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Adapting to AI in Education: Strategies for Teachers

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A B S T R A C T
This paper investigates contemporary trends in 21st-century teaching with a focus on the concept of social branding in the educational context. As educators navigate digital transformation, the role of personal and institutional branding becomes increasingly significant. The article examines how digital literacy, social media engagement, and professional self-presentation influence teaching practices and student engagement. Through a critical lens, the author explores how modern teachers can build a positive online presence, foster educational communities, and align their identity with evolving pedagogical expectations. The paper also addresses challenges such as digital burnout, ethical dilemmas, and the risks of performative professionalism

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INTRODUCTION

Generative artificial intelligence (GenAI) tools, such as ChatGPT, are growing ubiquitous in education; teachers and students alike are grappling with how best to navigate them. These generative large language models (LLMs) and their capacities are clearly increasing student interest and engagement. Many educators are seeking ways to augment their lessons with generative AI tools, while tracking the developing evidence and adjusting their paths as LLMs appear to evolve simultaneously. Conversely, other educators are concerned about academic misconduct and student complacency, especially related to writing. These fears are compounded by generative AI tools' unique abilities to summarize and distill assignments (Ferreira Mello et al., 2023). Evaluate and improving assessment types, task phrasing, and personalizing assignments are some solutions educators have suggested. While these approaches may be effective, they exhibit significant short-lived or conditional advantages, and tweaking human-created assessment types alone is insufficient. On the whole, generative AI tools possess a multitude of advantages. Adaptive learning experiences tailored to each student's unique needs and abilities can be accepted and produced, offering unmatched opportunities to increase learning via diverse pedagogical methods (Mollick & Mollick, 2023). Generative AI has applications in education beyond AI-assisted learning. Additionally, instructors possess unique expertise, experiences, and capabilities that can be leveraged in effective teaching. Generative AI-driven knowledge and capabilities afford many avenues to improve pedagogy and enhance learning. This vast array of possibilities is all the more valuable given the exclusive cumulation of generative AI tools and human instruction. Other avenues are still actively explored and undergirded with putative applications of generative AI in education. It is worth noting that generative AI possesses capabilities yet unknown to

humans—modes of thought and intuition that cannot be extracted or expressed—and its limits are also unknown. While tools and products persistently improving, discovering, or emerging, a time when generative AI tools will fail to surprise or confound is implausible. Many risks are apparent and carry both known and unknown consequences that require careful navigation. Some responses may produce fabricated information or contain glaring errors, and output quality can be unreliable, with no assurance that output conforms to syntactical density, grammatical correctness, or syntactic acceptability.

2. The Role of AI in Modern Teaching

Rapid technological advancements are transforming education, resulting in a paradigm shift in human learning and teaching. Intelligent systems play a critical role in a future education paradigm where learning occurs in context, customized to human needs, information and knowledge are dynamically organized, and profound learning experiences are delivered along with evidence (R. Kshirsagar et al., 2022). An effective intelligent education system provides timely, adaptive, personalized training and assessment to teachers and learners. A deep understanding of human conceptual attainment and associated teaching and learning processes is foundational to intelligent education. A broad range of strategies applicable in AI systems include the generation of assessment methods for learning, assessment or course design; analysis and suggestion of learning pathways, learning activities, or resource recommendations; active learning and data gathering based on machine learning; and deep mining and interpretation of learning or teaching data.

In an AI education system, various components are required to implement strategies for each teaching and learning function. Faculty members and researchers from multiple disciplines are involved in building components of an intelligent education system. While each area is important, a learner model is the foundation of a successful intelligent education system and represents one of the most challenging components. Learner models are increasingly included in educational technology systems and applications, forming part of the so-called intelligent systems. They are expected to provide support for what learners do and know in their interactions with the system. A learner model is a systematic description of regarded learner variables, which help in providing tailor-made educational services to improve a learner's learning performance, promote a learner's awareness, allow efficient interaction, and support learning personalization. Even though there is an increasing need for this opportunity in the education sector, the concept of a learner model has only been partially adopted, if not simply ignored.

3. Benefits of Integrating AI in the Classroom

Despite the fact that Artificial intelligence (AI) is increasingly being used in schools and elsewhere, there has still been a rapid acceleration in its usage for pedagogical purposes since functionality was made free to the general public in late 2022. Since the unexpected rise to prominence amid this widespread adoption of AI technologies, schools have reacted in a variety of ways that reveal a wide range of attitudes toward this incredible digital technology and its educational potential.

Many educators still believe that the use of AI in education is spiraling out of control, with rampant cheating in writing assignments by asking to generate essays, poems, and other texts. Others feel completely helpless to try to control this change in how students can engage with text as a result of the democratization of AI literacy in recent months. Schools and districts are instituting bans on the use of AI tools in the classroom. Some argue that schools should better focus their resources on developing an understanding of the AI tool and its implications, as opposed to trying to ban a technology that has become omnipresent in life outside of school and its role in society at large. Others see great potential in the adoption of AI tools in the classroom and have even begun applying them productively in their own teaching. Furthermore, some educators have critically engaged in helping to explain the limitations of the technology while still providing examples of ways that schools might build products that increase student agency in using the technology as a curricular topic instead of one to be avoided altogether.

AI-based programs can “turn any text into a quiz” by allowing a user to input any text. It will pair a generated multiple-choice question with text selections with those text selections as answer options to test

for understanding. A couple of these programs will accept input, and some go as far as aggregating offerings from multiple vendors and provide teachers with curated collections of quizzes based on the text domain they are teaching around. Data analytics allow education companies to capture student information and analyze whether, for example, the question of a quiz was too difficult or whether students were or not satisfied with a specific learning resource. AI systems can use data to identify those aspects of learning that are critical for individual students.

3.1. Personalized Learning Experiences

The advent of Generative AI (GenAI) in education—particularly in personalized learning—represents a significant leap forward in addressing the unique needs, learning styles, and pace of individual students. GenAI promises a more tailored educational experience that can offer a significantly broader set of knowledge and applications than traditional educational settings.

A major benefit of GenAI in personalized learning stems from its ability to create adaptive learning paths. GenAI can analyze individual student performance and preferences, dynamically adjusting its content and resources to suit each learner's unique requirements. Such adaptability not only caters to students' diverse needs but also promotes a more effective learning experience. This is vital in today's complicated and time-constrained learning environment. The educational task each student faces has become increasingly multi-faceted over the years. The number of tasks assigned to a single student in a learning environment easily multiplies as GenAI offers vast knowledge and applications. Overall, this benefit can create personalized opportunities to offer the content and resources that suit the learning preferences of each learner rather than a one-size-fits-all approach.

