APPENDIX A

EQUITY IN ARTIFICIAL INTELLIGENCE: BACKGROUND AND CONSIDERATIONS

By the end of this appendix, you will:

- Be able to define equity in the context of artificial intelligence
- Identify common challenges in mitigating bias and promoting equity with artificial intelligence
- Explore potential solutions and strategies for utilizing AI in your role

ISTE STANDARDS AND INDICATORS: GUIDING QUESTIONS

The following guiding questions can help you direct your thinking and lean into how you can use the ISTE Standards to drive positive change in your schools. These questions are designed to help you explore how the ISTE Standards can be implemented in your work. This appendix addresses the following ISTE Standards sections.

ISTE Coaching Standards

4.1.b Change Agent. Facilitate equitable use of digital learning tools and content that meet the needs of each learner.

Guiding questions:

- What measures can you take to make the AI tools that you use accessible to all learners, including those with learning challenges?
- How can you help educators and administrators be equipped with the skills and knowledge to use AI tools with your school community?

4.3.c Collaborator. Partner with educators to evaluate the efficacy of digital learning content and tools to inform procurement decisions and adoption.

Guiding questions:

- How are educators and administrators currently using AI?
- How can feedback from educators and administrators about the usability of the AI be collected and utilized?
- In what ways can the ongoing training and professional development be provided based on their feedback on the tool?

ISTE Education Leader Standards

3.1.b Equity and Citizenship Advocate. Ensure all students have access to the technology and connectivity necessary to participate in authentic and engaging learning opportunities.

Guiding questions:

- What is the current state of AI knowledge and access across your community?
- What are barriers and considerations you should take into account when implementing AI in your community?
- How can these barriers and considerations be identified, and what can you do to address them?

ISTE STANDARDS AND INDICATORS: GUIDING QUESTIONS (continued)

3.3.b Empowering Leader. Build the confidence and competency of educators to put the ISTE Student Standards and ISTE Educator Standards into practice.

Guiding questions:

- What professional development opportunities can be provided to faculty and staff to deepen their understanding of the ISTE standards alongside innovation in AI?
- How can school leaders and instructional coaches model best practices with AI usage alongside the ISTE standards?
- In what ways can school leaders communicate to the school community about how AI is being used?

3.5.a Connected Learner. Set goals to remain current on emerging technologies for learning, innovations in pedagogy and advancements in the learning sciences.

Guiding questions:

- As a school leader, how would you assess yourself on your awareness of emerging technologies such as AI?
- How can collaboration with educators and instructional coaches be fostered to share insights about AI in education, and how AI can be used in the classroom?
- What strategies can you implement to stay informed about the latest trends on AI in education?

In the modern classroom and school, artificial intelligence (AI) has emerged as a transformative force, reshaping traditional paradigms and offering innovative solutions to challenges in education. At the same time, AI brings with it questions surrounding how exactly it impacts educators, school leaders, and students; how to minimize potential biases related to AI; and how it can help with equitable learning. In this appendix, we'll take a look at the intersection of AI and education, exploring the myriad ways in which artificial intelligence is making waves in education and what you can do to begin to explore artificial intelligence in your role.

THE INTERSECTION OF AI AND EDUCATION

The roots of artificial intelligence reach back to the mid-20th century. Prior to 1949, computers could follow commands but not store them, and so they were used to automate simple tasks only. There was also the glaring financial problem that computers were extremely expensive and not readily available to consumers. Technological advancements from 1957 to 1974 helped artificial intelligence blossom: Computers could store commands and more data, plus they became faster. While still out of most consumers' reach, their accessibility grew as their cost dropped. Machine learning algorithms also improved, and programmers began to better understand which to apply when (Anyoha, 2017).

Today, our computers can do much more than word processing and media creation. AI-powered tools can now predict what we want to say and what we want to do, can assist with complex problem solving, and even plan out full-scale outlines and itineraries. The world of science-fiction seems closer than ever, but when you take a closer look at how most people actually use artificial intelligence, the results are a bit tamer than you might think. Many of the most common uses surround things like opening up a phone or computer with facial recognition, sending an email or a message to someone, interacting with voice assistants such as Amazon Alexa and Google Home, and digital banking (Marr, 2019). Just today, in fact, I logged into my computer using facial recognition, and then used speech-to-text to craft an email to a friend! On a day-to-day basis, AI helps us accomplish many of our routine tasks faster or more efficiently. For example, within the field of education AI can automate such common tasks as drafting email communication, compiling meeting notes, and creating lesson plans.

