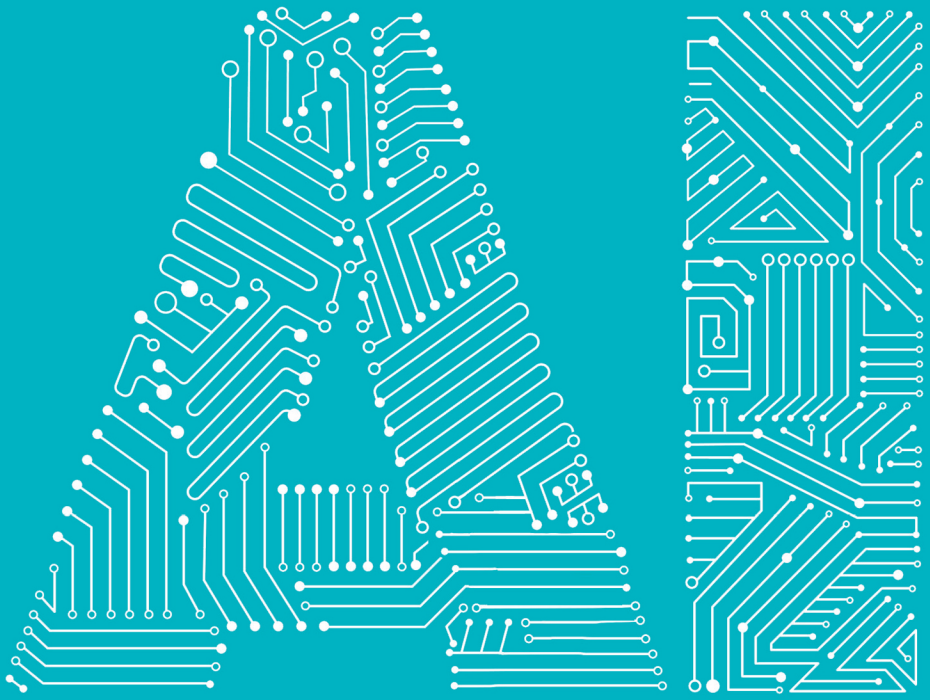
PRITEN SHAH



AI AND THE FUTURE OF EDUCATION

TEACHING IN THE AGE OF ARTIFICIAL INTELLIGENCE

JOSSEY-BASS
A Wiley Brand

Additional Praise for *AI and the Future of Education*

"This book makes a strong case that generative AI models are more than obstacles for educators to work around, and that if used thoughtfully and creatively, they can help teachers and administrators prepare their students to thrive in a rapidly changing technological environment. Shah understands that using AI in our classrooms won't come naturally to most of us, and offers concrete suggestions throughout, ranging from useful tips for modifying traditional assignments all the way to insightful recommendations for reimagining what the aims of formal education ought to be in the first place."

—Jeff Behrends, Senior Research Scholar,
Department of Philosophy, Harvard University

"Priten Shah's knowledge, experience, and spirit of public service in the fields of AI and education make this book essential reading for educators at all levels. He offers a must-read for teachers, administrators, parents, and policymakers on the voyage to best practices for using AI in classrooms."

—Anne L'Hommedieu-Sanderson, Executive Director,
ThinkerAnalytix and Associate of the Department
of Philosophy, Harvard University

"While teaching in the age of artificial intelligence may be intimidating for some, Shah's cogent and concise book is a great asset for educators, administrators, and school boards. *AI and the Future of Education* can especially help teachers better understand and incorporate the possibilities of AI as they continue to keep students at the center of all they do."

—Ajay Nair, PhD, President, Arcadia University

"The depth of Priten Shah's background in education and tech, and the clarity of his thinking and writing, make *AI and the Future of Education* a first-rate introduction to the subject. He offers a framework for understanding the basics of programs like ChatGPT, and his recommendations will offer excellent guidance to teachers and leaders in their exploration and evaluation of these tools, helping them to navigate the radical change that AI is already bringing to education."

—Bill Wharton, former Head of School,
The Commonwealth School

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Teaching in the Age of Artificial Intelligence

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Preface

This book is meant to provide an introduction to educators who are interested in learning about both the current and future capabilities of artificial intelligence (AI) in education. It focuses primarily on generative artificial intelligence (popularized by ChatGPT, Google's Bard, and Microsoft's Bing Chat), and offers teachers concrete insight into how they can use these technologies now and how they will likely be able to use them in the near future.