Another significant advantage of GenAI-driven personalized learning is the heightened level of student engagement it fosters and the potentially broader scope of knowledge and applications. GenAI tools can ignite while offering educational content that aligns with students' interests and proficiency levels rather than providing rigid national standards that often disregard ethical, cultural, and social considerations. This facet questions the flexibility and adaptability of AI-based tools, especially in balancing universal humanitarian concepts and culturally specific topics. Moreover, in times of diversity, AI-embedded tools can potentially exclude marginalized cultures from standardized machine learning algorithms for generating personalized experiences (E. August & Tsaima, 2021).

Additionally, GenAI enhances accessibility in education across cultures, yet education nowadays tackles non-binary situations (Karpouzis et al., 2024). Several global companies offer AI-based tools for making educational content available to people with abnormal hearing or vision.

3.2. Enhanced Administrative Efficiency

Education institutions are using Artificial Intelligence (AI) in higher education to improve the academic performance of students. The objective of the institution is to improve learning through administrative enhancement, academic enhancement, and student engagement enhancement. Students should be engaged in programs like seminars and talks to help them manage stress. Smart automated system bots constantly monitor the students and teachers, sending feedback of low engagement to administrative heads. The authentication of devices is possible through face recognition systems. Chatbots installed in web and mobile apps understand human language and resolve problems of students and instructors.

AI-driven learning analytics proactively identify student trends and help instructors design efficient curriculums. Instructors can track the data of students accessing material and submit attendance online with this tool without installing hardware or software on their devices. They can analyze which parts of the material are key learning areas for students. Teachers can also see the number of customers the material with the below expectations met and can send reminders regarding such papers for attendance illogical. In this academic year, the institution had used online examination through various tools. The examination system identifies the students through screen browsing, screen blocking, and other settings. Any unlawful activity of students can be logged and sent to the examination controllers graphically. Parents and institute

heads will observe the participation of their children in the academic programs through cognitive learning skill analysis program.

4. Challenges of AI Adoption for Teachers

AIEd adoption will be challenging, requiring careful planning, evaluation of the trade-offs, and paving smooth transitions for a large number of actors. Questions remain regarding what is and is not possible with AIEd. How will the status quo and future vision differ, and what will the emergent ontology of AI and learning look like? Tools and features with high efficacy are predicted, but developing educational tools driven by data science and able to compete with large tech firms and replicate learning capabilities of humans involving time-series predictions present hurdles. Existing AIEd systems suggest building block technologies or large back-end AIEd systems with bespoke integrations, though non-essential technologies at present cannot predict results in an emergent industry. AIEd can be built via bottom-up co-design, where teachers and learners collaborate, but this requires co-design skills and knowledge that need to be improved or adapted. Given current funding schemas, no external incentives exist to begin.

Promoters posit a rapid transformation of education possibly towards large well-evidenced AIEd systems. Class definitions and parameters for success covering competence measures and teaching approaches present confusion or lack clarity. Since education is a societal system, large-scale transformation will likely be non-linear, timelocking idiosyncratic trajectories. Creativity and exploratory behavior with respect to imagination have largely been neglected. Concepts envision opportunities for a contingent scenario, typically focusing on simplistic rules about what gets funding. AIEd and its ramifications can reach previously neglected enrichments for teaching and learning that intuition and common sense deem impossible. Studies suggest the need for framework models incorporating reasonable decision heuristics that are simple top-down objectives. AI replacing the basic educational function via AIEd tools, with radically higher student–teacher ratios feasible in an impact-maximizing exploitation phase, augmenting the current student–teacher ratio via a military-scholar model, and niche applications were considered.

4.1. Resistance to Change

AI within education is met with resistance that often prescribes policies and dictates consequences. In a survey of teachers, barriers to using adaptive educational technologies included lack of training, lack of access, and systems that were not user-friendly or satisfying (Schiff, 2021). While some technologies expand teachers' reach or capabilities, others are imposed by impact-driven imperatives focused more on testing than on student learning. Teachers actively constructing their own teaching approaches and related values are a crucial part of a professional educational community. But unless they find, shape, and co-create a community of practice, chances are they will encounter frustrations, constraints, technophobia, and resistance. All in turn rob much of the genuine excitement, curiosity, and possibility that the innovations may hold.

AI within education is also met with an embrace that sometimes treats AI the same as other technologies by celebrating prescriptions and promises. To many beatified evangelists, questions about intrusiveness and custodianship then seem out of place. People watch them scrutinizing AI's every thought and utterance before allowing it into their own classrooms. Institutional responses include new programs for knowledge engineering and collecting student data or discourse. Teachers are granted insider access to new machines matched only by the prominence of their voices as critics, more or less aligned with their programs. Ignoring the enormous instances of previous machinery in many educational settings, people exalt AI as a big bang, and as new. Dreams of personalization, adaptability, extensibility, interactivity, playfulness, engagement, access, correction, and motivation, so long cherished in education, will be revived, reinvented, repackaged, and redeployed. Conversely, teachers are cast as ancients or Luddites, shrugging off the new for the old. At the same time, they are chastised for not waking up, getting on with it, or figuring it out.

AI within education is met with a mix of resistance and embrace. Embraces that celebrate the potential of AI education can often prescribe predetermined claims, policies, and consequences on how to address the

challenges AI brings. In turn, resisters are accused of technophobia and worse. Changes wrought by AI suggest the need for widespread rethinking about what is valued within teaching and learning, how those values manifest in practice, and the institutional conditions and structures that engender those practices. Those harboring the rarest of a network of constructive optimism by navigating the terrain of prefigurements, the social institutions of education AI devices, and their impostures—testable machines cannot guide, feedback cannot communicate, programming cannot adapt, and illiteracy cannot teach—concur.

4.2. Training and Professional Development Needs

Despite significant technological advancements, Pyongyang's education system remains entrenched in conventional and traditional methods, grounded in moral and ideological education. Per pupil expenditure is nearly twice that of South Korea, yet practically non-existent outcomes have led many to theorize about Pyongyang's ability to employ deceptive technology in its communications with outside states and regimes. This post reviews existing educational research and its limitations, and paths forward for the study of North Korean education. These limitations are exacerbated by the use of behaviorist and cognitive approaches long discredited in the global education research community. Moreover, the inability to obtain access to schooling environments or unwitting informants due to ideological circumscription limits the capacity to study educational practices in North Korea. All of these obstacles limit knowledge of the organization, curriculum, pedagogy, architecture, administration, stresses, aspirations, and consequences of the education system in North Korea. To remedy this situation, there needs to be a renewed focus on the study of North Korean education beyond the ideological obfuscation of the state. Research output entirely mediated through interpersonal relations with defectors provides the greatest insights on schools and pedagogy, but must be bolstered in the future with further in depth engagements with good quality defectors. Beyond pedagogy, a key necessity is the acquisition of data on the characteristics of classrooms, architecture, curricula and teacher education programs, which might be achieved by analyzing archival materials and comparative discussions with defectors in multiple timeframes (Aliabadi et al., 2023).