It can also be used for student assessments and leveraged by students for completing assignments, research, and exams, which raises questions for educators and school leaders.

For instance, how can we, as educators, model responsible use while integrating AI into our classrooms and preparing students for a world where artificial intelligence is becoming the standard rather than the outlier? How does AI impact crucial elements of education, such as the overall cost of implementing these platforms?

The waters of artificial intelligence are uncharted, and school leaders are often trying to navigate them without a clear map. In August 2023, the Center for Reinventing Public Education (CRPE) in conjunction with the Mary Lou Fulton Teachers College at Arizona State University held focus groups to discuss AI in education. Many school leaders and administrators who participated were very excited about AI, despite the concerns about artificial intelligence in the classroom and in schools and a desire for more guidance (Dunnigan & Richards, 2023). Discussing the focus group outcomes, Dunnigan & Richards pointed out, "At the time the focus groups were conducted, no state departments of education had offered any guidance to help districts navigate the new landscape" (2023). Additionally, some school leaders called on guidance from the tech industry to assist them with artificial intelligence implementation: "If you're one of those people who creates this fantastic tool, then you need to also help educate around it," one focus group participant said (Dunnigan & Richards, 2023). Perspectives from school leaders on AI are important because they set the tone for learning priorities, especially when it comes to equitable learning. While there is optimism surrounding artificial intelligence in schools, there is also concern and worry about what's next on the horizon—and about bias.

BIAS IN ARTIFICIAL INTELLIGENCE

To understand how bias relates to AI, you first need to know a bit about how an AI system, or *model*, is created. Sophisticated AI models, such as ChatGPT (openai.com/chatgpt), are built on algorithms that leverage *machine learning*, which means the model can analyze patterns in the data it receives, learn from them, and make predictions based on the patterns. The more input a model receives, the more it "learns" and the more accurate its predictions and responses will be. Before releasing an AI model, developers must *train* it by inputting a large amount of data (think of this as the computer equivalent of cramming for a test).

Unfortunately, bias can emerge at various stages of the AI development process, from data collection and preprocessing to model training and deployment. This is initially largely out of our hands; as educators and school leaders, we're the users, not the creators of these tools and technologies. However, understanding how bias relates to AI is crucial for ensuring

that the AI technologies that we want to implement and use are fair, are ethical, and do not perpetuate or amplify educational inequalities. Additionally, if an AI feature enables you to give actionable feedback (such as through a survey, a digital form, or email), please do give it. Feedback enhances the product and provides additional perspectives to the tool.

There are many biases in artificial intelligence within education, but I find three pop up the most often in conversations with school leaders and instructional coaches:

- **Data bias.** Bias often originates from the data used to train AI models. Remember that artificial intelligence is created from inputs. If historical data used for training contains inherent biases regarding concepts like race, gender, and identity, the model will learn and perpetuate those biases. Suppose, for example, a school administrator needs to hire a third-grade teacher and is using AI-based hiring software to sift through resumes. If the dataset used to train the underlying AI model is biased towards certain demographics, the software might exhibit gender or racial bias in predicting job suitability.
- **Algorithmic bias.** Have you ever looked up one item, such as shoes or laundry detergent, on the internet and then suddenly your entire social media feed is full of advertisements about shoes or laundry detergent? Algorithms within artificial intelligence work the same way; they're just based off of whatever is put into the creation engine. Remember, machine learning enables a model to analyze new input and refine its results based on the new data. Therefore, when you or anyone else uploads a document or types a request for information (called a *prompt*), bias can be introduced based on the choices made. The developer's selection of features (such as whether or not a tool, platform, or device may have accessibility features) and the complexity of the model that was created by the developer can all contribute to bias. This algorithmic bias can result in unfair or discriminatory outcomes, even if the initial training data from preliminary testing is unbiased.
- **Representation bias.** If the training data is not representative of the diverse population that the AI system will encounter, it can lead to representation bias. For instance, if a facial recognition system is trained predominantly on lighter skin tones, it may perform poorly for individuals with darker skin tones. As a Black woman, this has happened to me a fair share of times when trying to log in to my computer with facial recognition. Likewise, while working on a recent project, I wanted to use an AI art feature to create a picture of students learning, but all of the students looked the same: wavy blonde hair, light skin, and either blue or green eyes. Even when I typed additional information into the creation engine it still produced a similar image. I eventually decided to use another creation engine so that the picture would have the diversity that I wanted.

Even though bias exists in artificial intelligence, there are still many ways that you can use AI to enhance the education experience of students. It begins with equitable learning.

