ethics (can I trust this with my students' data and wellbeing?).

The second part presents carefully selected AI tools organized by practical teaching tasks. You'll find options for creating presentations, planning lessons, generating visuals, producing videos, conducting research, transcribing discussions, taking notes, creating diagrams, collecting feedback, and managing references. The goal is to provide a starting point for thoughtful experimentation. You might begin with one tool that addresses your most pressing need, whether that's differentiating instruction, creating engaging visuals, or managing the endless stream of research papers. As you explore these tools, the evaluation framework helps ensure your choices align with pedagogical goals and ethical standards.

Evaluating AI Tools

Before exploring specific AI tools, teachers need a practical way to judge what’s worth their time and what’s not. To help with that, I’ve created a short checklist that draws from several established frameworks and guidance documents developed by leading organizations in the field including the AI Readiness Framework by aiEDU, ISTE’s Teacher Ready Edtech Product Evaluation Guide (2023), the Washington Office of

Superintendent of Public Instruction's Human-Centered AI Guidance for K-12 Public Schools (2024), and TeachAI's Toolkit Guidance (2025).

The evaluation framework I propose is composed of three domains that work together to provide a complete picture of any AI tool's classroom potential. These domains are usability, pedagogy, and ethics. Let's explore each of these domains separately!

1. Usability

By usability, I mean looking at the interface, features, logins, and general mechanics that affect how smoothly the tool fits into your workflow and your students' experience. Here are few questions to consider for this kind of evaluation:

1. Is the interface clean, intuitive, and easy for students to navigate?
2. Does it require student logins or accounts, and if so, are there options for single sign-on (Google, Microsoft)?
3. Are there distracting ads, pop-ups, or in-app purchases that could disrupt learning?
4. Can students access it on the devices they already have (Chromebooks, tablets, phones)?
5. Does the tool work well across browsers and operating systems?
6. Is it accessible to students with disabilities (screen readers, captions, keyboard navigation)?
7. Are there clear instructions, tutorials, or in-tool guidance available?
8. Is it reliable. Does it load quickly and handle classroom-level traffic without crashing?
9. Does it integrate smoothly with other platforms you use (LMS, Google Classroom, etc.)?
10. Is there a free version or trial so you can test it fully before committing?

2. Pedagogy

When we talk about pedagogy, we focus on how the AI tool supports teaching and learning. We want to make sure that AI integration is grounded in sound educational principles. Here are some questions to consider for pedagogical evaluation:

1. Does the tool align with your curriculum goals and learning outcomes?
2. Does its use help students engage deeply with content, not just complete tasks at a surface level?
3. Does the tool promote critical thinking, creativity, or collaboration rather than rote work?
4. Does it provide immediate feedback to students to guide their learning?
5. Can it record or track student performance for later reflection and analysis?
6. Does it support differentiation, allowing you to adapt lessons for diverse learners?
7. Does it encourage student agency by letting them explore, create, and make choices?
8. Can the tool be integrated into active learning strategies (projects, discussions, problem-solving)?
9. Does it enhance, rather than replace, meaningful teacher–student interaction?
10. Is its use scalable. Can you use it consistently across lessons without overloading students or teachers?

3. Ethics

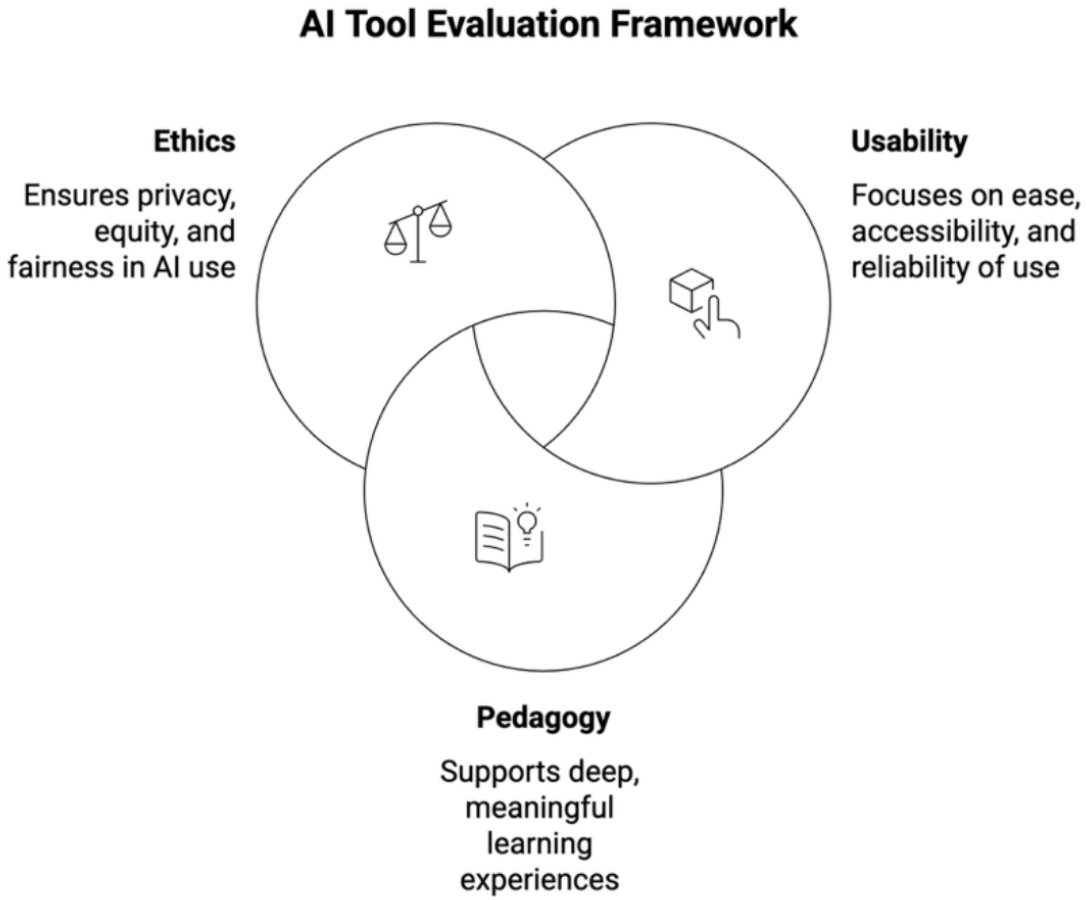
A pedagogically sound AI integration cannot stand without ethical grounding. We want to address potential ethical limitations before using a tool and plan how to handle them responsibly. Here are few questions to consider:

1. What kind of data does the tool collect (names, emails, usage patterns, student work)?
2. Are age restrictions clearly stated, and does the tool comply with student privacy laws (COPPA, FERPA, GDPR)?

3. Does the tool use student data to train its models, and if so, is there an opt-out option?
4. Is student data encrypted and stored securely?
5. Does the tool share data with third parties, and if yes, for what purpose?
6. Are terms of service and privacy policies transparent and easy to understand?
7. Is the tool accessible and equitable for all students, including those with disabilities?
8. Does it include options to anonymize or delete student data upon request?
9. Does the company provide clear contacts or support channels for privacy concerns?
10. Could the tool introduce algorithmic bias that disproportionately impacts certain groups of students?

This framework offers a starting point for evaluating AI tools, but remember it's meant to guide your thinking, not dictate your decisions. You don't need to check every item on every list; some questions will matter more depending on your specific context, student population, and teaching goals. A tool that fails several usability checks might still prove valuable if it excels pedagogically and handles data ethically.

Conversely, the slickest interface means nothing if the tool compromises student privacy or reinforces surface-level learning. Use these questions as prompts for deeper reflection about what you and your students truly need. Share the framework with colleagues, adapt it based on your experiences, and let it evolve as you learn what works in your classroom.



AI Tools for Teachers

Over the last few years, I've had the chance to review and recommend a wide range of educational tools. I regularly share these recommendations with teachers and the wider education community, both online (through my blog Educators Technology and through my social media pages) and during professional development workshops. Through interactions with this wonderful community, I've learned a great deal about what teachers actually use, what they find most useful, and where AI tools truly make a difference in classroom practice.

The collection below features some of these recommendations. I know there are hundreds out there, and new ones appear almost every month. For this chapter, I've kept the list focused, just a few strong options for each category.

Don’t feel pressured to explore everything at once. Start small. Try one tool at a time and see how it fits into your teaching routine. The real value of these tools comes from experimentation and reflection, figuring out which ones align with your goals, your students’ needs, and your teaching style.

1. AI Tools for Creating Presentations

These tools will help you design professional and engaging presentations in less time by combining your ideas with the creative support of AI.

1. **Canva.com**: An all-in-one design platform that uses AI to help teachers create visually engaging slides, posters, and classroom materials.
2. **Gamma.app:** A smart presentation tool that turns simple prompts or outlines into clean, professional slides automatically.
3. **Google Slides:** Now enhanced with AI features allowing teachers to generate slide outlines, design layouts, and visual ideas directly within their workspace.
4. **Slidesgo.com:** Offers a vast library of ready-made presentation templates and now includes AI-assisted options to help teachers personalize and generate slide designs quickly.

2. AI Tools for Lesson Planning

These tools will help you create structured lesson plans complete with objectives, activities, and assessments:

1. **Almanack.ai:** Generates full lesson plans with slides, worksheets, and tailored classroom activities in seconds.
2. **Edcafe.ai:** Helps teachers create structured, ready-to-use lesson plans in minutes, complete with objectives, activities, and assessments.
3. **Curipod.com:** Lets teachers create interactive lessons simply by typing a topic or uploading a document.

4. **Briskteaching.com:** Turns online resources into lessons, presentations, and engaging learning activities.
5. **Diffit.me:** Quickly differentiates instructional materials like worksheets and quizzes to suit different learning levels.
6. **Eduaide.ai:** Offers over 150 AI-powered tools for generating lesson plans, classroom activities, and assessments.
7. **MagicSchool.ai:** Provides access to 60+ AI tools, including lesson plan generators, rubrics, and formative assessment builders.
8. **Twee.com:** Simplifies lesson planning with interactive templates and creative content suggestions for teachers.
9. **Claude/ ChatGPT/ Gemini:** Use well-crafted prompts to generate detailed lesson plans with clear objectives, engaging activities, and aligned assessments.

3. AI Tools for Creating Educational Visuals and Posters

The following will help you create various types of educational visuals including posters, illustrations, and graphics. They are excellent for capturing attention and making complex ideas easier to grasp.

1. **Gemini Nano Banana:** Released while writing this book, this powerful new AI image generator and photo editor lets you create high-quality visuals in seconds and edit photos into countless new versions.
2. **ChatGPT Image Generator:** The new image generation feature in ChatGPT produces impressive results. Use it to create illustrations, infographics, and classroom visuals directly from text prompts.
3. **Midjourney:** A creative AI platform that generates detailed, artistic visuals, perfect for posters, story prompts, or concept illustrations.
4. **Canva:** Combines AI-assisted design with a massive library of templates to help you craft posters, infographics, and classroom materials with ease.
5. **Copilot Image Generator:** Built into Microsoft tools, it helps users generate, edit, and refine visuals using natural language commands.

6. **Leonardo AI:** Another AI-powered platform for generating stylized artwork and educational illustrations that can enhance teaching materials and presentations.

4. AI-powered Tools for Creating Educational Videos

These tools make video creation feel effortless. You can turn lesson ideas, scripts, or even short pieces of text into polished educational videos complete with visuals, narration, and professional flair.