AI is rapidly developing, and the book aims to be independent of a particular snapshot in time by offering relevant advice at multiple stages of AI development. It does not assume that AI will remain incapable of a particular skill set, and it sets the stage for the large-scale changes that will be necessary in the coming years.

I highly encourage you to read all the prompt suggestions in every chapter, or at least skim through them, as the prompts (Chapter 2 explains this further) offer insight into effectively using these AI systems in your classroom. In that way, the book is meant to be a practical primer and does not focus on capabilities that teachers cannot yet use (e.g., sentiment analysis of facial expressions) and provides tips that are actionable immediately.

You will want to try at least some of the prompts from each section, and remember to add more context about the subject you're

teaching, the age group, any standards or learning objectives you have, and what output you are seeking. I have limited the prompts in size to help you quickly see the possibilities, and Chapter 2 explains how to write the most effective prompts.

Both to acknowledge the rapid pace of development and to keep the length manageable, I have limited the focus on content specific to a particular model, tool, or platform. I hope to allow teachers to choose the platform that best suits their needs when they read the book. We provide many more tool guides, lesson plans, prompts, and examples on our website at pedagog.ai, and we encourage you to access those resources as you work through the book.

Of course, a logical question most readers will ask is: "Did AI write this book?" While AI did not write the book, it was used to help prepare it. The book was, however, ultimately written, edited, and put together by a team of real humans. Various AI tools, including some of our own implementations, such as OpenAI's ChatGPT, Google's Bard, and Microsoft's Bing Chat, were consulted throughout the book as brainstorming buddies, thought partners, and a second pair of eyes on a funky-sounding paragraph. To help illustrate the role that AI can play in our workflow, the following lists the prompts used:

Prompt: "These are the guiding questions I'm considering discussing in a book section on the future of education and AI on {fill}. Are there any questions that seem unclear or irrelevant to this section?"

Prompt: "I'm trying to create an example for teachers on {fill}. This is what I have so far {fill}. What else could I add to provide a thorough picture?"

Prompt: "You are a prompt generator that helps me generate a prompt for teachers to use in generative AI tools so that they can do {fill}. What prompt would you use?"

Prompt: "This is a paragraph in a book on AI and the future of education. Provide me with suggestions for what you would change to ensure teachers can understand it properly: {fill}."

AI tools were also used to help edit the manuscript, where particular suggestions were provided, and I modified my grammatical structure or word choice based on their insight. Grammarly's AI-powered grammar and spell check system helped me rapidly review work and correct typos or errors.

As you read the book, you'll notice that most sections include big-picture insights into what changes can and might look like and more accessible information on how to approach AI for various uses. I encourage you to focus on both so you can see where we are headed and are prepared to navigate teaching in the age of AI.

Chapter 1

Embracing AI in Education

In response to the rapid development of artificial intelligence (AI), during the 2022–2023 school year, educators voiced concerns over plagiarism, cheating, and the futility of many of their traditional assignments. Suddenly, within minutes, students could generate essays that were hard to tell apart from human writing. Conventional plagiarism detection methods became obsolete as generative AI produced individual responses for each student. Some teachers scrambled to modify their assignments to keep up with the changes, while others were unaware of the newfound technological developments.

While the issue of academic integrity was pertinent in the months following the advent of these new technologies, the longer-term conversation must involve embracing and making room for AI to ensure

our classrooms meet our students' needs effectively. Educators must learn what AI is, how students are using and can use it, how it can make their lives easier, and how pedagogical goals that once seemed impossible can now be reached.

This book is a primer for educators to do just that. Throughout the chapters, I provide background information on the technological changes (both past, present, and likely future) and what that means for every teacher across the educational system. In addition, the book contains examples, tips and tricks, and thought-provoking questions to help prepare educators to teach in the age of AI.

Significant technological developments have always forced educators and the systems they work in to evolve to meet the educational needs of their students and take advantage of new opportunities. In that way, AI is similar to the challenges that educators have faced in the past. However, what makes these challenges different is the rapid pace at which they are developing, and the pain points and fractures within our educational models that they are exposing. These two factors make it essential that educators think about the implications of these developments on their practice and pedagogy quicker and more thoroughly than ever before.

To help educators do just that, Chapter 2 helps teachers develop a fundamental understanding of what AI is and how it is related to education, Chapter 3 highlights the fractures created by AI and identifies opportunities for large-scale change and adaptation in education, and Chapter 4 helps adapt traditional pedagogical theory to AI.