5. Strategies for Teachers to Embrace AI

As much as AI is about new technology and approaches, it is also about learning from the past. All educators have experience with disruptive technologies from the introduction of the photocopier, to the digital calculator, to Google. The steps taken with these earlier technologies can inform the path ahead with generative AI.

The first and most important lesson is to not panic. Take time to learn how the technology works, how it can be useful, and how it can be abused. Consider designing assignments that take advantage of the best possibilities and avoid, minimize or disclose the worst (Mollick & Mollick, 2023). As a general rule, giving thoughtful assignments can deter the worst abuses in many contexts, including generative AI.

The second lesson is to collaborate. Building community is crucial in dealing with anything new, especially with something this disruptive. Individual approaches and understandings can vary widely, and competition among educators can be detrimental to teaching and learning. Shared effort gives strength and offers an opportunity to learn. Working together creates a connection between the people and the technology, which makes the effort easier.

The third lesson is to be transparent about AI use and abuse. The best answers will come from teaching students to think about generative AI while making these approaches transparent and widely known. Educators should highlight specific approaches that avoid abusive outputs and activate interesting creativity. Share work to make society and participants better with as few downsides as possible.

5.1. Continuous Learning and Adaptation

Teaching with AI will require sustained effort and innovation, and not just the addition of AI examples to current curricula (Mollick & Mollick, 2023). The solution ultimately lies in continual learning and adaptation. The conversation will remain fluid, so continued learning will be required. All stakeholders will

need to play a proactive role in understanding how the technology is currently being used by students as they make attempts at integration. Teachers will need to develop their own fluency and confidence with AI tools, using them creatively and constructively, in order to develop their pedagogy around them. Teachers will also need to understand current students' prodigy with AI, as they often are far more capable and aware of possibilities than teachers expect. Exposure to students' use can spotlight effective, innovative examples to follow or critique, lessons learned or muscle memory that can be drawn on for new experiences with AI tools. Input from students can also help teachers gauge the word's landscape, and share what works and what doesn't regarding student agency and agency around their assignments, as well as addressing 'how well' tools are designed for wider use.

Teachers can participate in learning communities, such as training sessions or informal gatherings with like-minded faculty. This space may be explored creatively, drawing on topics from early experimental uses to classroom lessons in beginner programming. Teachers should proactively seek an audience for the practices they are developing and work to codify and share them with others, stretching or reinventing a training format or schedule as appropriate. The 'how to' around new AI-assisted pedagogy may very well be learned from others, meaning even newly-connected examples may become a platform to build off of. With an ever-evolving landscape, this work can be seen as creative and experimental, delivered in rapid iteratives – shorter or more frequent sessions – in order to keep pace with fluid changes.

Addressing initial concerns with AI may build awareness on the part of teachers and help focalize immediate areas for effort and engagement, opening up options for positive pedagogical engagement with the tools. One early core of learning may be a smorgasbord session on possibilities AI offers for students – from algorithmically-generated tutoring programs to AI warm-ups, brainstorming partners and co-researchers. Each form of assignment can be introduced and simulated, with a few framing guide ideas explored for ensuring engagement with AI produces meaningful end products. This will provide a broad language for further exploration, and capture one opportunity for AI to be used positively in education. By participating in the learning with students, teachers can assess the efficacy of framing prompts and refine guide examples. Any discomfort, questions, opportunities for exploration and engagement that arise are also valuable.

5.2. Collaboration with Tech Experts

Educators must assess and stay abreast of emerging technologies and AI-informed educational paradigms, many of which demand the incorporation of specific knowledge and skills into primary and secondary education. Awareness of new practices and how they relate to the curricula of classes, grades, or subjects that they teach is typical of in-the-know educators. Partnerships with the tech-savvy for student comfort and empowerment may deter teachers from becoming fully informed about systems students encounter and utilize, abandoning any system of checks and balances (Van Brummelen & Lin, 2020). Tech companies ignore personal, societal, and ethical impacts, believing need defines difficulty in human–machine interaction. Educators, parents, guardians, and trusted adults must provide feedback when systems cause concern. Effective AI-informed education, technical, ethical, or philosophical, requires standards and horizontal models of cooperation among a multitude of specialists. Parents, guardians, and trusted adults must be informed of subjects, materials, and systems students encounter and engage with, which they often are not.

Education policy regarding AI-informed education must accommodate not only standards and best practices but also education technologies envisioned in accordance with society's values. Competition among algorithms seeking effectiveness, efficiency, and economy must not be permitted, for AI user rights would be sidelined. AI could impede learning by offering overly enticing diversions or disinformation leading to social isolation, weaponization, manipulation, or humanitarian misery. Late or ineffective intervention could cause irreversible harm to generations of users. In lieu of vigilance and advocacy, potential shapers of AI's role in society may emerge at the scale and speed of technology itself, accelerating, coercively,

catastrophically, or chaotically. Precognitive computer- or tool-driven "solutions" could cause harm for purely technical reasons, while conduct in the light of day with full participation could at least ensure values such as human rights, equity, dignity, accountability, transparency, explainability, safety, privacy, and non-manipulation. Humankind adequately—if belatedly—percepted and dealt with similar worlds that, albeit less elaborate than those in existence today, would be described entirely differently. It will be too late when the current digital "revolutions" resemble previous industrial ones, rendering dialogue infeasible and retribution of sociocultural irreparability futile.

6. AI Tools and Technologies for Educators

Artificial Intelligence (AI) holds much promise for faculty. AI tools can give feedback on assignments to create spaces for active learning, facilitate students in group projects, identify struggling students, and make drafting easier, among many other potential uses. However, AI technologies also come with challenges. AI tools can say incorrect things, be unexpectedly absurd, generate impossible output, tell students not to use them, and give unhelpful directions. Understanding how and when to use AI effectively—as well as advocating for responsible practices—is now a vital component of innovative teaching in higher education. Below are both AI tools useful for faculty as well as prompts to operate them effectively. First the tools, followed by their effective use.

Tool Breakdown: The following is a list of specific tools that may be worth exploring. These tools are organized by whether they work at the course-level, assignment-level, or as a supportive tool.

Course-Level Tools: Fathom: Identify which students are falling behind and receive support for those students. Eduflow: A platform for building adaptive, multi-stage assignments to facilitate peer evaluation. Otter AI: Transcribe interviews, discussions, and lectures. Calm: Generate relaxing music for use in class or study. Generate a entry in answer to a question.