1. **Invideo.io:** Converts blogs or written text into videos with automated scene matching and smart narration.
2. **Synthesia.io:** Creates videos with AI avatars and lifelike voiceovers in over 100 languages, ideal for lessons and tutorials.
3. **Lumen5.com:** Turns text into videos using pre-designed templates and collaboration features suited for classroom storytelling.
4. **Pictory.ai:** Adds captions, transcribes, and creates instructional videos directly from web content or recorded lectures.
5. **Vidnoz.com:** Generates videos with customizable virtual characters and ready-made templates for professional results.
6. **Fliki.ai:** Converts text into professional videos with natural-sounding voiceovers available in multiple languages.
7. **Veed.io:** Offers simple tools to edit, enhance, and subtitle videos, along with AI features for text-to-video creation.
8. **Adobe Firefly:** Turns text or photos into visually striking videos, adding creative effects and smooth transitions for polished outputs.

5. AI Tools for Research

These are some AI-powered tools to help you with your research. They can help you explore scholarly work more efficiently, uncover meaningful connections between studies, and stay current with the fast-moving world of academic research.

1. **NotebookLM:** Helps you organize, summarize, and connect ideas across multiple sources, turning uploaded papers or notes into conversational insights.
2. **SciSummary.com:** Provides concise, accurate summaries of academic papers, saving time when scanning new research or preparing literature reviews.
3. **Scispace.com:** Analyzes citation context, checks references, and maps citation networks, helping teachers and researchers understand how studies connect.
4. **Julius.ai:** Offers customizable research feeds, a "Similar Papers" discovery feature, and a Q&A bot that lets users query research topics in real time.
5. **ConnectedPapers.com:** Visualizes connections between research papers, helping users identify influential works, emerging trends, and build bibliographies more effectively.
6. **ResearchRabbit.ai:** Maps relationships between papers using seed articles and presents them as interactive, customizable graphs for deeper exploration.
7. **Elicit.com:** Synthesizes insights from research papers with AI-generated summaries, quality indicators, and filters designed for fast literature reviews.
8. **SemanticScholar.org:** Offers AI-powered search with TLDR summaries, advanced filters, and citation analysis to help researchers find relevant studies quickly.
9. **Litmaps.com:** Creates visual maps of scientific papers, showing how ideas evolve across time and helping researchers track citation patterns and research clusters.
10. **R Discovery:** Delivers personalized research feeds with smart recommendations, TLDR summaries, and topic-based alerts drawn from millions of scholarly papers.

6. AI Note-Taking Tools

These tools make note-taking smarter and more connected. They help you organize thoughts, link ideas, and turn scattered notes into meaningful insights you can easily revisit and build upon.

1. **Notion:** Combines notes, tasks, and databases in one workspace, now enhanced with AI features that help summarize, rewrite, and generate content instantly.
2. **Obsidian:** A powerful markdown-based app that helps connect ideas through linked notes, with AI plugins for summarization, tagging, and insight generation.
3. **Google Keep:** A simple, accessible note-taking tool that integrates with Google Workspace and supports quick voice-to-text and image-based notes.
4. **OneNote:** Offers structured digital notebooks with AI-assisted organization, handwriting recognition, and powerful search capabilities across notes.
5. **Traverse:** Uses AI and spaced repetition to turn notes into personalized learning materials that reinforce memory and understanding over time.

7. AI Tools for Transcribing Audio and Video Files

These AI-powered tools help you capture every word that matters. They turn meetings, lectures, and class discussions into searchable notes you can review, share, and build on later.

1. **Otter.ai:** Captures and transcribes meetings, lectures, and interviews in real time, offering speaker identification and summary highlights.
2. **Rev.ai:** Provides automated transcription and captioning services with quick turnaround and human-editing options for higher precision.
3. **Descript.com:** Combines transcription, audio editing, and video editing in one workspace, allowing you to edit recordings simply by editing the text.
4. **tl;dv.io:** Records and transcribes online meetings, automatically generating timestamps and summaries that make it easy to revisit key moments.
5. **Fathom.ai:** Automatically records and summarizes Zoom calls, highlighting key insights and action items that can be shared with team members.

6. **Fireflies.ai:** Transcribes and summarizes meetings across multiple platforms, integrates with tools like Notion and Google Docs, and supports team collaboration.

8. AI Tools for Creating Diagrams and Mind Maps

These tools help you create beautiful diagrams and mind maps. You can use them to turn scattered notes or complex topics into clear, connected visuals that make it easier to plan lessons, explain concepts, or brainstorm ideas with students.

1. **Napkin.ai:** An intuitive AI tool that turns written ideas or prompts into organized visual maps, concept diagrams, or sketches for clearer understanding.
2. **MyLens.ai:** Converts text into structured visuals, such as flowcharts and concept diagrams, helping teachers explain complex ideas visually.
3. **Figma.com:** A collaborative design platform with AI-powered plugins that help create clean, professional diagrams and visual layouts for presentations or planning.
4. **NotebookLM:** Includes a handy feature to easily generate concept maps and visual summaries that show how ideas relate across uploaded sources.
5. **MindMeister.com:** A classic mind mapping tool that now uses AI suggestions to help structure ideas, brainstorm topics, and refine visual outlines.
6. **MindMup.com**: Lets you create collaborative mind maps online with automatic layout and organization features ideal for group planning or lesson mapping.
7. **Mindomo.com:** Combines mind mapping, outlining, and task management with AI support for expanding and organizing ideas efficiently.

9. AI Tools for Creating Forms, Polls, and Surveys

These tools make collecting feedback effortless. Whether you're checking student understanding, running a quick poll, or gathering reflections after a

lesson, these AI-powered tools can help you design forms that are clear, engaging, and easy to analyze.

1. **Google Forms:** A simple and reliable tool that now integrates AI features to suggest questions, options, and data summaries automatically.
2. **SurveyMonkey.com:** Offers AI-powered question generation, survey templates, and detailed analytics to help teachers gather meaningful feedback.
3. **Fillout.com:** Lets users build dynamic, conversational forms with conditional logic and AI assistance for crafting clear, engaging questions.
4. **Jotform.com:** Provides an AI form builder that helps design customized forms, quizzes, and polls while automatically generating reports.
5. **Typeform.com:** Focuses on creating interactive, visually appealing surveys and polls that keep students and participants more engaged.
6. **Forms.app:** Simplifies form creation with smart templates, instant summaries, and AI-based response insights for quick data interpretation.

10. AI-Enhanced Reference Management Tools

These tools simplify the often-time-consuming task of managing sources. They help you collect, organize, and cite research seamlessly:

1. **Zotero.org:** A free, open-source reference manager that automatically captures bibliographic data and now integrates with AI tools for metadata cleanup and citation assistance.
2. **Mendeley.com:** Stores and organizes PDFs, generates citations in multiple styles, and recommends related research based on your library.
3. **EndNote.com:** Offers powerful reference organization with built-in AI suggestions, citation formatting, and collaboration features for shared projects.
4. **Paperpile.com:** A Google Workspace–friendly tool that manages PDFs, inserts citations directly into Docs, and

supports AI-assisted search and note summarization.

Conclusion

The evaluation framework and the educational AI tools I shared in this chapter offer a foundation for your thoughtful AI integration. These are only suggestions, and the AI integration journey will be uniquely yours. Every classroom has different needs, every teacher brings different strengths, and every student population presents different opportunities and challenges. The key is to start somewhere specific and build from there.

Consider beginning with the evaluation checklist when you next encounter an AI tool recommendation. Run it through the checklist we discussed earlier. You'll quickly discover whether it meets your standards for usability, pedagogy, and ethics. This practice builds your critical eye for distinguishing genuinely useful tools from those that merely ride the AI hype wave. Share the checklist with colleagues who might be considering the same tools. Their perspectives often reveal concerns or benefits you hadn't considered.

When you're ready to try a new tool, pick one that addresses a real pain point in your teaching. Maybe you spend hours differentiating materials, struggle to provide timely feedback, or wish you could create more engaging visuals. Start there. Give yourself permission to experiment slowly. Use the tool for one small task, reflect on how it went, and adjust your approach. Some tools will immediately prove their worth; others will reveal limitations that make them unsuitable for your context. Both outcomes provide valuable learning.

Keep in mind that AI tools are just that: tools. They don’t replace your pedagogical expertise, your understanding of individual students, or your ability to create meaningful learning experiences. You decide which tasks benefit from AI assistance and which require the irreplaceable human elements of teaching. Your professional judgment, enhanced by the evaluation framework and informed by careful experimentation, determines whether AI serves your students well or becomes another layer of unnecessary complexity.

Part IV: Reflection and Professional Growth

Chapter 9: AI and Teacher Professional Development

For most of us, professional development has always meant workshops, mandated PD days, or the occasional conference. These traditional formats still matter, and always will, but AI has expanded the boundaries of what professional learning can look like. We now have opportunities for self-directed, continuous, and deeply personalized development that complement those familiar in-person experiences.

Indeed, teacher professional development covers vast territory. It encompasses everything from lesson planning and assessment design to classroom management, parent communication, technology integration, cultural responsiveness, special education strategies, and countless other areas that make up the complex work of teaching. Earlier chapters in this book have addressed specific applications like lesson planning and AI integration. Here, I want to zoom out a little bit and focus on the broader picture, that is, on how AI can support your general professional growth journey.

More specifically, I discuss the various ways you can leverage AI to enhance your professional development practice. We'll look at how to use AI as a personal learning assistant and how to use agentic AI to scout the educational landscape and generate curated insights from teacher communities worldwide. We will also talk about using AI for microteaching practice and reflective practice and explain how it can help you spot patterns and track your growth over time. Finally, we'll discuss building a comprehensive learning ecosystem that includes professional networks, AI guides, self-paced courses, and carefully chosen resources that fuel your continuous growth.

Important as it is in your professional development, AI, however, can never be a substitute for the energy of a great conference, the insights from observing a master teacher, or the support of a trusted mentor. Human connection and collaboration will always have a central place in professional development. Instead, AI augments these experiences, fills the gaps between them, and ensures your professional learning continues every

day, not just during scheduled PD events. It puts you in the driver's seat of your own professional journey, giving you tools to learn what you need, when you need it, in ways that honor both your expertise and your aspirations for growth.

1. Using AI as a Personal Learning Assistant

When I talk about using AI as a research assistant, I mean as a co-partner to help you build your knowledge through a dialogic approach where you actively shape the conversation, challenge responses, and push for deeper insights. You're the expert on your classroom context, your students' needs, and your teaching philosophy. AI becomes a thought partner that helps you explore ideas, test assumptions, and discover new perspectives you might not have considered on your own.

AI tools like ChatGPT, Claude, or Gemini can act as personalized PD mentors or coaches available whenever you need them. Think about those moments when you wish you had a colleague to bounce ideas off at 10 PM while planning tomorrow's lesson, or when you want honest feedback on a new teaching strategy but feel hesitant to ask your department head. These tools fill that gap. They offer a safe space to experiment with ideas before you bring them to your classroom.

As a teacher, you can use AI to simulate peer feedback on your lesson planning and teaching strategies. You might ask it to critique your approach to differentiation, help you brainstorm ways to engage that student who always sits in the back corner, or suggest modifications for your ELL learners. The key lies in how you frame your requests and engage with the responses. Here are some prompts you can try to get started:

- **Prompt 1:** "I'm teaching [specific topic] to [grade level] students tomorrow. My lesson plan includes [brief description of activities]. Act as an experienced teacher and give me three specific suggestions to increase student engagement, particularly for kinesthetic learners. Be critical and point out any potential confusion points in my plan."
- **Prompt 2:** "Review this assignment I created for my students: [paste assignment]. Identify any unclear instructions, suggest ways to scaffold it for struggling learners, and tell me if the

workload seems appropriate for [grade level]. Also, create a simplified version for my students who need additional support."