HOW AI HELPS WITH EQUITABLE LEARNING

Personalized learning, tailoring a student's education to meet their needs, has long been a key factor in being equity-forward. When you give students multiple opportunities to showcase their abilities and thrive, they tend to become more confident in their educational abilities, participate more in class, and have increased scores across assignments and assessments. AI has ushered in a new era of personalized learning, enabling educators to more accurately and quickly customize and provide activities and supports that meet the unique needs and abilities of each student.

AI-driven *adaptive learning platforms* now have the ability to leverage machine learning algorithms to analyze individual learning patterns and adapt content delivery in real-time. At the forefront of personalized education, these platforms analyze a student's interactions with learning materials in real-time, adjusting content delivery and difficulty levels based on their performance and comprehension. This dynamic adaptation ensures that students receive the right level of challenge and support, fostering a more engaged and effective learning experience.

For example, Reading Progress and Reading Coach (tinyurl.com/395kmntz) in Microsoft Teams can track a student's reading fluency and progress. WolframAlpha (wolframalpha.com) can help students solve complex math problems for everything from single-digit addition to complex calculus, and transformative performance tools like speech-to-text, ink-to-text, and Microsoft's Immersive Reader (tinyurl.com/yfeedymk) can assist students and increase accessibility in a variety of ways. This personalized approach not only enhances understanding, but also addresses gaps in knowledge, assisting in the belief that no student can be left behind.

You can use artificial intelligence and adaptive learning platforms in your classroom for equitable learning in many ways, including:

- **Tutoring/academic support.** AI-driven tutoring systems, such as the Duolingo chatbot (blog.duolingo.com/duolingo-max) for language learning, Thinkster Math (hellothinkster.com) for mathematics, and Khan Academy (khanacademy.org) for a variety of subjects, can offer real-time feedback and guidance to students.

Teachers can integrate these systems into their classrooms to supplement traditional instruction and provide additional support for students who may need extra help or challenges. Administrators and school leaders can use these tools to implement "challenges" within the school building to encourage faculty and staff professional development. One administrator I know, for example, instituted a Duolingo challenge in a school where many students were bilingual in Spanish; she encouraged the faculty and staff to spend five minutes per day on the app so that they could improve conversational Spanish with students and their families.

- **Automated grading.** AI in systems such as Microsoft Forms (tinyurl.com/2e2n6xue), Google Forms (google.com/forms), Mentimeter (mentimeter.com), SurveyMonkey (surveymonkey.com), Nearpod (nearpod.com), and more can streamline the grading process for assessments, quizzes, and assignments. Teachers can use automated grading tools to save time, allowing them to focus on providing more detailed feedback and addressing individual student needs. School leaders can also use automated feedback features for meetings, polling, and data collection.
- **Insights from classroom and school data.** AI analytics tools can analyze student performance data, helping teachers identify trends and patterns. By understanding each student's learning journey, teachers can make informed decisions on instructional strategies and interventions. This, in turn, can help administrators and school leaders identify where the school may need to allocate more academic and instructional support.
- **Lesson planning.** Programs like ChatGPT and Magic AI (magicai.ai) can help educators and school leaders assist with planning and preparation, especially with lesson plan creation. You can type a prompt, such as *create an 8th grade science lesson about the gas planets of the solar system*, and the platform will create a rudimentary outline for educators to follow. This significantly cuts down on time that a teacher may spend lesson lanning.

Beyond these four examples, I've seen colleagues experiment with many more ways to integrate into their classrooms and school communities. Don't be afraid to experiment yourself. Learning by trial and error can teach you a lot about how AI tools and platforms work and how they can be implemented.

For example, I recently used AI in a math activity with third grade students. The students were supposed to explain how they solved a simple single-digit multiplication problem (think 6x5 or 9x10). Typically, students would write out how they solved the math problem. This time, however, the teacher gave students the opportunity to utilize speech-to-text to explain. Later in the day, he told me that he had many students who were nervous to put a pencil to paper or even put their fingers to a keyboard in order to write out what they had done. Some of these students would take up to forty-five minutes to write a single sentence because they would get so frustrated with the writing process. When given the opportunity to use speech-to-text, on the other hand, the students thrived. They were able to speak directly into the device while AI software converted their explanation into text on the screen. The forty-five minutes of frustration now turned into five minutes of joy, and they were happy to share their problem-solving results with their classmates and teacher. This would not have been possible without AI capabilities.