Assignment-Level Tools: A chat interface for conversing with a large language model. Use AI to generate bits of a code or even entire programs. Program a live-coding music performance. Automatically evaluate handwriting. A suite of educational tools, now powered by AI.

Supporting Tools: Co-create marketing pieces and videos with AI. Create images by describing them with words. Generate videos based on description. Automate literature reviews.

6.1. Learning Management Systems

The way people learn and use different approaches in classrooms that work for many people today may be very different and not effective for them when AI becomes the teacher. AI with advanced general knowledge may communicate with children on the level of understanding appropriate to them and promote learning using traditional channels and individual methods. Importantly, this AI dialogue can go on indefinitely, as AI will remain a scholarly productive novelty with almost infinite data storage capabilities and consulting possibilities. Nevertheless, this system will respond only to a question posed, will be a State Servant with the same personality, and will act in accordance with the law without any comments. Learning Management Systems effectively build educational ecosystems comprising many users, primarily independent actors. Dynamics of correct man-to-man learning and knowledge-building engineering approaches like prolonged timed examinations may become threatened and inefficient. In addition, this system will be a mere entity with the same availability to students as to teachers or scientists. Questions remain as to how already basic technological platforms designed for this have to be enhanced, what developments are to be expected, and which disruptions will appear in the world view and education (Mollick & Mollick, 2023). Current state-of-the-art solutions providing multilingual bespoke smart online assessment systems to be customized by each community are easily deployable for individual or local use. These models only require at least one minimum data-driven good teacher model to start up and subsequently develop. Applications using free resources for linguistics provide the technological basis for smart, comprehensive, available, and independently working Assessment-as-a-Service Delivery Platforms. These services could be enhanced by adding emotional detection and correction modules because ethics-

consistent and compliant web-camera-based smart emotional state monitors are already commercially available (Gorshenin, 2018). It is expected that innovative Educational Platforms will broaden their horizons, add rich extra-educational opportunities, and form as soon as there is one good teacher on one side and a population in need of training on the other side because education is a necessary and profitable industry worldwide.

6.2. AI-Powered Tutoring Systems

Tutoring is a powerful mode of instruction that can significantly improve learning outcomes for students. When used effectively—small group sizes, a high number of hours, and attention to various aspects of the learning experience—tutoring has sizeable evidence for efficacy (Mollick & Mollick, 2023). AI has long been seen as a possible substitute for tutoring; however, previous attempts have not yielded an intelligent system or experience that matches the capabilities of either human tutors or even basic tutoring knowledge graphs. This contrasts with the broader success of AI in modeling and generating human-like text, images, and more. Nonetheless, there are at least eight avenues such AI might take in allowing for student learning. The simplest use of an LLM is as a supplement for simple questions and answers. A student training for a big test or needing clarification about a particular topic might benefit from a knowledge graph of forms that would otherwise be collected from various educational sites and materials. Yet, even this simple use requires appropriate expertise in building queries to test the learner's knowledge. Even so, this knowledge graphical use of AI is immediately usable for test creation, making quizzes and games with randomized questions using standard question formats. This type of deepening knowledge format allows for quick student assessment on knowledge comprehension and retention.

One potent use for LLMs to help students learn is to act as an AI tutor, teacher, or even mentor. This response would invoke longer prompts resembling a syllabus rather than traditional prompt-response setups. AI, especially LLMs, is highly adaptable to such instructions. Immediate eye-grabbing opportunities arise about how to construct prompts and systems to difference between "ask a question" and "tell a story." This type of tutoring has risks, particularly confabulations and incorrect answers. Nevertheless, the interest in AI tutoring looks at how this can be addressed. Compared to other educational software, LLMs might embody the greatest potential as entirely new systems for educational instruction. Accordingly, interrogation into how this might work at the general types of real-time interactions is discussed, along with modulations around AI's role in teaching, including how to increase success rates in usage.

6.3. Assessment and Feedback Tools

Generative AI (GenAI) tools can assist students with fully or semi-automated assessments. The introduction of GenAI tools makes the challenging and interesting task of assessment design more complex. In this stage of assessment design, strategies have been suggested to craft an evaluation that maintains academic integrity and does not undermine learning outcomes. The first strategy is to identify competencies, where the competencies are described either as subject-based knowledge, skills, and abilities, general skills cultivated through the assessment, or a mix of these two categories. GenAI may be used to evidence any competency specified in assessment design by prompting clarifying questions to detail the competencies and gather examples. Concerns raised around the use of rug-pulling prompts in the evaluation can be addressed by targeting alternative task types that facilitate establishing knowledge, skill, and ability (KSA) tests (Kadel et al., 2024).

The second strategy is to document guidelines for task performance, where guidance notes are commonly shared with students to foster transparency in assessment design. Documentation should be precise, unambiguous, and clear rather than vague, misleading, or incomprehensible to improve assessment quality. A GenAI tool can assist note-taking, text simplification, or even mainstreaming the documentation. On the concern of difficult tasks being incorporated into grading criteria leading to confusion, considerations concerning clarity and transparency are possible, such as guiding general and quick high-level overviews for important instructions to detect unclear or vague wording. The third strategy is to determine criteria to

assess proficiency, which often cover general characteristics of outputs, task completion, task performance, language or structure, and originality (D Lindsay et al., 2023).

Criteria could also be mapped into detailed descriptors of the quality of each criterion that specify what good or poor performance looks like. A GenAI tool can help format the table, brainstorm, and collect exemplary and counterexamples of templates. There are concerns around biases in generation, such as inaccurate competency or ambiguous descriptors. These could be addressed by devising and refining the criteria and descriptors with educators and diverse students, cross-checking with discipline information and standards, and decluttering descriptors with systematic phrasing. The last strategy is business continuity, where it is common for educators to consider peer assessment or moderation when delegating grading responsibilities due to time constraints.

7. Case Studies of Successful AI Integration

The following several pedagogical approaches may promote learning and mitigate AI misuse. These primarily align with research on the expanding role of technology in education, adapted here to this novel pedagogical frontier.

Assignment framing can minimize AI use. Questions inviting simple summaries or combinations of text will easily be answered by even rudimentary bots. Framing more reflective questions can discourage AI misuse. For example, a calculus assignment may read, "Show me how to derive this function and teach a class on this subject to a group of second-year students," calling for an explanation but warning against the use of chatbots or copy-pasting. Similarly, framing assignment thinking as collaboration mitigates risk. A political science assignment may read, "You are a junior analyst at a think tank. You're tasked with writing a memo about the differing geopolitical perspectives of Russia and China, which you know little about. You meet with a senior analyst to discuss this. What do you ask?" Notably, this framing calls for text generation, while requiring students to engage with the chat and reject AI-produced output.