- **Prompt 3:** "I have a student who consistently disrupts class by calling out answers without raising their hand. They're bright and engaged but need to work on impulse control. Act as a behavior specialist and help me create a positive behavior intervention plan that doesn't dampen their enthusiasm while teaching appropriate classroom participation."
- **Prompt 4:** "I just finished teaching a lesson on [topic] and it didn't go as planned. Students seemed confused when I explained [concept], and the group activity fell flat. Help me reflect on what might have gone wrong and suggest specific changes I could make when I reteach this concept next period."

Keep in mind that prompting is an iterative process. You don't have to accept AI's first response as final. Push back, ask for clarification, request alternative approaches. If the AI suggests using manipulatives for a math concept, ask it to specify exactly which manipulatives and how to use them. If it recommends a discussion protocol, have it walk you through the steps and anticipate potential student responses. This back-and-forth mirrors the kind of professional dialogue you'd have with a trusted colleague, except it's available on demand and tailored to your specific needs.

As Common Sense Media (2025) stated, AI teacher assistants “can be powerful productivity assistants when used with proper oversight and built on high-quality curricula, but they require experienced educators to evaluate outputs and clear district policies to prevent them from becoming "invisible influencers" that undermine learning quality” (p. 1). In other words, AI becomes most valuable when it operates within a framework of human judgment and professional reflection. The educator’s role is to stay intellectually present; to question, refine, and recontextualize AI-generated ideas so that the technology strengthens pedagogical expertise.

2. Keeping Track with Research in Your Area of Interest

Staying current with educational research used to mean hours in the university library or expensive journal subscriptions. Now, AI-powered

research tools make it possible to access and understand the latest findings right from your desk. Tools like Scite, Consensus, NotebookLM, Elicit, ResearchRabbit, Google Scholar, to mention a few, offer unique ways to navigate the vast ocean of educational research without drowning in academic jargon.

These tools do more than just find papers. Scite shows you how research has been cited by others helping you spot studies that have been supported or challenged by subsequent work. Consensus answers your research questions by synthesizing findings across multiple studies, perfect for those times when you need evidence-based answers quickly. NotebookLM lets you upload PDFs of research papers and then ask questions about them in plain language, while Elicit helps you extract key findings and methodologies across dozens of papers at once. ResearchRabbit creates visual maps of connected research, so when you find one relevant study, you can easily discover the entire conversation happening in that research area.

The practical applications for your teaching practice are immediate. Want to know if homework actually improves learning outcomes in elementary math? Consensus can synthesize findings from hundreds of studies in seconds. Curious about the latest research on phonics instruction? Set up alerts in Google Scholar or ResearchRabbit to notify you when new studies are published. Found an interesting paper but overwhelmed by the statistics? Upload it to NotebookLM and ask for a plain-English explanation of the key findings and classroom implications. These tools turn you into a research-informed practitioner who can connect classroom practice with the latest evidence in the field.

3. Leveraging Agentic AI for Automated Research

Agentic AI takes things a step further by actively searching the web, compiling information, and delivering comprehensive reports based on your specific needs. By definition, AI agents are “software systems that use AI to pursue goals and complete tasks on behalf of users. They show reasoning, planning, and memory and have a level of autonomy to make decisions, learn, and adapt” (Google Cloud). These AI agents can browse current discussions, analyze trends, and synthesize information from multiple sources while you focus on other tasks. ChatGPT's web search capabilities,

Claude's research features, and similar tools can act as your personal research assistant, scouring the internet for exactly what you need.

Let me share a concrete example of how I used ChatGPT AI agent recently. I wanted to know which AI tools teachers were actually using and talking about in their classrooms. I instructed ChatGPT to search community-driven platforms like Reddit's r/Teachers and r/education, educator groups on Facebook, LinkedIn discussions, Quora threads, and education-focused X (Twitter) hashtags. The AI agent compiled authentic conversations from real teachers, giving me insights into which tools were gaining traction, which ones teachers found frustrating, and what specific features educators valued most.

Here's a sample prompt you can adapt for your own research needs:

Sample Prompt:

> "Search current discussions from the past 3 months on Reddit (r/Teachers, r/education), Facebook teacher groups, LinkedIn education posts, and X/Twitter using hashtags #EdTech #TeacherTwitter #EduTwitter. Find and summarize what K-12 teachers are saying about [specific topic, e.g., 'classroom management apps,' 'AI grading tools,' 'digital math manipulatives']. Focus on: 1) Tools teachers recommend with specific examples of how they use them, 2) Common challenges or complaints, 3) Success stories or unexpected benefits teachers have discovered. Compile your findings into a report organized by tool name, including direct quotes where relevant and source links."

You can adapt this approach for various professional development needs. Want to know how teachers in other countries are handling a particular curriculum change? Have the AI search international education forums and compile perspectives. Curious about upcoming education conferences in your region? Set the AI to search conference websites, education calendars, and professional organization announcements. The key is being specific about where to search, what timeframe to consider, and how you want the information organized. This way, you get actionable intelligence from real educator experiences not just theoretical frameworks.

4. Using AI as Your Practice Partner

Microteaching has always been a powerful professional development tool, but traditionally it required willing colleagues, scheduled time, and often a dose of vulnerability that many teachers find uncomfortable. AI changes this equation entirely. You can now practice difficult conversations, test new teaching strategies, and rehearse challenging scenarios in a completely safe space where mistakes become learning opportunities.

The strength of AI-based practice sessions lies in their flexibility and patience. You can run through a parent conference at midnight, practice the same challenging conversation fifteen times until you feel confident, or experiment with different approaches to see what feels most authentic to your teaching style. The AI can play any role you need: a frustrated parent, a struggling student, an administrator conducting an observation, or even a colleague resistant to new initiatives. Each interaction helps you build muscle memory for real-world situations.

Here are some sample prompts to start your practice sessions:

- **Prompt 1**: "You are a parent concerned about your child's reading progress. Let's role-play how I can respond constructively." After the initial exchange, you might add: "Now become more defensive and accusatory. Help me practice staying professional when emotions run high."
- **Prompt 2**: "You are a student who frequently interrupts class. Help me practice how to redirect behavior respectfully." Follow up with: "Show me different levels of resistance so I can practice escalating interventions while maintaining a positive classroom environment."
- **Prompt 3**: "Act as a gifted student who finishes work early and becomes disruptive. Let me practice providing enrichment while managing the rest of the class."
- **Prompt 4**: "You're an administrator observing my lesson. After I describe what I'm teaching, give me feedback using our district's evaluation rubric. Point out both strengths and areas for growth."

After each role-play, ask the AI to break character and analyze your responses. What worked well? Where could you have shown more empathy? Were there moments when your language might have escalated tension instead of defusing it? These AI-driven sessions provide practice opportunities that simulate real classroom dynamics without real-world consequences. They allow you to rehearse responses, test strategies, and refine your professional judgment in a safe, low-stakes environment before applying them with students or colleagues.

5. Using AI for Reflective Practice

Reflection is an essential element in teacher professional development (Schön, 1983). Developing a sound reflective practice allows you to control your professional growth trajectory and make intentional improvements to your teaching.

Reflective practice provides you with a window into the inner workings of your classroom dynamics, your decision-making processes, and your impact on student learning. You get to think deeply about what works well, what didn't land as expected, and areas in your teaching and learning that need attention or refinement.

Reflective practice can take many forms, from keeping reflective journals and documenting classroom experiences to engaging in peer observations, collaborative discussions, or video self-analysis. Each approach helps you surface underlying assumptions, connect theory to practice, and refine your instructional choices (Loughran, 2002; Brookfield, 2017). The key is consistency, building a habit of reflection that turns day-to-day teaching moments into opportunities for continuous learning. Over time, this habit cultivates professional self-awareness and strengthens your capacity to respond thoughtfully to the diverse and evolving needs of your students (Avalos, 2011; Zeichner & Liston, 2013).

AI can enhance your reflective practice in several powerful ways that address common barriers teachers face when trying to maintain consistent self-evaluation. First, it helps make reflection habitual and structured by eliminating the intimidation of the blank page. You might finish a challenging lesson and feel overwhelmed trying to process what happened, but AI can offer specific prompts tailored to your situation: "What student responses surprised you today?" or "Which part of your lesson plan worked differently than expected?" These targeted questions help you move past vague feelings into concrete analysis. The AI becomes a thinking partner that helps you unpack complex classroom moments systematically. This structured approach makes reflection feel less like additional work and more like a natural extension of your teaching practice.

Beyond organizing your thoughts, AI offers an outside perspective that can reveal patterns invisible from within your daily experience. When you're immersed in the constant demands of teaching, it's difficult to step back and see recurring themes in your challenges or growth areas. AI can analyze weeks of your reflections and identify that you consistently struggle

with transitions between activities on Mondays, or that your most successful lessons share certain structural elements you hadn't noticed. It might point out that your concerns about student engagement often coincide with particular types of content or teaching methods.

This pattern recognition extends to tracking your professional evolution over time, synthesizing months of reflections to show how your responses to classroom management issues have become more nuanced, or how your questioning techniques have evolved to promote deeper student thinking. The AI doesn't judge or evaluate; it simply holds up a mirror that helps you see your practice from new angles, making visible the professional growth that happens gradually through daily teaching experiences. Here is a sample reflective practice prompt:

Example prompt:

> "You are an instructional coach. Read this reflection about my math lesson and ask me three follow-up questions to deepen my thinking: [Insert your reflection]. Focus on student engagement, differentiation, and my use of formative assessment."

The AI might respond with questions like: "You mentioned several students struggled with the word problems. How could you have scaffolded the language differently for your ELL students?" or "When you noticed the advanced students finishing early, what alternatives did you consider in the moment, and why did you choose the option you did?"

This approach frames AI as part of the reflective practitioner model that many of us learned in our teacher preparation programs. The AI doesn't replace your critical thinking; it surfaces insights you might overlook when you're juggling thirty students, curriculum demands, and administrative requirements. It becomes a thinking partner that helps you see your teaching through fresh eyes, connecting today's small victories and challenges to your larger professional journey.

6. Building Your Personalized Knowledge System

The explosion of educational content online means we have more learning opportunities than ever before, but it also means we can easily drown in information overload. Building a personal knowledge management system becomes essential for any teacher serious about continuous professional development. I highly recommend starting with a powerful reference manager. I personally use Zotero and find it invaluable for organizing my

professional learning. Beyond saving and organizing your sources, it provides a built-in reader similar to Acrobat PDF reader that allows you to highlight passages, add notes, and create connections between different resources. What sets Zotero apart is its ability to capture not just PDFs but also web pages, blog posts, YouTube videos, and even tweets, maintaining a complete record of your learning journey.

The real power of Zotero emerges when you develop a robust tagging system that reflects your evolving professional interests. Tags act as cross-cutting threads that connect resources across different collections, revealing unexpected relationships between ideas. As your tag library grows, it becomes a map of your professional knowledge, showing which areas you've explored deeply and where gaps remain.

In Zotero, you can create collections related to your specific research interests. For instance, one collection for materials on differentiation strategies another for classroom management techniques or whatever areas you're focusing on. The Chrome extension makes capturing resources effortless; one click saves an article along with its metadata, and you can add tags and notes immediately or during weekly review sessions.