AI empowers educators with valuable insights into individual student progress and learning behaviors. Through data analytics and predictive modeling, teachers can identify areas where students may be struggling, enabling timely intervention and targeted support. This data-driven approach enhances the teacher's ability to provide personalized guidance and facilitates a deeper understanding of each student's learning journey.

While the potential of AI in personalized learning does appear to be limitless, I'd be remiss if I didn't mention the challenges and ethical considerations that must be addressed from an equity perspective. Beyond the bias concerns mentioned above, we must strike the right balance between data collection and student privacy, ensure equal access to learning tools, and avoid reinforcing biases and faulty information. Schools and districts are constantly trying to navigate these challenges, to the point where some schools and districts have outright blocked artificial intelligence tools, such as ChatGPT and other tools from OpenAI, until they can get a handle on how they'd like to utilize them. If you, your school, your district, or your organization is using AI services, be sure to always check the generated results so that you can begin to mitigate these challenges.

A large question remains: How can you actually use artificial intelligence to create learning experiences for students, and what are the steps that you can take to make that happen? Next, we'll go into some strategies for using artificial intelligence to create equitable learning experiences.

TIPS FOR CREATING EQUITABLE LEARNING EXPERIENCES WITH AI

Creating equitable learning experiences with artificial intelligence does involve careful consideration of ethical principles, inclusivity, and addressing potential biases. Here are some tips that I've used with AI to promote equity in education:

- **Try the AI tool first, both as a school leader and also within your equity team.** This may go without saying, but it's important to try out an artificial intelligence tool that you are considering before you ask for others to implement it. This is a crucial step in your understanding of artificial intelligence and how it may work with your faculty, staff, and school community. Ensure that the data used to train the AI model is responsive and also representative of your student population.
- **Make it a point to implement a process and guidelines to monitor for bias.** Regularly monitor the AI systems you use for biases that may emerge over time, such as biases regarding student achievement, race, identity, and students who may have learning challenges. Implement mechanisms to identify and address any biases in algorithms, ensuring that the system's outcomes remain fair and equitable. Users, including educators and students, should understand how decisions are made by AI systems, because transparent systems are easier to audit for potential biases.
- **When you communicate about your AI tools with families and the school community, make the language transparent and explainable.** AI isn't exactly a new feature, but it can seem intimidating. When you're including AI in school and family communications, discuss the current communication strategies in place and how they may be updated regarding the implementation of AI in education (i.e., an "AI Tip of The Week" in newsletters to faculty and staff). Encourage your instructional leaders to reflect on how transparent and understandable information about AI systems is to various stakeholders, including students, parents, and educators (this isn't necessarily something to add to their plate, but something for them to consider and perhaps bring to PLC and school/district meetings). And, as always, if families or the school community has questions, explore ways to improve communication to build trust and understanding.

- **Guard student privacy at all times.** Implement robust privacy measures to protect student data. Clearly communicate how AI technologies will be used, and obtain informed consent from students and their parents or guardians. Prioritize security and compliance with relevant data protection regulations. Schools do this differently, but I recently saw a principal who used a very neat approach: The principal communicated to families that the possibility existed that students would be using AI search engines in class to begin projects, start research, and generate ideas for papers. The principal then provided three resources for families to learn more about AI and how it's being used in school: a link to an article about AI in education, a podcast link about AI, and a link to an AI search engine so that families could explore it themselves.
- **Be sure to include professional development opportunities for educators regarding artificial intelligence.** Whenever you add an artificial intelligence program or platform to your institution, it's important to provide educators with training on how to effectively integrate that tool into their teaching practices. Professional development will not only help them understand the technology, but also ensure that educators can leverage the technology to enhance learning experiences for their students.
- **If you're interested in regularly using artificial intelligence within your school's technology plan, make it a point to include that in regular evaluations and feedback.** Continuously evaluate the impact of AI on learning outcomes and gather feedback from both educators and students. Use this information to make iterative improvements to AI systems, addressing any challenges or disparities that arise.