Tailoring assignments to students' knowledge can significantly improve the prospect of learning. AI query generation is limited by context length, but students beyond rudimentary understanding can generate thoughtful and nuanced prompts, resulting in much more engaging responses. Furthermore, tailoring to individual students loosens assessment constraints. An assignment on stoichiometry may provide the same chemical reaction but vary contexts and point estimates. While different, improvement could indicate learning transfer. Tailoring also elicits two forms of formative assessment. One anticipates the generation of flawed input/output, while the other can automatically track iterated prompts up to submission.

To maximize learning, incorporate novel multimedia education. Videos can explain fundamental concepts in multiple derivatives, integrating information-rich and somewhat passive learning. Genres with short required inputs of thought will produce generative learning and engagement with machinery. Simply recording video calls with chatbots is less pedagogically effective; the video should include guidance and thinking for the target audience. However, education on nuance-preserving distance requires real-time audio processing. Newly available text-to-audio models can assist teacher-assisted rules covering differences in genre interpretation for students to apply automatically in assignment production.

Long-form synthesis has become an academic pain point, since the absence of created text lowers driver autonomy. One possible solution is marking attending conversations, but these are textual. In the rush to teach AI use, maelstroms may have emerged. Further, pedagogy must acknowledge rapid development in models. What works today may not tomorrow, as seen with declining performance. Hence, preparation must draw on pedagogical intuition about thoughtful tasks and output limits. Fluid writing systems are challenging, as are standards assuring an expectation of behavior language.

7.1. Elementary Education

The initial post invites teachers to share experiences using AI with young students and asks for responses to several specific questions. The activity provides an opportunity to use AI with young learners and recognizes the significant importance of this topic. The prompt suggests a purposeful selection of questions

that would be particularly relevant at the elementary level.

Utilizing AI in elementary classrooms is not easy as most students are still learning print and digital literacy, but it is necessary due to its rapid takeover. In just one year, elementary students have moved from learning simple narrative writing to those with multiple characters, multiple perspectives, and varying interest levels. Too much noise is being made about students, and not enough time is being spent to teach educators how to use AI appropriately. Additionally, AI can help someone with more advanced knowledge than the current instructor, accelerating their learning.

In this case, educators should introduce students to safe and responsible AI use on a computer. For example, younger children can pair up with an AI assistant as a virtual buddy guide to a new part of their community. Relevant questions to help educators in this endeavor include: What has been effective so far, and what hasn't? Are there pockets of AI use you can share? Are there examples of content explicitly noting AI integration? Are there any relevant artifacts on a general forum? Are there potential large group items in an AI comment folder or future central resource repository?

7.2. Higher Education

In classrooms, Artificial Intelligence (AI) can take many forms. To start, AI can serve as a tutor to provide learning services to students. Educational institutions often have classes with large student bodies, making it impossible for teachers to devote sufficient attention to each individual. As a result, many students are left behind or left to fend for themselves when having difficulties in courses. AI-based tutors can fill the attendant needs for downward scalability and on-demand tutoring. Such systems empower students to connect with tutors when needed, whether at 2:00 p.m. or 2:00 a.m. Students can also customize the tutors according to their needs of pace, time, and space. It would be difficult for a person from India to understand the English of a tutor from America. Ideally, there can be a translator agent, but it cannot produce real-time explanations of a random student's questions in a random language. With AI-based educational systems, the tutors can be multilingual and explain queries appropriately in the students' choice of language (Hemachandran et al., 2022). A few people are slow at grasping things. A normal paced tutor can be a reason for their failure. AI-based educational systems can embed features to reduce the pace of the tutor to understand things properly.

In a blended learning model, though teachers force students to go through pre-required courses, it is likely that working individuals will not be able to take the classes ahead of schedule. AI agents can monitor the learning status of the students and customize the lectures according to the language requirements of the individuals, such as to be text-based, voice-based, or GDS parameter-based, and provide necessary notifications. The benefit of having AI-based educational systems is immediate doubt clarification. Teachers may be busy or distracted, waiting for the session to resume to address students' doubts; confusion will exist despite students' patience. With AI-based educational systems, the students can be provided with active agents to question open agents, and they would get the answers immediately. Even though the virtual agent may not get the correct answer, the confidence of the knowledge can be stated in a very polite way. With no emotions being driven, there will be no bias-ness in the education system that would drive students to work hard.

7.3. Special Education

The inability to specify either what success looks like or this alignment between success and input is particularly crucial to understanding the profound difference between drafting and editing. The two modalities are only loosely aligned. Would-be drafters lose what they want to say and how to shape it in painstakingly trying to write it down. Editors, however, only produce a cleaner version of what's already fixed. As such, there's little mismatch between picture and comment (where may include not just words, but any or all of visual images, sound, action, any other sign). The two senses of aligning vary orthogonally: Drafters confront a strong mismatch of types, while a much stronger sense of fixity entails that what's said and capted by picture and comment in editing may come to be all but indissociable. When editing attempts

to engage drafting expectations, misalignments only sharpen, and, moreover, the resultant misalignment in turn blinds the eye to what editing is doing (and so to recognizing that it is editing) (Mollick & Mollick, 2023).

8. Ethical Considerations in AI Education

While the potential of AI is significant, it is imperative that students are taught not just about AI tools and opportunities, but are also educated about the ethical challenges introduced by the new technology itself. The current use of AI tools in education presents numerous ethical challenges, many of them unknown to students until they are enmeshed in systems that generate large amounts of personal data. Such concerns could include but are not limited to: excessive data collection and manipulation; civil liberties, particularly surveillance; use of AI to discriminate; automation bias; malicious use of AI; the ways education institutions build or procure systems without a clear standard of care; and student recourse in the case of AI assisting in misattributed failures.

For students to be prepared for participation in democracy and the AI-inflected world of tomorrow, it is essential that AI ethics be fully integrated into next-generation AI education. Unlike conventional ethics education, education about AI ethics is required both because AI's promise for human betterment are not guaranteed and that such systems bring knowledge challenges not present in traditional technology contexts. Solutions to existing problems caused by AI can present in tandem new problems in unpredictability and bias; simply incorporating awareness of these solutions into current education puts all current institutions at risk of falling behind. Students have a right to know how AI systems affect their lives and mitigate their harms, and small omissions in this exposure risk large downstream consequences. Educating about AI ethics is inadequate on its own — experience with a diversity of alternative futures with an emphasis on agency and opportunity beyond contemporary patterns is also essential.