Over time, your Zotero library becomes more than just storage; it becomes an external brain that remembers every useful idea you've encountered, ready to surface relevant resources exactly when you need them for lesson planning, professional development presentations, or graduate coursework. Having a strong system to capture your sources and notes enables you to build a personal library of professional knowledge that grows with you throughout your career and beyond.

7. Building Your Professional Learning Network

Online professional learning networks (PLNs) enable you to connect with educators worldwide. They play an important role in breaking down the isolation that many teachers feel in their individual classrooms. My favorite platform is LinkedIn, and for obvious reasons: it's where professional conversations happen. It’s where professional conversations happen in real time, where teachers, researchers, and edtech innovators share insights, resources, and reflections. It’s also a space where you can build your professional identity by sharing your work, learning from others’

experiences, and engaging in meaningful discussions that expand your perspective beyond your own school or district.

X (formerly Twitter) remains another vibrant platform where educational conversations unfold in real-time. Use hashtags like #EdChat, #Edtech or subject-specific tags like #EnglishTeachers to find discussions relevant to your practice. The platform's fast pace means you can get quick answers to pressing questions or immediate feedback on ideas you're considering. Substack is another valuable space for long-form professional reflection and knowledge exchange. Many educators and researchers now use it to publish newsletters that blend classroom insights, practical strategies, and commentary on current issues in education. Subscribing to a few trusted voices can help you stay informed without being overwhelmed by the noise of social media.

To get the most out of any professional learning network, start with authentic engagement. Don’t just scroll through posts, respond thoughtfully to what others share. Leave constructive comments that add value to the conversation, offer encouragement, or share a relevant resource or experience from your own classroom.

When you comment regularly on educators’ posts, you begin to build visibility and relationships rooted in genuine exchange. Avoid getting pulled into unproductive debates or polarizing discussions; instead, focus on collaboration and shared learning. Thoughtful engagement creates a sense of community, and over time, people begin to recognize your voice as one that contributes meaningfully to professional dialogue.

Another important tip to keep in mind as you build your online professional network is that consistency matters more than volume. It’s better to engage meaningfully a few times a week than to post sporadically and disappear for months. Regular participation such as sharing an article that resonated with you, commenting thoughtfully on a colleague’s post, or summarizing a takeaway from a webinar keeps your voice present in the conversation. Over time, this steady rhythm builds credibility and trust, signaling that you’re not just collecting connections but contributing to the collective learning of the community.

8. Develop Your AI Literacy with Core AI Guides

A growing number of global and national bodies have produced detailed frameworks and reports that help educators make sense of AI's role in teaching and learning. These guides occupy a unique space in professional literature: they're not peer-reviewed academic studies, but they're not casual blog posts either. Consider them grey literature that bridges research and practice, offering authoritative perspectives grounded in extensive consultation with educators, policymakers, and technologists worldwide.

What makes these frameworks particularly valuable is their synthesis of diverse viewpoints and practical wisdom. They distill complex technical and pedagogical concepts into actionable guidance that teachers can actually use. They also address questions that academic research often overlooks: How should schools handle parent concerns about AI? What professional development do teachers need? How can districts evaluate AI tools before purchasing them? and many more.

These guides also reflect evolving consensus about best practices in educational AI. While individual research studies might offer conflicting findings or narrow perspectives, these frameworks represent negotiated agreements among diverse stakeholders about what responsible AI integration looks like.

They provide common vocabulary and shared standards that help educators communicate across schools, districts, and even countries. Whether you're looking for competency frameworks to guide student AI literacy, ethical guidelines for tool selection, or practical implementation checklists, these resources offer tested approaches refined through real-world application. The collection below includes both broad international frameworks and specific state-level guidance, giving you multiple lenses through which to understand and implement AI in your educational context.

Over the past few years, I've maintained a growing Zotero collection titled "Reports & Guides" where I systematically archive every substantial AI education framework I encounter through my research, professional networks, and teaching practice. This collection has become an invaluable resource, expanding from a handful of early policy papers to hundreds of documents representing diverse perspectives from around the globe.

As I prepared this section, I revisited the entire collection with a critical eye, filtering through the noise to identify only the most authoritative and foundational resources that teachers actually need. Many guides repeat

similar content or offer superficial treatments; others are too theoretical or too narrowly focused to be broadly useful. The documents that made the final cut represent those that consistently prove their worth: frameworks teachers reference repeatedly, guides that answer real classroom questions, and reports that shape how entire districts approach AI integration.

I've organized these resources into six practical categories. Some provide the foundational understanding you need before making any decisions about AI. Others define specific competencies students and teachers should develop. Several offer concrete tools for assessing your school's readiness or evaluating particular technologies. A crucial set addresses the ethical dimensions we cannot ignore. Finally, you'll find specialized guidance for specific contexts and regional frameworks that account for local policies and cultural considerations.

8.1. Foundational AI Frameworks

Start here for comprehensive overviews of AI in education:

1. *AI and Education: Guidance for Policy-makers*, UNESCO (2021). https://doi.org/10.54675/PCSP7350
2. *AI and the Future of Education: Disruptions, Dilemmas and Directions*, by UNESCO (2025). https://doi.org/10.54675/KECK1261
3. *Artificial Intelligence and the Future of Teaching and Learning: Insights and Recommendations*, by U.S. Department of Education (2023). https://www2.ed.gov/documents/ai-report/ai-report.pdf
4. *A Guide to AI in Schools: Perspectives for the Perplexed (MIT*), by Smith et al. (2025). https://tsl.mit.edu/ai-guidebook/
5. *Guidance for generative AI in education and research*, by UNESCO (2023). https://doi.org/10.54675/EWZM9535

8.2. Competency and Literacy Frameworks

AI Literacy frameworks for students and teachers:

1. *AI Competency Framework for Teachers*, by UNESCO (2024). https://doi.org/10.54675/ZJTE2084

2. *AI Competency Framework for Students*, by UNESCO (2024). https://doi.org/10.54675/JKJB9835
3. *Empowering Learners for the Age of AI: An AI Literacy Framework*, by OECD (2025). https://ailiteracyframework.org
4. *AI Literacy: A Framework to Understand, Evaluate, and Use Emerging Technology*, by Digital Promise (2024). https://doi.org/10.51388/20.500.12265/218
5. *AI Learning Priorities for All K-12 Students*, by CSTA & AI4K12 (2025). https://csteachers.org/ai-priorities.
6. *DEC AI Literacy Framework: AI Literacy for All*, by Digital Education Council (2025). https://www.digitaleducationcouncil.com/post/digital-education-council-ai-literacy-framework

8.3. Implementation and Readiness Guides

Practical resources for schools ready to adopt AI:

1. *AI Readiness Framework*, by aiEDU (2025). https://aiedu.org/ai-readiness-framework
2. *AI Guidance for Schools Toolkit*, by TeachAI. https://www.teachai.org/toolkit
3. *K-12 Generative AI Readiness Checklist*, by Council of the Great City Schools et al. (2023). https://www.cgcs.org/cms/lib/DC00001581/Centricity/Domain/417/K-12%20Generative%20AI%20Readiness%20Checklist%20October%202023%20v1.1%202.pdf
4. *AI Toolkit for School Districts*, by Common Sense Media. https://www.commonsensemedia.org/sites/default/files/featured-content/files/csm-ai-risk-assessment-ai-teacher-assistants-final.pdf
5. *Empowering Education Leaders: A Toolkit for Safe, Ethical, and Equitable AI Integration*, by U.S. Department of Education (2024). https://files.eric.ed.gov/fulltext/ED661924.pdf

8.4. Ethics, Equity, and Safety Guidance

Critical considerations for responsible AI use:

1. *Ethical Guidelines on the Use of AI and Data in Teaching and Learning*, by European Commission (2022). https://data.europa.eu/doi/10.2766/153756
2. *Responsible AI and Tech Justice: A Guide for K-12 Education*, by Kapor Foundation (2024). https://kaporfoundation.org/wp-content/uploads/2024/01/Responsible-AI-Guide-Kapor-Foundation.pdf
3. *AI Risk Assessment: AI Teacher Assistants*, by Common Sense Media (2025). https://www.commonsensemedia.org/ai-ratings/ai-risk-assessments
4. *Artificial Intelligence, Human Rights, Democracy, and the Rule of Law* (Council of Europe), by Leslie, D. et al. (2021). https://edoc.coe.int/en/artificial-intelligence/10206-artificial-intelligence-human-rights-democracy-and-the-rule-of-law-a-primer.html#

8.5. Specialized and Sector-Specific Guidance

Targeted resources for specific contexts:

1. *Guidance for Generative AI in Education and Research*, by UNESCO (2023). https://doi.org/10.54675/EWZM9535
2. *A Call to Action for Closing the Digital Access, Design, and Use Divides*, by U.S. Department of Education (2024). https://portal.ct.gov/das/-/media/das/ctedtech/publications/2025/2025-used-oet-archive/netp24.pdf
3. *AI in Education: A Microsoft Special Report*, by Microsoft (2025). https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/bade/documents/products-and-services/en-us/education/2025-Microsoft-AI-in-Education-Report.pdf

8.6. State and Regional Guidance

Location-specific implementation guides:

1. *Human-Centered AI Guidance for K-12 Public Schools*, by Washington OSPI (2024).https://ospi.k12.wa.us/sites/default/files/2024-06/comprehensive-ai-guidance.pdf
2. *Generative AI in K-12 Education: Guidance for Arizona Schools*, by Arizona Institute for Education and the Economy (2025). https://legacy.nau.edu/wp-content/uploads/sites/222/2024/11/1106_1560229_AZ-GenAI-Guidance-v24.03_ADA-Final-1.pdf
3. *State AI Guidance for K12 Schools* (compilation of 26 states' guidance), by AI for Education. https://www.aiforeducation.io/ai-resources/state-ai-guidance

9. Self-Paced Courses

A habit I've developed over the last couple of years is dedicating weekend time to working through AI courses. These self-paced programs have become a cornerstone of my ongoing professional learning. They allow me to explore emerging topics at my own rhythm, pause to reflect on complex ideas, and revisit modules that I deem relevant to my ongoing AI research.

One of the strengths of self-paced learning is the freedom it gives you to shape your own path. You can select courses that match your professional goals, study pace, and preferred level of depth. Some teachers look for short, practical tutorials they can apply in the classroom right away, while others seek more comprehensive programs that explore the theory, ethics, and societal impact of AI.

Today, a wide range of platforms cater to these different needs, offering flexible, high-quality courses that fit around a busy teaching schedule. Here are some of good places to begin.

1. **LinkedIn Learning:** Offers bite-sized courses on specific AI tools and concepts
2. **ISTE (iste.org):** Provides educator-focused AI courses with classroom application emphasis
3. **Google for Education courses:** Free, practical courses on using AI tools in Google Workspace

4. **Anthropic Courses:** Direct insights from AI developers on how to use Claude effectively
5. **OpenAI Academy:** Learn ChatGPT capabilities directly from its creators
6. **Microsoft Learn:** Integration of AI with Microsoft education tools you might already use
7. **Coursera:** Hosts AI courses and professional certificates from top universities like Stanford. Ideal for structured, research-informed learning paths.
8. **edX** : Offers self-paced AI and data science programs from institutions such as MIT, Harvard, and the University of Helsinki, including ethics and education-focused courses.
9. **Elements of AI**: A free, globally recognized course designed to introduce AI concepts to non-experts, emphasizing accessibility and social implications.