While plagiarism and academic integrity may have captured the initial public dialogue for education, I hope to present a more optimistic future for education. If these technologies are integrated and adapted to, instead of fought and avoided, educators and students will

be better equipped for the world that awaits us as AI revolutionizes our societies.

OPPORTUNITIES AND CHALLENGES: AI IN THE CLASSROOM

- What opportunities does AI present in the classroom?
- What challenges do educators face when implementing AI?
- What are the risks of overreliance on AI in the classroom?

While AI has intruded upon our classrooms, the opportunities it will create for our schools far outweigh the risks such technologies pose. The transition and adaptation will not be seamless, as we've already started to see, but with the proper knowledge and skills, educators can approach this new age ready to focus on what they do best: teach our students. Nonetheless, as with any rapid development, we must carefully consider how, when, and why we shift our practice and pedagogy in response to AI. While the entirety of this book is devoted to helping teachers carefully navigate this transition, the following sections provide an overview of the opportunities and challenges that AI is bringing.

The Opportunities

In the wake of the COVID-19 pandemic, teacher burnout and attrition were at all-time highs. This was not surprising given the growing blend of challenges teachers face. They are suffering from the pedagogical challenges of students who are academically behind, disengaged with the classroom, and presenting with various developmental, cognitive, and socioemotional needs. In addition, they

are burdened by the practical challenges of keeping up with parent and administrative communication, implementing multiple systems and protocols, and ensuring they generate standards-aligned material. These have combined to push teachers to the breaking point and caused a nationwide teacher shortage. While AI cannot fill in the gaps created in the classroom by our departing colleagues, it can help solve and mitigate many of these challenges and make teaching a less daunting experience for current and future teachers.

Teachers spend countless hours outside their instructional time planning lessons and activities, preparing instructional materials, providing assessment feedback, and managing administrative tasks. These tasks are independent of teachers' face-to-face time with students, and involve generating and responding to content for various non-instructional purposes. The development of generative AI technology thus offers a path to offloading much of the workload that happens behind the scenes of instructional time. AI can help outline curriculum, draft lesson plans, generate assessments, and draft communication and feedback for teachers. The more teachers can rely on AI for this portion of their workload, the more time and energy they will have to focus on providing students with direct instruction. Chapters 5 and 6 provide suggestions for educators on how to best use AI tools to make their own time more effective and valuable.

AI can also solve many of our pedagogical problems by providing us with custom, individualized, technology-based solutions to the issues we are facing. Creating personalized, interactive, and dynamic learning opportunities is becoming easier and more accessible for a broader range of educators to meet our students where they are and help keep them engaged in the learning process. Recent developments in AI technology will allow teachers to tailor their instruction and assignments to individual students, creating a more equitable and effective teaching strategy. In addition, AI systems will be able to

help teachers analyze student data, and pinpoint learning difficulties and gaps quicker to provide targeted support for struggling students. Chapter 7 details how educators can use AI to boost student differentiation and engagement through various strategies and tools.

Many of these opportunities are already present with the technologies as they stand now, and in the upcoming years, these will only further develop and present more ways for teachers to shift how they spend their time.

The Challenges

As educators begin to take advantage of these opportunities, it will remain essential to engage critically about how much we come to rely on these technologies. There are significant ethical and practical challenges that such drastic changes in our workflow and pedagogical tools will bring, and both students and teachers need to be able to think and act critically.

As students prepare to enter a world where AI is ubiquitous, whether in future educational stages, their careers, or their social lives, they will need to be able to analyze the ethical and social implications of various AI technologies. They will have to be able to navigate how and when to use the assistance of AI and define what integrity means for them and their peers. As democratic participation and dialogue change, students must be able to navigate misinformation, deepfake media, and tailored manipulation and propaganda. They will also need to think through what they produce and put out into the world and its consequences for the rest of society. Finally, they will have to critically evaluate the output of AI to spot and address biases and inaccuracies. Chapter 8 provides guidance on critical skills and dispositions students will need to develop in school to successfully navigate these challenges later in life.