More than in traditional contexts, exposure to and experience with representations of AI directly shape perceptions of what is possible with AI. Such participation must be universal in parity of agency, across domains. Technologies, policies, operations, biases, and affinities that shape current and future societies can be represented widely and publicly interpreted and reinterpreted, and it is imperative that tomorrow's voices are reflective of conditions they wish to inhabit. AI technology shape the kinds of opportunities available to students, both in terms of explicit opportunity to act and access to interpretive opportunities. These futures must be made available — presently and in pursuit of a future that all wish to inhabit — or students will spend lives subjected to the actions of limited individuals and systems imputed to be beyond understanding for generations.

8.1. Data Privacy Concerns

The boom in generative AI tools posed a dilemma for academics and institutions: whether they accept and use the AI or ban it from courses and assessments. After careful consideration, it was decided to embrace the development and find ways to use the tool to enhance teaching and student learning, like any other technology. AI chatbots can generate useful writing and educational prompts and information that will require critical evaluation and thorough checking by teachers and students.

The decision on a university-wide system must include academic integrity provisions before writing tasks can be issued to students. Still, teachers must learn to incorporate their use into regular study tasks. With the rapid development and enhanced capacity of online AI tools, this will not be easy. It can only be done in stages. One obvious risk is that students will overuse the tool and generate texts as answers without any editing. If asked to react to a short text, students can copy and paste one generated from the AI without engaging with its content or critically evaluating it. Institutions must develop protocols, tests, and protections to ensure that e-submissions do not use the AI or, if so, that the level of AI-generated texts is considerably lower than the human input required. This can be judged academically through random tests or mass screening.

The university must also be prepared for complaints, moderation procedures, and students' fear of possible

algorithm implementation or massive screening. It would be a logistical nightmare that would require a whole new level of university staffing. There needs to be guidance or specific instruction on using the chatbots. What are the possible prompts and accepted responses? Would a single response fulfill the task? Would students try to "game" the AI to put off undesirable questions altogether? There should also be cross-institution indications to assess students. Institutions must campaign to guide students into how to correctly, ethically, and effectively use such tools. Online educational materials for students can be developed or crowdsourced among staff and institutions and linked to responses.

8.2. Bias in AI Algorithms

Cultural and Societal Bias. Machine learning can characterize some properties of the training examples. These characteristics draw attention on social and cultural aspects. For example, the language production of a group of people may specify its geographical origin. However, such information may have an ethical or moral implication. Some information may discriminate not only diverse nationalities but also gender, immigrant backgrounds, age, social origin. Thus, it is important to investigate these so-called 'private attributes' in some contextual environments (Leavy et al., 2020) and learn the mapping functions without these characteristics.

Semantic Bias. Automated systems have problems when using language that does not fill the grammar requirement, e.g. spelling errors. For NLP applications, inserting out-of-distribution words is also considered a semantic gap on the knowledge. Code-switched intention prediction and even word representation on new domains are learning tasks with semantic bias (Englert & Muschiol, 2020). Further, in this view, unseen visual features or unreasonable assumptions on generative applications can also result in biased predictions. Though in this generality, semantic bias is hard to recognize. It needs extra investigation of the training and test data.

Different Distribution Bias. The training and test data are drawn from different distributions. Such a distribution difference can mislead testing from diverse perspectives. A common illustration is domain adaptation where the training and test examples are in different senses or geographical locations. Transfer learning schemes are popular methods to fill in this gap.

Causal Bias. Certain unfairness is out of the observational level but rather raised by observational variables. Including these latent causes in the model structure is hard to identify. It is difficult to achieve fair predictions for these causes, merely facilitating identification upfront. It is necessary to explicitly model the limitations of AI in predictive justice. To tackle the above knowledge gaps, it needs to collect the comprehensive fairness definitions, recognize the validity of the assumptions, identify biases and their types for the given AI application.

9. Future Trends in AI and Education

The momentum toward Artificial Intelligence in education has swept up both developers and end users. With the push toward AI, many vendors are scrambling to develop school-ready options, often without fully understanding existing workflows, and many teachers are unsure of how to engage their students with these new capabilities (Schiff, 2021). This sets the stage for a momentous time for the profession to reshape the educational systems that shape children as it undergoes potentially disruptive third- and fourth-wave technical innovation.

It might help to distinguish between two types of AI companies: those built to replicate teaching practices and those built to construct learning experiences in more novel ways. The first group 'bolts on' AI to run existing educational technologies and approaches. Expanding the AI toolbox of tutors, systems for grading essays, games, and spreadsheets might help novices and non-native speakers with writing assignments, or flags risky behaviors on social media.

The second category represents a more thorough rethinking of educational experience, such as new paradigms for human-machine interaction powered by AI. For example, generative dialogues enabling complex inquiry, the use of virtual and haptic simulations for skill development, redesigned learning

environments that leverage understanding of real-world situations… all challenging the very notion of 'standards'. Automated sentiment analysis in services may encourage filtering of healthier content, and the shift in labor from teachers to parents, content vendors, or machines entails heavy ethical questions. Regardless of kind, these technologies also become platforms for testing out human learning theories and gathering large swaths of data, some as part of 'games for learning' designed to target and practice specific skills, others as spying on student thoughts and behaviors.

9.1. Emerging Technologies

Education's future looks bright as interactive and engaging AIEd tools arrive at the same screen that brings passive and oppressive educational content. AI tools hold the potential to make huge contributions to education, though they have their strengths and weaknesses. Concerns about accuracy, predictability, and transferring the skills and processes learned to non-digital modes arise with these tools. Educators must help students navigate expected and unexpected giftedness and peril by imparting safe and ethical educational approaches to AI tools (Mollick & Mollick, 2023).

Teachers can integrate AI into education with some classic principles from design and pedagogy: assign planning, drafts, review, and feedback; begin simple; plan for product sharing; and scaffold access. These AIEd integration strategies are designed to affect students' use of AI tools, giving them productive structures and opportunities, some from the point of view of the AI tool (Schiff, 2021).

With these limitations, chatbots remain widely available text processing applications that any student can use. AI can sound wise but can also sound confused and make bizarre errors that need fixing. Students can be asked to prompt the chatbots with questions without prior context, slowly giving them context until the response is useful. These contexts could include words to avoid or keep, a focus on numeric responses with calculation display steps, or a request for in-text citations following a requested numbered list of references. In other contexts, students will not need to prompt carefully, as the bots will work perfectly at their best and miss the inquiry position altogether.