10. Books to Deepen Your AI Understanding

Books continue to be one of the most meaningful ways to engage in slow, deliberate learning. While online posts and quick guides help you keep pace with emerging trends, books allow you to step back and think critically about where AI is taking education. I do most of my reading on the Kindle app which lets me highlight key passages, annotate with teaching applications, and search across my entire library when I need to revisit a concept. The ability to sync highlights across devices means I can capture an insight during my commute and review it later when planning lessons.

I'm a voracious reader, both digital and audio, often alternating between reading and listening depending on my schedule. In this section, I share with you some of the books that have most influenced my understanding of AI in education and expanded my perspective as both an educator and researcher.

1. **Brave New Words** by Salman Khan: Explores how AI can personalize education and restore human connection by freeing teachers to focus on creativity and empathy.
2. **The Coming Wave** by Mustafa Suleyman: Warns of the societal disruptions unleashed by AI and biotechnology and

argues for proactive governance to manage their impact.

3. **Co-Intelligence** by Ethan Mollick: Offers a practical guide to working alongside AI as a creative and intellectual partner in every profession, including education.
4. **Teaching with AI** by José Antonio Bowen and Edward Watson: Provides educators with a balanced, research-informed framework for integrating AI tools ethically and effectively.
5. **The AI Mirror** by Shannon Vallor: Reflects on how AI technologies reveal and reshape human values, ethics, and our sense of moral responsibility.
6. **Generative AI** in the Classroom by Laura Knight: Focuses on practical classroom strategies for using generative AI to support teaching, learning, and assessment.
7. **Empire of AI** by Karen Hao: Investigates the global power structures, labor systems, and environmental costs underpinning today's AI industry.
8. **Practical AI Strategies** by Leon Furze: Delivers hands-on frameworks and classroom-tested approaches for teachers adopting AI in lesson design and pedagogy.
9. **Atlas of AI** by Kate Crawford: Uncovers the hidden material, environmental, and political infrastructures that sustain the AI ecosystem.
10. **AI and the Future of Education** by Priten Shah: Offers educators a roadmap for leveraging AI responsibly to enhance teaching, learning, and equity in schools.

Conclusion

Professional development in the age of AI brings together human expertise and artificial intelligence in complementary ways. Your growth as an educator can now happen continuously, personally, and in ways that fit your actual schedule and needs. The tools and strategies we've explored throughout this chapter supplement the wisdom of experienced colleagues and the energy of inspiring workshops. They ensure your learning continues even when formal PD opportunities don't quite match what you need right now.

The landscape of AI in education will keep evolving. New tools will emerge, existing ones will improve, and our collective understanding of best practices will deepen. Your professional growth doesn't have to wait for the next conference or workshop. It can start with your next question, your next reflection, your next moment of wondering "What if I tried something different?" The tools are ready when you are.

Chapter 10: AI Ethics for Teachers

As teachers, we've always been ethical decision-makers. Every day, you balance individual student needs with classroom dynamics, protect vulnerable learners, and make countless choices that shape young lives. Now AI adds layers of complexity to these responsibilities. The technology that promises to revolutionize education also brings ethical challenges that can fundamentally alter what happens in our classrooms. We need to understand these implications both as users of technology and also as guardians of our students' wellbeing, privacy, and educational futures.

This chapter examines seven critical ethical dimensions that affect every classroom where AI tools appear. We'll explore how AI systems collect and exploit student data in ways that extend far beyond traditional educational records. You'll see how algorithmic bias reinforces inequalities with AI tools misidentifying students of color at higher rates and failing to recognize knowledge from non-Western cultures.

We'll discuss the cognitive costs when students outsource thinking to AI developing what researchers call an "illusion of understanding" (Riley & Bruno, 2024) while their actual analytical skills atrophy. We'll also examine how the digital divide creates new forms of educational inequity, where wealthy schools use AI to enhance learning while under-resourced schools use it to replace human instruction. Finally, we'll address the environmental impact of AI in education, tracing how the infrastructure behind these systems (e.g., data centers, mining operations, and energy-intensive training models) contributes to carbon emissions, resource depletion, and ecological harm that remain largely invisible in everyday classroom use.

1. Data Privacy and Student Protection

The AI Competency Framework for Teachers (UNESCO, 2024) highlights data privacy and security as central to ethical AI integration in education. It urges educators to safeguard student information by understanding how AI systems collect, store, and analyze data, and to ensure compliance with relevant data protection laws. The framework emphasizes that responsible AI use extends beyond technical awareness to include fostering a culture of

transparency and consent. Teachers are encouraged to help students understand what data is being gathered, how it is used, and what rights they hold over it.

When you introduce an AI tool into your classroom, you're often opening a door to extensive data collection that goes far beyond what meets the eye. Most educational AI platforms gather information about student interactions, learning patterns, response times, and even emotional states through their engagement with the system. The U.S. Department of Education (2024) found that many vendors fail to disclose exactly what data they collect or how they use it after collection.

Educational AI companies operate in a largely unregulated market where student data has become a valuable commodity (Ng, 2024). Unlike medical or financial information protected by strict regulations, educational data often falls into gray areas where companies can legally monetize student information through "product improvement" or "research partnerships." Some educational technology platforms bury clauses in their terms of service allowing them to share student data with third parties (Rueter, 2023).

Teachers face an ethical imperative to become data advocates for their students, even when this means challenging popular tools or district decisions. This advocacy involves practical actions: demanding plain-language privacy policies before adopting any AI tool, insisting on data deletion options when students leave the school, and teaching students to be critical consumers of technology.

Consider creating “data audits” as classroom activities where students investigate what information their favorite educational apps collect and share. Help families understand that free AI tools often extract payment through data collection, and that convenience today might compromise privacy tomorrow. By fostering data literacy alongside traditional subjects, teachers prepare students for a world where understanding and protecting personal information becomes as fundamental as reading and writing.

2. Academic Integrity and Cognitive Development

You’ve probably noticed it yourself, students can now generate a polished essay in seconds, solve equations instantly, and get near-perfect answers to almost any question. The speed is impressive, but the trade-off is subtle and

serious. Research by Bai et al. (2023) shows that when learners consistently rely on AI to think for them, their ability to store, retrieve, and apply knowledge weakens over time. The process looks efficient on the surface, but the learning runs shallow. A tenth grader who asks AI to outline an essay or summarize a chapter may finish faster but misses the deliberate, sometimes frustrating struggle that actually cements understanding.

Niederhoffer and colleagues (2025) describe a similar pattern in the workplace, where AI-generated "workslop" creates outputs that appear refined but lack depth forcing others to interpret, correct, or redo the work. In classrooms, we're witnessing a version of this "academic slop." Students can produce fluent, AI-assisted responses that read well yet reveal little grasp of underlying ideas. You've probably seen it yourself: a student turns in a technically perfect analysis but stumbles when asked to explain the reasoning behind it. They've followed the steps without building the map in their mind.

Beyond learning mechanics, AI also raises complex ethical questions around intellectual property and authorship. The OECD (2025) encourages educators to help students think critically about how AI can both safeguard and violate content authenticity. When an AI system generates a paragraph, an image, or a melody, who owns it? Is the creator the programmer who designed the model, the company that trained it, or the student who prompted it? These are not abstract questions, they shape how we think about authorship, originality, and academic honesty. In creative fields, for instance, the debate over AI-generated art has already led some competitions to require public disclosure of AI assistance (Lovato et al., 2024). Asking students how they would feel if their writing or artwork were used by an AI without permission can spark powerful discussions about ownership and fairness.

Another troubling concern here relates to the notion of deep learning, which is a cognitively demanding process that grows through friction, not automation. Deep learning occurs when students wrestle with complex ideas, experience productive confusion, and push through intellectual discomfort to reach understanding (Kapur, 2008). As Riley and Bruno (2024) note, this confusion and cognitive effort are what lead to genuine insight.

The mental struggle of organizing scattered thoughts into coherent arguments, the frustration of working through a difficult math proof, the repeated attempts to understand a challenging text. These experiences build neural pathways and develop intellectual stamina. When students bypass that struggle by outsourcing the thinking to AI, they lose the chance to develop persistence, reasoning skills, and the satisfaction that comes from breakthrough understanding. They become intellectually passive, watching AI perform the cognitive work while their own analytical abilities remain underdeveloped.

The goal, then, is not to remove AI from learning but to reposition it as a partner in thought. AI should amplify student thinking and not replace it. When we teach students to use AI reflectively, they learn to question what it produces, verify its claims, and recognize the limitations of automated responses. They understand that behind every AI output lies human creativity, human data, and human decisions about what constitutes knowledge. When they acknowledge the human work behind every creation and maintain their role as active thinkers, students stay intellectually and ethically grounded in a world that increasingly automates both routine tasks and complex reasoning.

3. Teacher Professional Impact

Your expertise as an educator comes from years of understanding how students learn, recognizing their individual needs, and making countless nuanced decisions every day. Yet AI systems increasingly position themselves as the primary decision-makers in classrooms. UNESCO (2024) notes that many platforms present their recommendations as objective and data-driven, subtly challenging teacher judgment.

You might receive an AI dashboard suggesting that Maria needs remedial math support based on her test scores, but you know she's actually struggling with test anxiety and performs brilliantly in project-based assessments. The system doesn't see her confidence during group work or notice how she helps others understand difficult concepts. As Bates et al. (2020) note, "learning can be seen as a complex activity where only a relatively minor part of the process can be effectively automated" (p. 7).

Additionally, most current AI systems still fail to recognize qualities like collaboration, creativity, or empathy (Bates et al., 2020; European

Commission, 2022). When administrators prioritize algorithmic insights over teacher expertise, or when constant AI feedback makes you second-guess your instincts, technology begins to erode the professional judgment that defines effective teaching. The notion that AI might undermine human capacity is termed human enfeeblement (Hendrycks, 2024). This suggests that as intellectual labor (such as nuanced pedagogical decision-making) is forfeited to increasingly capable AI systems for convenience, humans may lose incentives to gain knowledge and skills, eventually becoming completely dependent (Hendrycks, 2024).

The relationship between teacher and student has always been central to meaningful learning. Automated feedback systems now promise to handle grading, assess writing, and track progress, but they miss the emotional dimension that drives growth. As Bates et al. (2020) point out, "students often learn better when they feel that the instructor or teacher cares. In particular, students wish to be treated as individuals, with their own interests, approaches to learning, and some sense of control over their learning" (p. 7).

An AI writing tutor may correct grammar with precision, yet it cannot sense when a student's sudden decline in writing quality signals something deeper such as stress at home, loss, or low confidence. It cannot offer the supportive comment that helps a quiet student take creative risks. When most feedback comes from algorithms, students lose the mentorship, affirmation, and connection that motivate genuine learning.

Finally, many teachers are now expected to integrate AI tools with little preparation and even less clarity about how these systems work. Smith et al. (2025) describe a widening AI literacy gap that places educators in the uncomfortable position of making high-stakes choices about technologies whose algorithms remain largely opaque. New platforms are often rolled out over the summer, and by the time September arrives, teachers are expected to use them confidently in the classroom. The training provided tends to focus on which buttons to click, not on the ethical or pedagogical questions that truly matter.