USING AI RESPONSIBLY

The final piece of the puzzle for this chapter is identifying how to use AI responsibly. The best advice that I can give is that when we're thinking about using AI in school communities, it's imperative to exercise a "healthy skepticism." AI can do a lot of things that can enhance the learning experiences of students and also expedite our processes as educators and school leaders, but it still has its fair share of growth with regard to ethical implications and bias. Remember that AI is only a tool and, like all tools, can sometimes yield flawed results. As the tool's operator, or the one training others to use it, we each must hone our skills and

use AI responsibly. Encourage curiosity about what artificial intelligence is and curiosity about how artificial intelligence works. Here are some of my favorite ways to encourage using AI responsibly in education:

- **Whenever possible, highlight articles and case studies on AI successes and challenges.** Sometimes the best way to learn is from seeing how others have done it. When you can, present case studies that highlight both successful and problematic implementations of AI in education. Discuss instances where AI systems have been beneficial and situations where they may have led to unintended consequences or biases. I typically do this once per week.
- **With students, explore ethical dilemmas with AI in education.** Engage students in discussions about the ethical dilemmas associated with AI. Present real-world scenarios where ethical considerations are paramount, encouraging students to weigh the pros and cons of different approaches.
- **Make it a point to examine bias in AI.** Discuss the concept of bias in AI systems and how it can impact decision-making. Explore examples where AI algorithms have exhibited bias and the potential consequences. Help students understand the importance of mitigating bias in AI applications.
- **Encourage questions and collaborative answers.** Work to create a school culture that encourages students to ask questions about AI. Foster an environment where curiosity is valued, and students feel comfortable challenging assumptions and seeking clarification. After all, many of us are learning about this together!
- **Whenever possible, experiment with hands-on AI projects.** Last but not least, see what students can do using artificial intelligence! Engage students in hands-on projects that involve creating or interacting with AI systems. Encourage them to reflect on the ethical considerations and potential biases in their projects, fostering awareness and esponsibility.

While a lot is uncertain at this writing, I'm very hopeful for the future. As the field of artificial intelligence continues to evolve, educators, policymakers, and technology developers must collaborate to ensure that AI is harnessed responsibly, fostering an inclusive and equitable educational landscape that prepares students for success in an increasingly complex and diverse world.

RESOURCES FOR FURTHER EXPLORATION

If you'd like to dive deeper into the topics covered in this chapter, scan the QR codes for the resources listed in Table A.1.

TABLE A.1

Appendix A Resources for Further Exploration

RESOURCE	DESCRIPTION	ACCESS
"The History of Artificial Intelligence"	For those who are curious about the history of artificial intelligence and computing, this article gives insight into how far we have come regarding AI as a whole and also how this progress has the potential to impact education.	TINYURL.COM/ 2T7DV2ZK
"'Just Slow It All Down': School Leaders Want Guidance on AI, New Research Finds"	From a school leadership perspective, these research findings offer insight as to how administrators view AI in schools and classrooms.	TINYURL.COM/ 3JVPVKBT
NCDPI Releases Guidance on the Use of Artificial Intelligence in Schools	Recently, the North Carolina Department of Public Instruction (NCDPI) released a guidebook for the use of generative artificial intelligence in public schools. This press release offers perspective on, and a link to, that guidebook.	TINYURL.COM/ MRFWUPMH
Shapiro Administration and OpenAI Launch First-in-the-Nation Generative AI Pilot for Commonwealth Employees	In the state of Pennsylvania, the Shapiro Administration has taken a step to utilize generative AI in state government employee operations (including education!), demonstrating an employee-centered approach that balances innovation with safety, security, and privacy.	TINYURL.COM/ YHXMEU67

APPENDIX A KEY POINTS

Here are the important takeaways from the chapter, paired with the ISTE Coaching and Education Leader Standards that inform them.

- When you're working with faculty, staff, and other members of school leadership, be sure to define AI and also highlight its potential transformative impacts on teaching and learning. (Empowering Leader 3.3.b; Collaborator 4.3.c)
- Be cognizant of bias in AI and how it can impact teaching and learning. Whenever a response is given by an AI tool, encourage your school community to always double-check the response and vet the source. (Equity and Citizenship Advocate 3.1.b; Collaborator 4.3.c)
- Remember that it's okay to start small regarding implementing AI, and it's always a good idea to try out the tools for yourself first before utilizing them with your school community. (Connected Leader 3.5.a; Change Agent 4.1.b)
- Continue learning about AI in education via your professional learning community, blogs, articles, podcasts, and more. (Empowering Leader 3.3.b; Connected Leader 3.5.a; Change Agent 4.1.b)

QUESTIONS FOR REFLECTION

After reading Appendix A, take some time to consider how its ideas apply within your context using the questions below.

- How aware are we of AI bias, and how could we make our school community more aware of the challenges of AI alongside its positives?
- In what ways may AI impact our student data? How will we address this?
- How do we ensure transparent communication about AI use?
- What professional development can we utilize to ensure that faculty and staff are properly trained on how to use AI in their roles?

Share your reflections and thoughts online using the hashtag #EdTechJourney.