9.2. The Evolving Role of Educators

AIEd is leaving the laboratory and entering the classroom. The argument for the quality gap presented above is teachers. Without teachers, the quality gap between traditional and digital education will not be easily closed, thus implementation will fall short of the hopes of educational technology's strongest proponents. This is why AIEd is so enticing: it offers to close the quality gap by tackling the most insoluble barrier—teaching. The central ambition of modern AIEd is to simulate teachers. A useful definition of artificial intelligence in education is the study of how to make computers do things at which people are better. The 'thing' referred to is teaching, and those people that AI hopes to emulate are most often teachers (Schiff, 2021). In a variety of domains, increasing reliance on this technology will require adjustments to educational practices. Education today is not adequately preparing either learners or educators for the heightening intrusion of AI from multiple directions. Many students and parents are seeking AI-enhanced educational support not available from their traditional institutions. Faced with such pressure, educators will need to contemplate radical adjustments, from major changes in pedagogy to radically new educational paradigms (Mollick & Mollick, 2023). Educators' use of AI largely falls into two categories. In the short term, they will need to adjust their pedagogical strategies: Bringing AI into class and teaching with it rather than just adjusting what is already taught. In particular, assigning AI a greater role will require new considerations concerning assignments, evaluations, classroom workflow, and attendance practices. Educators have experienced this struggle before. New technologies such as calculators and the internet have sometimes disrupted education but ultimately made lessons more impactful. AI-infused shifts will not be an exception and have to be embraced. At this point, most discussions center on adjustments students can make. For educators, teaching in conjunction with AI-like systems is still an open territory. Disruption could undo learning. In the longer term, AI will continue to develop in unanticipated directions and thus could mean broader shifts in the nature of education itself. Academic content could no longer be needed

and would need to be replaced with radical reimaginings of the social contract between educators and learners around the educational experience.

10. Building a Supportive Learning Environment

Building a supportive learning environment involves creating a classroom culture that encourages student questioning and risk-taking. Students should feel comfortable asking questions, including asking for clarifications on assignment instructions. Particularly as AI becomes a staple in students' lives, the uncertainty around it is likely to grow; teachers can help students manage uncertainty by normalizing difficulty in understanding while encouraging students to express what confuses them. This approach requires both background knowledge on education best practices and knowledge of AI shortcomings, including where students might not understand AI, nuances it might miss, or its factual failures. Upfront sharing with students how aware their teachers are of AI's faults can stave off any thoughts that teachers are unfairly taking advantage of their lack of knowledge, which can result in students shutting down. Additionally, learning about how AI is incorporated across the country, familiarizing themselves with its latest changes, and experiencing its faults for themselves will help teachers know where students may have difficulties and how to encourage conversations about them in class. Schools can also encourage risk-taking by sharing examples of what healthy risk-taking looks like as well as what happens when stakes are eliminated such as by providing students with impossible tests. A healthy culture that encourages risks on assessment and AI usage is one in which students can be open with their classmates and teachers about things that went wrong and be confident in doing so with predisclosed, empathetic anchors in place. Students should feel a sense of community internally and externally to the classroom around this subject to prevent isolation, misunderstanding, and a fixed classroom culture. Teachers can provide avenues for risk-taking such as using anonymous digital polls, asking open-ended questions soliciting thoughts or confusion in teams, or requesting students write discussion starters for their peers. However, the goal of these activities is less to produce answers than to normalize not knowing and encourage conversation; silence and limited community engagement often indicates local need for further enabling as opposed to a widespread absence of an issue.

10.1. Fostering a Growth Mindset

Every teacher should have a growth mindset for themselves, their colleagues, and their students because adopting a growth mindset is essential for academic, character, and personal growth. The brain, emotions, and outlook are all flexible and can be regulated and strengthened with intentional practices (M. Drake, 2015). Stress-management and emotion-regulation are examples of skills that can be developed through mindfulness practices. Mindfulness will be defined as being intentionally aware and open to the present moment. Teachers should focus on students' efforts and not on their abilities, and students should know that successful effort is essential when learning new skills. When students succeed, teachers will praise their effort or their strategies for problem solving, "You worked really hard on that and that really helped you get the right answer," rather than, "You're so smart." When students struggle or fail on tasks, feedback will show students that effort and strategy are what count in their performance. From an early age, children need to know that intelligence will grow with experience, practice, and effort. Teachers should foster hope and perseverance in students through difficult, frustrating challenges, and bring to students' attention the sustained effort over time being the key to outstanding achievement in any area.

Teachers will be trained to value challenge in their teaching and foster in students a joy for challenge through modeling and celebrating the struggle to find productive strategies when facing frustration. After education about the brain, resilience, motivation, and environment practices, teachers will bring their own experiences of difficulty to the classroom and narrate again positively, making salient the effort exerted and growth developed. Thus students will engage in public talks to make realize that it is precisely the most effortful tasks that do most to increase intelligence/growth. Students will be encouraged to relish a challenge by transmitting the joy of looking at something hard, never seen before, and figuring something out.

Raising awareness about the brain and neuroplasticity is an important step towards professors (Sandoval, 2019). Teachers should clarify that, through biology, growth happens at different rates to everyone; there are very widely ranges of intelligence despite the latent capacity in the amount of needed working memory to infer the relevant rules in any situation; and for creating habits/languaging the brain needs persistent rewards strutted as dopamine surging pulse/speed bursts and no hard-to-predict events/blockages. Fixes happen when inconsonant rules remain invisible/scandalous entities/failures, arriving to "the dumbtaat's short brain." One-off successes must not exceed celebration by a lot; more intelligent people recognize time and effort must be targetable in this same environment.

10.2. Encouraging Student Engagement

The success of 21st century education reform initiatives depends largely on teachers' ability to adopt new technological tools that promote student engagement in the context of an everchallenging curriculum. Teacher interest in the integration of technology typically declines after a couple years of use, but with learning opportunities that focus not just on the tools but also on instructional design these concerns can be addressed. Evidence suggests that successful integration of technology is associated with both student and teacher engagement. This indicates that teachers can design practical and meaningful uses of technology to engage all students in extended learning opportunities during mathematics lessons (J. Lange, 2018). If educators want students to be engaged with their work, the work must be engaging. Research distinguishes between engaging work and disengaging work. Engaging work consists of tasks that are challenging, creative, and personally meaningful. Disengaging work is pursued robotically, without investment or true interest, and consists of rote drills, repetitious practice, and mindless busywork. These ideas may assist teachers in developing engaging tasks that ultimately promote student engagement in the classroom. Teachers may also choose to take advantage of technology by giving students projects or research that can be completed using SMARTboards, iPads, or computer applications. This illustrates that higher-order questioning/categorizing is viewed as a way of promoting elaboration and creativity, while simple recall questions are more related to rote learning. However, teachers' views about how to encourage engagement through technology may also depend on their educational systems and are admittedly difficult to navigate.