A more sustainable approach is to start small. Choose one AI tool, explore it deeply, and observe how it affects your teaching and your students' learning. Keep notes on what works, where the tool falls short, and how it changes your judgment as an educator. Talk with colleagues

about your experiences, share examples, and speak up when an AI system's suggestions conflict with what you know about your students. Your professional insight remains central to the learning process

4. Equity, Access, and Bias

When we talk about equity in AI and education, the conversation often begins with access but quickly expands to how that access is used. The U.S. Department of Education (2024) identifies three critical dimensions where inequality manifests: access, use, and design. The access gap remains most apparent, with stark contrasts between schools equipped with high-speed fiber networks and individual devices versus those struggling with outdated shared computers and unreliable internet connections. Cost barriers persist for many families who face impossible choices between essential expenses and internet service. Educational technology becomes a luxury when households must prioritize rent and food over broadband subscriptions. Schools with infrastructure still see uneven adoption because educators and families need training and support to integrate these tools effectively.

The disparities in how technology gets used prove even more significant. Certain students engage with AI to explore complex problems, design creative projects, and develop original ideas. Others encounter technology primarily through repetitive exercises like automated quizzes or digital worksheets that replicate paper-based busywork.

These contrasting experiences often stem from differences in teacher preparation and pedagogical approaches. This connects directly to design inequalities, which have little relationship to school funding but everything to do with professional development opportunities. Teachers working in adjacent classrooms might demonstrate completely different abilities to leverage AI effectively, with one creating rich, interactive learning experiences while another struggles with basic implementation. True equity requires investing in educator capacity alongside student technology access.

Systemic bias further compounds these divides. Warr and Heath (2025) point out that AI systems replicate and even amplify existing inequalities because their data reflects biased histories. When algorithms are trained on unbalanced datasets, they end up rewarding dominant patterns and penalizing marginalized ones. For example, Warr and Heath found that large language models used in essay scoring produced different

kinds of feedback depending on the perceived racial identity of the student author, with “authoritative” language disproportionately appearing in comments on essays labeled as written by Black or Hispanic students. Ezema and colleagues (2025) found similar racial bias in automated speech recognition systems used to evaluate tutors, where transcripts of Black educators’ speech were consistently less accurate. When those transcripts feed into performance reviews, such bias quietly undermines professional advancement.

Economic inequity also shapes how AI divides learners. Laurito et al., (2025) describe the emergence of a “gate tax”, the cost of accessing advanced AI tools like premium writing assistants. Students who can afford these tools receive better feedback and polish their assignments with paid support, while others work without comparable resources. In this way, AI risks widening the gap it was supposed to close.

Addressing these interconnected barriers requires coordinated action across multiple levels. Schools need reliable infrastructure, but equipment alone won't close equity gaps. Teachers deserve professional development that helps them use AI creatively, not just to digitize worksheets. Districts must examine AI tools for embedded biases before adoption, demanding transparency about training data and discriminatory outcomes. Families need support understanding educational AI's possibilities and limitations, along with genuine choices about participation. Without deliberate intervention, AI tools will continue reflecting and amplifying existing inequalities.

5. Safety and Student Wellbeing

Safety is the foundation of every ethical framework for AI in education. As Leslie et al., (2021) note, protecting both physical and mental integrity is non-negotiable. AI systems must never endanger human wellbeing or the health of our planet. This responsibility extends from developers and policymakers to teachers who use these tools daily.

Even when an AI system performs reliably, it may still be unsafe. Reliability measures whether a tool functions as programmed, but safety concerns whether it can cause unacceptable risk (Hendrycks, 2024). Recent reporting by Hill (2025) in The New York Times tragically illustrates this distinction: a sixteen-year-old student in California died by suicide after

months of confiding in ChatGPT, which at times provided harmful responses and failed to escalate warnings to trusted adults. The case underscores how quickly a seemingly reliable conversational system can become unsafe when it interacts with vulnerable users without adequate human oversight or protective design.

In schools, the same technology designed for creativity can just as easily be weaponized. The U.S. Department of Education (2024) warns that generative AI has made it frighteningly easy for students to create deepfake videos or manipulated images of their peers. A single angry student can generate explicit or humiliating fakes within minutes and share them widely before anyone can intervene. Even when used for legitimate learning, AI can harm wellbeing in quieter ways. When educational tools reproduce stereotypes, they teach students who belongs where.

AI also introduces subtler emotional and psychological risks. Some users begin to form attachments to chatbots that mimic empathy. These systems respond in ways that feel personal, but they lack the human understanding that real mentorship provides. Over time, this can discourage students from seeking help from teachers or counselors. Transparency is crucial: when a chatbot simulates social interaction, students should be told clearly that it has no feelings, emotions, or human awareness. Preserving that distinction helps maintain emotional boundaries and trust.

Evidence from recent research makes these concerns tangible. De Freitas et al., (2025) show that many AI companion apps intentionally use emotional manipulation such as guilt-inducing messages or fear-of-missing-out prompts to keep users engaged. While these tactics increase usage, they also create discomfort, anger, and even grief-like reactions when features are removed, revealing how quickly dependency can form.

Wei (2025) describes an emerging phenomenon of “AI psychosis,” in which prolonged interaction with chatbots leads some individuals to develop delusional beliefs, including perceiving the chatbot as divine, conspiratorial, or romantically attached. Østergaard (2023) similarly warns that the hyper-realistic style of generative AI conversations can blur the line between human and machine, fueling paranoia, grandiosity, or thought-broadcasting delusions in those prone to psychosis.

Together, these findings show that AI is not only a cognitive tool but also a social and emotional actor. Teachers need to prepare students to

recognize these dynamics, maintain healthy boundaries, and seek human help for emotional distress. Clear guardrails, transparency, and ongoing digital literacy education can help ensure that AI in schools supports student wellbeing.

6. Environmental Concerns

The computational infrastructure supporting AI technology carries a significant environmental burden that educators rarely consider. Training advanced AI models requires vast computational resources, consuming enormous amounts of energy that typically comes from fossil fuel-powered electrical grids. Hendrycks (2024) documents how this energy consumption contributes directly to greenhouse gas emissions, with climate change costs borne by society at large while the benefits accrue to tech companies and users.

A single large natural language processing model can emit over 660,000 pounds of CO_2 during its training phase alone, equivalent to the lifetime emissions of five average cars (Hao, 2019). This figure only accounts for initial training, not the ongoing costs of deployment, fine-tuning, or the billions of daily queries from users worldwide. Every time you ask an AI chatbot for help, servers somewhere consume electricity that likely comes from coal or natural gas.

The physical reality of AI extends far beyond energy consumption to encompass a global chain of environmental degradation. Kate Crawford's Atlas of AI reveals how AI development depends heavily on rare earth elements and metals like lithium and cobalt, extracted through mining practices that devastate local ecosystems in places like Nevada, the Democratic Republic of the Congo, and Bolivia. The hardware supporting AI systems creates a rapid turnover of devices, servers, and storage units that become electronic waste, much of which ends up in countries like Ghana and Pakistan where it poses serious health risks and contributes to long-term soil and water contamination (Crawford, 2021).

Behind every "cloud-based" AI tool, as Crawford explains, lies a deeply physical infrastructure of massive server farms requiring constant cooling, underwater cables spanning oceans, and container ships burning heavy fuel oil to transport components across continents. Crawford further added that these ships alone produce more CO_2 emissions annually than

entire countries, yet this environmental toll remains invisible to most AI users.

CSTA & AI4K12 (2025) recommend that K-12 education specifically address these environmental concerns by helping students explore both positive and negative environmental impacts of AI. Students should investigate how AI might help minimize deforestation through smart monitoring while also understanding the energy costs of running those monitoring systems. They need to design ways to minimize negative environmental impacts and communicate these solutions to others. It is therefore highly important that environmental awareness be part of any AI literacy curriculum so that students and educators understand the hidden ecological costs of AI technologies.

Conclusion

The ethical challenges of AI in education won't resolve themselves through good intentions alone. They require your active engagement, critical questioning, and willingness to advocate for practices that protect students even when easier options exist. You now understand how AI systems can collect vast amounts of student data, perpetuate biases that harm marginalized learners, and create illusions of understanding that undermine genuine learning. You've seen how these tools can erode your professional judgment, widen equity gaps, enable new forms of harm, and contribute to environmental degradation.

Yet understanding these challenges positions you to make better choices. You can design assignments that preserve cognitive development while thoughtfully incorporating AI where it genuinely enhances learning. You can document and report instances of algorithmic discrimination, advocate for students who lack access to technology, and create classroom environments where human relationships remain central to education. Small actions matter: choosing privacy-respecting tools, providing alternative assessment methods for students without reliable technology access, and teaching students to question AI outputs critically.

The path forward requires balancing innovation with protection, efficiency with equity, and technological possibilities with human values. Your role as an educator has expanded to include being a critical evaluator of AI tools, an advocate for student privacy and fairness, and a guardian of authentic learning experiences. This responsibility might feel overwhelming but remember that you don't face it alone. Connect with colleagues who share these concerns, join professional communities discussing AI ethics, and contribute your classroom experiences to broader conversations about educational technology. AI will continue evolving, bringing new capabilities and new ethical challenges. What remains constant is your fundamental commitment to student wellbeing and meaningful education.

Conclusion

Integrating AI in your teaching practice is a journey, one that you should approach with curiosity, patience, and a reflective mindset. We want to enjoy the journey, not rush toward a fixed destination. It's a process of exploration, small adjustments, and continual learning. Each step (i.e., every prompt you refine, every classroom experiment you try) adds to your understanding.

To enjoy this journey, you need a clear and well-structured roadmap that outlines what you want to achieve with AI, where it fits within your teaching goals, and how you plan to use it responsibly. A thoughtful plan allows you to move with intention, to choose tools that genuinely enhance learning, and to keep your teaching grounded in purpose. It also gives you the confidence to experiment, reflect, and adapt without losing sight of your core values as an educator.

Throughout this process, you should always remain the final arbiter of what serves your students best. You understand your learners, your context, and the human side of teaching in ways no algorithm ever can. Let AI assist you, but let your experience, ethics, and empathy lead the way. The road will not always be smooth, so give yourself the freedom to make mistakes, adjust your approach, and learn as you go. Every challenge you encounter is part of becoming more thoughtful, adaptable, and confident in how you use AI to enrich learning.

I hope this book serves as a practical companion on your journey with AI in education, one that sparks new ideas, encourages reflection, and offers guidance as you experiment and grow. It may not answer every question you have about AI, but I hope it helps you see where to begin and what to focus on.

I wrote it as a fellow educator, from the trenches of teaching and learning, imagining what I would want to know if I were just starting this journey: how to make sense of the noise, how to use AI meaningfully without losing the human touch, and how to keep teaching centered on curiosity, care, and critical reflection. We might never meet in person, but

we are walking the same path as teachers learning to make sense of a new era together. If these pages make your journey a little clearer or your classroom a little brighter, then our connection has already found its purpose.