Educators, too, will need to act carefully to ensure that introducing AI doesn't worsen existing problems in education. While AI has the potential to help us narrow the achievement gap, we need to ensure that our responses take advantage of it to do so rather than risk widening it. To do so, we will also need to make progress on closing the digital divide to ensure that AI's benefits are equitable. Finally, as more data and information is shared with AI companies and providers, educators need to be able to think through data privacy and security to ensure that students are not exploited for profit gains. Some initial thinking and background on these issues are covered in Chapter 9.

Given the nature of technological developments and AI specifically, teachers will need to focus on self-evaluating their skills and knowledge to navigate these challenges. While teachers do not have to become technical experts in machine learning, there are core skills and knowledge that will help them navigate the age of AI. They will also have to constantly remain in tune with new developments and progress and seek resources that help build on their practice. In fact, teachers can turn to AI itself for their own professional and personal development. All of these suggestions are built upon in Chapter 10.

Risks

One of the fears echoing from most industries is about the future of the workforce in the age of AI. Educators, however, will remain crucial players in helping prepare students for the future world. At the same time, the drastic increase in reliance on technology brings risks that we must balance.

While I have outlined how AI can enhance instruction, educators must balance technology and face-to-face interactions to maintain the essential human element in education. These interactions are critical for fostering empathy, social skills, and emotional intelligence. We

must continue to advocate for the importance of educators as human facilitators of knowledge and skill acquisition. Most of the book is devoted to helping teachers adapt to this role.

Educators must also be careful because an excessive focus on AI in the classroom may lead to an unhealthy dependence on technology, diminishing students' ability to think critically and solve problems without digital assistance. While just like the calculator and even the smartphone have changed what kinds of skills students need in order to function effectively in the world, higher-level skills are built on lower-level ones, and moving too quickly away from them can risk students who are unable to work independently. The strategies outlined in this book are designed to ensure that students continue to learn the fundamental skills necessary for the rest of their lives while still developing fluency with the tools and systems they will encounter throughout their lives.

These risks are not so great that we should avoid or fear the introduction of AI, but they are significant enough that they warrant thoughtful implementation and integration strategies. The following section offers a framework for thinking about how we integrate AI into our educational systems.

SUSTAINABLE AI INTEGRATION STRATEGIES

- What are the key components of successful AI integration?
- What are implementation strategies that will work long term?
- What are bridges to future implementation strategies?

It is not an easy task to integrate AI into our educational systems. While individual teachers and students across the country are already exploring ways to connect AI with their pedagogical and educational goals, a sustainable strategy will be necessary in order to avoid knee-jerk reactions that either risk exposing students to technology that isn't

ready for the classroom or leave them far behind their peers. While many of these strategies will be at the district and state level, teachers will likely have to adapt faster than these institutions work and play a crucial role in helping policymakers craft the right strategies.

Before starting to think about integrating AI into your classroom, it will be helpful to outline the goals, timelines, and purpose of doing so. This will create a vision from which you can choose how to evaluate tools, help you make curricular decisions, and guide your conversations with other stakeholders. Here are some questions you can ask yourself:

- What are my overall educational objectives for incorporating AI in the classroom?
  - What problems am I trying to solve?
  - What standards am I trying to meet?
  - What do I want my students to gain from the integration?
- What are important events around which I can plan my integration?
  - Are there semesters or quarters I can divide my plan into?
  - Are there particular units or chapters where I have more leeway to try new things?
  - How much time will I need to introduce the concepts or tools to my students?
- What am I trying to solve with AI integration?
  - Am I integrating so my students don't fall behind?
  - Am I integrating to better meet my already established pedagogical goals?
  - Am I integrating to make my life easier and allow me to focus on teaching?

    - Are there real-world skills I want to ensure my students gain from this experience?

Once you have your big-picture view, consider what outside support or involvement you'll need to make these goals a reality. Here are some questions to think about which stakeholders need to be involved and what role they have to play:

- What administrators' buy-in do you need? Are there district policies to navigate or change?
- What other teachers should you involve? Are they interdisciplinary connections you can make across departments?
- What is the sentiment from your students? Are they asking questions or already using AI?
- How involved is your parent population? What will their perception be?
- What level of training and support will you need from your district, and what will you be able to seek yourself?

Once you know what role others will play in your integration, it is time to consider the practical considerations of how you will go about your plan. You need to think through the details about tools, data, and implementation. Here are some questions to guide that:

- What specific tasks or responsibilities would I like to offload to AI?
    - Which tools can help me do those tasks closest in quality to how I would?
- What aspects of my students' learning journey can AI tools support or improve?
    - Which tools are built specifically for that?