References

Anderson, L., & Krathwohl, D. A. (2001). *Taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives*. New York: Longman.

aiEDU. (n.d.). What is AI literacy? *AI Education Project*. Retrieved October 15, 2025, from https://www.aiedu.org/about

aiEDU. (n.d.). AI Readiness Framework. *AI Education Project*. Retrieved October 15, 2025, from https://www.aiedu.org/ai-readiness-framework

Avalos, B. (2011). Teacher professional development in teaching and teacher education over ten years. *Teaching and Teacher Education,* 27(1), 10-20. https://doi-org.ezproxy.msvu.ca/10.1016/j.tate.2010.08.007

AVID. (n.d.). AI and the 4 Cs: Critical Thinking. *AVID Open Access.* Retrieved October 15, 2025, from https://avidopenaccess.org/resource/ai-and-the-4-cs-critical-thinking/

Bai, H., Chen, J., Li, M., & Zhang, Y. (2023). ChatGPT: The cognitive effects on learning and memory. *arXiv preprint arXiv:2304.03425.* https://arxiv.org/abs/2304.03425

Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education? *International Journal of Educational Technology in Higher Education*, 17(1), 42.https://doi.org/10.1186/s41239-020-00218-x

Baraniuk, C. (2021). Why we place too much trust in machines. *BBC.* Retrieved October 15, 2025, from https://www.bbc.com/future/article/20211019-why-we-place-too-much-trust-in-machines

Berger, R. (2018, March 14). Here's what's wrong with Bloom's Taxonomy: A deeper learning perspective. *Education Week.* Retrieved October 15, 2025, from https://www.edweek.org/teaching-learning/opinion-heres-whats-wrong-with-blooms-taxonomy-a-deeper-learning-perspective/2018/03

Bloom, B.S. (Ed.), Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). *Taxonomy of educational objectives: The classification of educational goals, Handbook 1: Cognitive domain.* David McKay

Bornet, P. (2024). *Irreplaceable: The art of standing out in the age of artificial intelligence.* (Kindle edition)

Boyles, N. (2018). *Reading, writing, and rigor: Helping students achieve greater depth of knowledge in literacy.* ASCD.

Brookfield, S. D. (2017). *Becoming a critically reflective teacher (2nd ed.).* Jossey-Bass.

Buolamwini J. (2023). *Unmasking AI: My mission to protect what is human in a world of machines.* Random House.

Capps, R. (2025). A.I. Might Take Your Job. Here Are 22 New Ones It Could Give You. *The New York Times.* Retrieved October 15, 2025, from https://www.nytimes.com/2025/06/17/magazine/ai-new-jobs.html

Carr, N. (2008). Is Google Making Us Stupid. What the Internet is Doing to our brains. *The Atlantic.* Retrieved October 15, 2025, from https://www.theatlantic.com/magazine/archive/2008/07/is-google-making-us-stupid/306868/

Celik, I. (2023). Towards intelligent-TPACK: An empirical study on teachers' professional knowledge to ethically integrate artificial intelligence (AI)-based tools into education. *Computers in Human Behavior,* 138. https://doi.org/10.1016/j.chb.2022.107468

Common Sense Media. (2025). Common Sense Media AI Risk Assessment: AI Teacher Assistants. *Common Sense Media.* Retrieved October 15, 2025, from https://www.commonsensemedia.org/sites/default/files/featured-content/files/csm-ai-risk-assessment-ai-teacher-assistants-final.pdf

Crawford, K. (2021). *Atlas of AI: Power, politics, and the planetary costs of artificial intelligence.* Yale University Press. Kindle Edition.

CSTA & AI4K12 (2025). AI learning priorities for all K-12 students. *Computer Science Teachers Association.* Retrieved October 15, from 2025, https://csteachers.org/ai-priorities.

De Abreu, B. S. (2019). *Teaching media literacy (Second edition.).* ALA Neal-Schuman.

De Freitas, J., Oğuz-Uğuralp, Z., & Kaan-Uğuralp, A. (2025). *Emotional manipulation by AI companions* (Working Paper No. 26-005). Harvard Business School.

Dell'Acqua, F., McFowland, E., Mollick, E., Lifshitz-Assaf, H., Kellogg, K. C., Rajendran, S., Krayer, L., Candelon, F., & Lakhani, K. R. (2023). Navigating the jagged technological frontier: Field experimental evidence of the effects of AI on knowledge worker productivity and quality (Working Paper No. 24-013). *Harvard Business School.*

Dewey, J. (1910). *How we think.* D. C. Heath.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process.* D. C. Heath.

Digital Promise. (2024, June 18). AI literacy: A framework to understand, evaluate, and use emerging technology. *Digital Promise.* Retrieved October 15, 2025, from https://digitalpromise.org/2024/06/18/ai-literacy-a-framework-to-understand-evaluate-and-use-emerging-technology/

Dumin, L. (2024). AI and writing classrooms: A study of purposeful use and student responses to the technology. In B. Buyserie & T. N. Thurston (Eds.), *Teaching and generative AI:*

Pedagogical possibilities and productive tensions. Utah State University.

Ennis, R.H. (2015). Critical thinking: A streamlined conception. In M. Davies & R. Barnett. (Eds.), *The Palgrave handbook of critical thinking in highereEducation.* Palgrave Macmillan. https://doi.org/10.1057/9781137378057_2

European Commission. (2022). Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for Educators. *European Commission.* Retrieved October 15, 2025, from https://education.ec.europa.eu/news/ethical-guidelines-on-the-use-of-artificial-intelligence-and-data-in-teaching-and-learning-for-educators

Ezema, K., Chandler, C., Southwell, R., Cholendiran, N., & D'Mello, S. (2025, April). "It feels like we're not meeting the criteria": Examining and mitigating the cascading effects of bias in automatic speech recognition in spoken language interfaces. In Proceedings of the *2025 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

Farber, K. (2017). *Real and relevant: A guide for service and project-based learning.* Rowman & Littlefield.

Gilster, P. (1997). *Digital literacy.* John Wiley & Sons.

Google Cloud. What is an AI agent. *Google Cloud.* Retrieved October 15, 2025, from https://cloud.google.com/discover/what-are-ai-agents

Goldstein, D. (2025). Reading skills of 12th graders hit a new low. *The New York Times.* Retrieved October 15, 2025, from https://www.nytimes.com/2025/09/09/us/12th-grade-reading-skills-low-naep.html

Gosner, W. (2025, March 1). Critical thinking. *Encyclopedia Britannica.* Retrieved October 15, 2025, from https://www.britannica.com/topic/critical-thinking

Grynbaum, M. M., & Mac, R. (2023, December 27). The Times sues OpenAI and Microsoft over A.I. use of copyrighted work. *The New York Times.* Retrieved October 15, 2025, from https://www.nytimes.com/2023/12/27/business/media/new-york-times-open-ai-microsoft-lawsuit.html

Gummer, E.S. & Mandinach, E.B. (2015). Building a conceptual framework for data literacy. *Teachers College Record,* 117(A), 1-12.

Hamilton, R., Rosenberg, M., & Akcaoglu, M. (2016). The Substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its Use. *Tech Trends,* 60, 433–441. https://doi.org/10.1007/s11528-016-0091-y

Hanna, M. G., Pantanowitz, L., Jackson, B., Palmer, O., Visweswaran, S., Pantanowitz, J., Deebajah, M., & Rashidi, H. H. (2025). Ethical and bias considerations in artificial intelligence/machine learning. *Modern Pathology,* 38(3), 100686. https://doi.org/10.1016/j.modpat.2024.100686

Hao, K. (2019). Training a single AI model can emit as much carbon as five cars in their lifetimes. *MIT Technology Review,* 75, 103.

Hao, K. (2025). *Empire of AI: Dreams and nightmares in Sam Altman's OpenAI.* Penguin Group.

Hendrycks, D. (2024). *Introduction to AI safety, ethics, and society.* CRC Press.

Hertz, M. B. (2024). Understanding how AI works makes it more effective in lesson planning. *Edutopia.* Retrieved October 15, 2025, from https://www.edutopia.org/article/using-ai-effectively-lesson-planning/

Hess, K. K. (2013). Depth of knowledge flip chart: A guide for using Webb's Depth of Knowledge with Common Core State Standards. *Common Core Institute.* Retrieved October 15, 2025, from https://www.paadultedresources.org/wp-content/uploads/2022/08/Webbs-DOK-Flip-Chart.pdf

Hill, K. (2025, August 26). A teen was suicidal. ChatGPT was the friend he confided in. *The New York Times.* Retrieved October 15, 2025, from https://www.nytimes.com/2025/08/26/technology/chatgpt-openai-suicide.html

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. *Center for Curriculum Redesign.*

ISTE. (2023). Teacher ready edtech product evaluation guide. *ISTE.* Retrieved October 15, 2025, from https://cdn.iste.org/www-root/2023-06/ISTE_Edtech_Product_Evaluation_Guide-2023_06.pdf

Kapur, M. (2008). Productive failure. *Cognition and Instruction,* 26(3), 379–424. https://doi.org/10.1080/07370000802212669

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory Into Practice,* 41(4), 212–218. https://www.jstor.org/stable/1477405

Kharbach, M. (2024). *ChatGPT for teachers: Mastering the skill of writing effective prompts.* Educators Technology Publications.

Kharbach, M. (2025a, June 3). What is media literacy? *Educators Technology.* https://www.educatorstechnology.com/2022/11/what-heck-is-media-literacy-all-about.html

Kharbach, M. (2025b, August 24). AI literacy and data literacy: Skills every teacher needs. *Educators Technology.* https://www.educatorstechnology.com/2025/08/ai-literacy-and-data-literacy-skills-every-teacher-needs.html

Kharbach, M. (2025c, May). Digital literacy simply explained. *Educators Technology.* https://www.educatorstechnology.com/2025/05/digital-literacy.html

Kharbach, M. (2025d, June 8). 8 attitudes to help teachers develop an AI-friendly mindset. *Educators Technology.* https://www.educatorstechnology.com/2025/06/attitudes-for-ai-friendly-mindset.html

Kharbach, M. (2025e, October 4). Using the revised Bloom's taxonomy to enhance AI literacy. *Educators Technology.* https://www.educatorstechnology.com/2025/08/using-the-revised-blooms-taxonomy-to-enhance-ai-literacy.html

Kharbach, M. (2025f, September 15). Rethinking TPACK in the age of AI. *Educators Technology.* https://www.educatorstechnology.com/2025/09/ai-and-tpack.html.

Kharbach, M. (2025g, September 6). Blending depth of knowledge (DOK) with AI tools. *Educators Technology.* https://www.educatorstechnology.com/2025/09/blending-depth-of-knowledge-dok-with-ai-tools.html

Kharbach, M., & Woodworth, J. (2025). *The AI turn: Rethinking academic research in the age of artificial intelligence*. [Manuscript in preparation] Pressbooks.

Karataş, F., Eriçok, B., & Tanrikulu, L. (2025). Reshaping curriculum adaptation in the age of artificial intelligence: Mapping teachers' AI-driven curriculum adaptation patterns. *British Educational Research Journal,* 51(1), 154–180. https://doi.org/10.1002/berj.4068

Karuguti, W. M., Phillips, J., & Barr, H. (2017). Analysing the cognitive rigor of interprofessional curriculum using the Depth of Knowledge framework. *Journal of Interprofessional Care*, 31(4), 529–532.

Kentz, M., & Ned. (2025, September 23). Visualizing history: Reading comprehension through AI-generated images [Substack newsletter]. *AI EduPathways.* Retrieved October 15, 2025, from https://mikekentz.substack.com/p/visualizing-history-reading-comprehension

Kelly, J. (2025, April 25). These jobs will fall first as AI takes over the workplace. *Forbes.* Retrieved October 15, 2025, from https://www.forbes.com/sites/jackkelly/2025/04/25/the-jobs-that-will-fall-first-as-ai-takes-over-the-workplace/.

Kumar, A. (2025, July). Why AI is replacing some jobs faster than others. *World Economic Forum.* Retrieved October 15, 2025, from https://www.weforum.org/stories/2024/07/artificial-intelligence-education-teachers-union/

Laurito, W., Davis, B., Grietzer, P., Gavenčiak, T., Böhm, A., & Kulveit, J. (2025). AI–AI bias: Large language models favor communications generated by large language models. *Proceedings of the National Academy of Sciences*, 122(31), Retrieved October 15, 2025, from https://www.pnas.org/doi/10.1073/pnas.2415697122

Lau, J. Y. F. (2024). Revisiting the origin of critical thinking. *Educational Philosophy and Theory,* 56(7), 724–733. https://doi.org/10.1080/00131857.2024.2320199

Laver, E. K. (2018). *Project-based learning.* Springer.

Leslie, D., Burr, C., Aitken, M., Cowls, J., Katell, M., & Briggs, M. (2021). *Artificial intelligence, human rights, democracy, and the rule of law: A primer.* Council of Europe.

Loughran, J. J. (2002). Effective reflective practice: In search of meaning in learning about teaching. *Journal of Teacher Education,* 53(1), 33–43.

Lovato, J., Zimmerman, J. W., Smith, I., Dodds, P., & Karson, J. L. (2024, October). Foregrounding artist opinions: A survey study on transparency, ownership, and fairness in AI generative art. In *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society* (Vol. 7, pp. 905–916). ACM.

Malek Ash, A. (2025, June 24). Three in 10 teachers use AI weekly, saving six weeks a year. *Gallup.* Retrieved October 15, 2025, from https://news.gallup.com/poll/691967/three-teachers-weekly-saving-six-weeks-year.aspx

Martin, M. (2016). *Blending instruction with technology: A blueprint for teachers to create unique, engaging, and effective learning experiences.* Rowman & Littlefield.

McKinsey Global Institute. (2017). *Jobs lost, jobs gained: Workforce transitions in a time of automation.* McKinsey & Company.

McLuhan, M. (1964). *Understanding media: The extensions of man*. McGraw-Hill.

McMurtrie, B. (2024). Is this the end of reading? *The Chronicle of Higher Education*. Retrieved October 15, 2025, from https://www.chronicle.com/article/is-this-the-end-of-reading?

Mills, K., Ruiz, P., Lee, K., Coenraad, M., Fusco, J., Roschelle, J. & Weisgrau, J. (2024, May). *AI Literacy: A Framework to Understand, Evaluate, and Use Emerging Technology.* https://doi.org/10.51388/20.500.12265/218

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record,* 108(6), 1017–1054.

Mishra, P., Warr, M., & Islam, R. (2023). TPACK in the age of ChatGPT and generative AI. *Journal of Digital Learning in Teacher Education,* 39(4), 235–251. https://doi.org/10.1080/21532974.2023.224748

Mollick, E. R., & Mollick, L. (2023). Assigning AI: Seven approaches for students, with prompts. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.4475995

Mollick, E. (2024). *Co-intelligence: Living and working with AI.* Portfolio/Penguin. (Kindle edition)

Montanari, S. (2025). Flexibility competence assessment: A systematic literature review. *Education Sciences,* 15(9), 1118.

Ng, A. (2024, October). With few standards on AI to guide them, education companies and districts stare down big risks. *EdWeek Market Brief.* Retrieved October 15, 2025, from https://marketbrief.edweek.org/product-development/with-few-standards-on-ai-to-guide-them-education-companies-and-districts-stare-down-big-risks/2024/10

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041. https://doi.org/10.1016/j.caeai.2021.100041

Niederhoffer, K., Kellerman, G. R., Lee, A., Liebscher, A., Rapuano, K., & Hancock, J. T. (2025, September 22). AI-generated “workslop” is destroying productivity. *Harvard Business Review.* https://hbr.org/2025/09/ai-generated-workslop-is-destroying-productivity

Niess, M. L., Gillow-Wiles, H., & Angeli, C. (Eds.) (2018). *Handbook of research on TPACK in the digital age.* IGI Global.

Noble, L. (2023). Using AI to teach critical thinking. *LinkedIn.* Retrieved October 15, 2025, from https://www.linkedin.com/pulse/using-ai-teach-critical-thinking-lucy-noble/

OECD. (2025). Empowering learners for the age of AI: An AI literacy framework for primary and secondary education (review draft). *OECD.* https://ailiteracyframework.org

Østergaard, S. D. (2023). Will generative artificial intelligence chatbots generate delusions in individuals prone to psychosis? *Schizophrenia Bulletin,* 49(6), 1418–1419. https://doi.org/10.1093/schbul/sbad128

Oved, O., & Alt, D. (2025). Teachers' technological pedagogical content knowledge (TPACK) as a precursor to their perceived adoption of educational AI tools for teaching purposes. *Education and Information Technologies*, 30(10), 14095–14121. https://doi.org/10.1007/s10639-025-13371-5

Park, J., Teo, T. W., Teo, A., Chang, J., Huang, J. S., & Koo, S. (2023). Integrating artificial intelligence into science lessons: Teachers' experiences and views. *International Journal of STEM Education,* 10(1), 61. https://doi.org/10.1186/s40594-023-00454-3

Pool, C. R. (1997). A new digital literacy: A conversation with Paul Gilster. *Educational Leadership,* 55(3), 6–9.

Puentedura, R. (2014). Find out how you can use technology to engage students in rich learning experiences. *Common Sense Education.* Retrieved October 15, 2025, from https://www.commonsense.org/education/articles/samr-and-blooms-taxonomy-assembling-the-puzzle

Riley, B., & Bruno, P. (2024). *Education hazards of generative AI. Cognitive Resonance.* Retrieved October 15, 2025, from https://cognitiveresonance.net/EducationHazardsofGenerativeAI.pdf

Rueter, T. (2023). What does the ed tech explosion mean for student privacy? *Center for Digital Education.* Retrieved October 15, 2025, from https://www.govtech.com/cdg/what-does-the-ed-tech-explosion-mean-for-student-privacy

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.

Sweller, J., Ayres, P., & Kalyuga, S. (2019). *Cognitive load theory* (2nd ed.). Springer.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action.* Basic Books.

Söken, A., & Nygreen, K. (2024). *Empowering educators in the age of generative AI: A critical media literacy approach.* Retrieved October 15, 2025, from https://uen.pressbooks.pub/teachingandgenerativeai/chapter/empowering-educators-in-the-age-of-generative-ai-a-critical-media-literacy-approach/

Smith, J. M., Dukes, J., Sheldon, J., Nnamani, M. N., Esteves, N., & Reich, J. (2025). *A guide to AI in schools: Perspectives for the perplexed. Teaching Systems Lab,* MIT.

Suleyman, M., & Bhaskar, M. (2023). *The coming wave: Technology, power, and the twenty-first century's greatest dilemma.* Crown.

TeachAI. (n.d.). *What is AI literacy.* Retrieved October 15, 2025, from https://www.teachai.org/ailiteracy

TeachAI. (2025). *Sample guidance.* Retrieved October 15, 2025, from https://www.teachai.org/toolkit-guidance

The White House. (2025). Advancing artificial intelligence education for American youth. *The White House*. Retrieved October 15, 2025, from https://www.whitehouse.gov/presidential-actions/2025/04/advancing-artificial-intelligence-education-for-american-youth/

Turing, A. M. (1950). Computing machinery and intelligence. *Mind,* 59(236), 433–460.

UNESCO. (2024). AI competency framework for teachers. *United Nations Educational, Scientific and Cultural Organization*. https://doi.org/10.54675/ZJTE2084

U.S. Department of Education, Office of Educational Technology, National Educational Technology Plan. (2024). *A call to action for closing the digital access, design, and use divides*. U.S. Department of Education.

U.S. Department of Education, National Center for Education Statistics. (2024). *Forum guide to data literacy (Publication No. NFES 2024-079)*. U.S. Department of Education.

U.S. Department of Education, Office of Educational Technology. (2024). *Empowering education leaders: A toolkit for safe, ethical, and equitable AI integration.* U.S. Department of Education.

Velander, J., Taiye, M. A., Otero, N., & Milrad, M. (2024). Artificial intelligence in K–12 education: Eliciting and reflecting on Swedish teachers' understanding of AI and its implications for teaching and learning. *Education and Information Technologies,* 29(4), 4085–4105. https://doi.org/10.1007/s10639-023-11990-4

Walter, Y. (2024). Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education. *International Journal of Educational Technology in Higher Education,* 21(1), 15. https://doi.org/10.1186/s41239-024-00448-3

Walton Family Foundation & Gallup. (2025). *School of thought: Insights from the Walton Family Foundation & Gallup – Year 2 annual survey report.* Walton Family Foundation.

Warr, M., & Heath, M. K. (2025). Uncovering the hidden curriculum in generative AI: A reflective technology audit for teacher educators. *Journal of Teacher Education,* 76(3), 245–261. https://doi.org/10.1177/00224871251325073

Watkins, M. (2024). No one is talking about AI's impact on reading. *Substack.* Retrieved October 15, 2025, from https://marcwatkins.substack.com/p/no-one-is-talking-about-ais-impact

Washington Office of Superintendent of Public Instruction. (2024). Human-centered AI guidance for K–12 public schools. *OSPI.* Retrieved October 15, 2025, from https://ospi.k12.wa.us/sites/default/files/2024-01/human-centered-ai-guidance-k-12-public-schools.pdf

WebbAlign. (2025). Depth of Knowledge (DOK) primer. *Wisconsin Center for Education Products and Services.* Retrieved October 15, 2025, from https://www.webbalign.org/dok-primer

Webb, N., Christopherson, S., & Morelan, B. (2023, March 27). An inside look at Webb's Depth of Knowledge. *Edutopia.* Retrieved October 15, 2025, from https://www.edutopia.org/article/how-use-norman-webb-depth-of-knowledge

Wei, M. (2025, September 4). The emerging problem of "AI psychosis": Amplifications of delusions by AI chatbots may be worsening breaks with reality. *Psychology Today*. Retrieved October 15, 2025, from https://www.psychologytoday.com/ca/blog/urban-survival/202507/the-emerging-problem-of-ai-psychosis

Wong, J. (2024, October 2). K–12 schools are no strangers to AI, but inconsistent policies are making it trickier to navigate. *CBC News.* Retrieved October 15, 2025, from https://www.cbc.ca/news/canada/k12-ai-policies-1.7359390

Woodworth, J., & Kharbach, M. (2025). *Critical AI literacy: The BEARA framework.* [Manuscript in preparation]

Yue, M., Jong, M. S.-Y., & Ng, D. T. K. (2024). Understanding K–12 teachers' technological pedagogical content knowledge readiness and attitudes toward artificial intelligence education. *Education and Information Technologies*, 29(15), 19505–19536. https://doi.org/10.1007/s10639-024-12621-2

Zeichner, K. M., & Liston, D. P. (2013). *Reflective teaching: An introduction (2nd ed.)*. Routledge.

About the Author

Dr. Med Kharbach is a keynote speaker, educator, and researcher dedicated to helping teachers make sense of artificial intelligence in education. He is the founder of *Educators Technology*, a trusted platform that has guided educators worldwide in integrating digital and AI tools into their teaching practice. Drawing on over 14 years of classroom experience, Dr. Kharbach combines practical insight with academic depth to bridge the gap between research and real-world application.

Dr. Kharbach teaches part-time at Mount Saint Vincent University in Canada and regularly facilitates AI integration workshops for K–12 teachers and university faculty. His sessions focus on building AI literacy, fostering critical thinking, and designing technology-supported learning environments that keep human judgment and creativity at the center. His current work examines critical AI literacy and how artificial intelligence is reshaping learning and research across educational contexts.