11. Preparing Students for an AI-Driven Future

Generative AI — AI systems that generate text, images, audio, code, and more — is transforming the way we live, work and learn. To prepare for this AI future, students must be educated about the technology, its benefits, and its risks. Educators can be proactive by designing curricula that meet students' and community needs while addressing the ethical, societal, and workforce implications of AI. AI technology, and the rapid proliferation of generative AI tools, has transformed the way we work, interact, and create. In the classroom, students are more likely to engage with learning when they see its connection to their world. The release of tools has created society's first opportunity for mass engagement with AI systems. AI literacy is critical to preparing the next generation for an AI future. Society needs thoughtful citizens and informed workers. AI is ubiquitous in industry, with an expected ten-fold increase in use over the next three years. AI technologies will alter the types of work available in many sectors and access to the workforce by minimising some jobs and creating others. Many career paths will become obsolete while new occupations will require new technical, analytical, and soft skills.

In 2022, a research group that aimed to increase accessibility to a middle school AI futures workshop worked with two nearby schools to adapt an AI literacy curriculum designed for high school students to an audience of 11 to 14-year-olds. The workshop aimed to increase knowledge of AI while developing competencies, such as critical thinking, digital literacy, and analytical skills. The goal was to unite the curricular and community needs for engaging youth in AI awareness and empowerment. Partnering with representatives from the school community was integral to meeting the needs of the target demographic. Middle school and high school youth are significant audiences during which student views of AI and AI-related careers develop. By increasing the AI literacy of students in middle school, schools can tap into

student interest before it is channelled away from AI. The curriculum design draws on evidenced-based approaches to teaching AI concepts and ethics and includes diverse aspects to help students understand both AI literacy and computational thinking. Creating an age-appropriate AI literacy curriculum involves condensing high school-based concepts to suit middle schoolers' interests while developing critical thinking skills and providing access to technology.

Educators should teach students how and when to use AI. Expert educators, researchers, and writers provided guidance on effective pedagogical strategies when using AI. AI systems can be effective agents that help develop creativity, develop critical thinking, expand teaching capacities, inspire class discussions, and ignite student-led AI explorations. This requires thoughtful prompting. How to effectively prompt questions and scope questions for gauge AI performance must be taught. Concerned educators are worried about student reliance on AI and learning loss. Educators fear sharing the classroom conversation with AI on student notes. Less experienced teachers might design high-stake assessments that solely gauge human intelligence or trust students to use AI responsibly. With input from expert educators, a problem solving approach that asks what to watch out for as educators seeks to adopt generative AI has been developed.

11.1. Skills for the Future Workforce

As AI continues to expand its influence across multiple aspects of human life, the importance of education has become increasingly apparent. While there is no universally accepted definition of what AI is, commonly recognized examples include virtual assistants, recommendation engines, and chatbots (Aliabadi et al., 2023). Nevertheless, AI is often misunderstood by both educators and students, who may hold conflicting beliefs about technology.

To best prepare students for the future in light of this complex and rapidly advancing array of technologies, educators cannot solely focus on specific tools or applications of AI, but must teach students how AI operates, its programs and effects on leadership, society, and the economy, and the ethical and legal ramifications of using AI technologies. As such, educators must teach K–12 students artificial intelligence in a transdisciplinary approach because AI must be taught in multiple subjects to provide a broad and comprehensive view of the technology.

When individuals ask writers to create complete essays, celebrities to create songs based on keywords, or businesses to create product descriptions from rough notes, the practice oftentimes generates junk. The reason for this often lies in the amount of instructions given, or the prompt given to achieve the desired outcome. Prompt engineering is the process of designing instructions for large language models. By specifying constraints, approaches, and addenda, individuals can guide AI to generate specific content according to their needs (Mollick & Mollick, 2023).

Prompt engineering allows individuals to create better results by tailoring the visuals created. Since AI is becoming more widely available, businesses are at risk of losing designers who take creative freedom away from individuals. By training individuals to use prompters well, AI could enhance creative designs such as marketing agencies creating multiple visuals without additional investment in creative workers.

11.2. Promoting Digital Literacy

Fostering awareness of the potential and limitations of AI tools and services is critical for effective use. Teachers should leverage their technology teaching background to begin discussions around potential misuse scenarios: uncritical acceptance of AI-generated materials, slanting an AI agenda to be politically meaningful, or AI-generated misinformation spreading like wildfire. Similarly, students should be led to think critically about AI news and the impacts of social media and disinformation. AI Literacy aligns with computational thinking (CT) and information literacy. With respect to AI literacy, achieving a reasonable level of cognitive complexity means not just having basic knowledge about AI, but being able to recognize AI-related risks, report AI tools' harmful practices, adjust browsing agents in search engines, and educate others about AI developments. These are tasks of a higher level of cognitive complexity than basic knowledge of what AI is or examples of AI in everyday life (Zhou et al., 2020). However, these same

reasoning skills can be constructed on Sociocritical Literacy tasks, across a continuum of increasingly complex cognitive analysis. It is recommended that pedagogies for AI Literacy take Sociocritical Literacy as a point of reference and adapt to a greater extent. Moreover, the understanding of risks before solutions is crucial in helping students to analyze AI-related risks and misleading narratives. By foregrounding this understanding, students may start looking for disruptions and consequences, and this higher-order analysis may lead to the posing of more innovative solutions. However, awareness of AI implications is contextually dependent and updating. For AI Literacy implementation, schools should consider promoting this situative knowledge to help teachers assess students' keen reading of AI news.

Similarly, efforts in knowledge-seeking to cope with AI tools' pitfalls are both important and challenging. Necessitating seamless knowledge searching is of low difficulty in implementation; thus, school policies could be amended with concrete guidelines or templates. Ultimately, students would increase their awareness of knowledge-seeking with easy-to-follow Deciding Rules and prompts. However, outreach to teachers is required to aid monitoring. Students would need modeling practices and further guidance to cope with complicated AI models at each phase of knowledge-seeking. Real-time prompts embedded in AI tools are suggested to give guidelines. Otherwise, teachers should support students in simple locking strategies, like creating layers to difference AI and Human copywriting. Setting knowledge-sinking devices as contradictory mechanisms to troubleshooting knowledge-obfuscating prompts is also viable; however, competitive differences should be cataloged preemptively. Since AI-generated misinformation and gaming have long been topics of discussion, it is required to keep students focused on this knowledge-obfuscating factor. Schools should target this context ultimately to provide high scouting tasks. Moreover, crafting a framework for students into AI Tools is needed, for either honing limitations or dulling performative gimmicks, to complement means to knowledge-seeking.

12. Conclusion

The emergence of AI has created the promise of profound change to current educational practices and institutions (Mollick & Mollick, 2023). The classroom will likely look different in one, five, and ten years. There is hope that AI will alleviate some administrative burdens for educators and create pro-social learning experiences for students. Many artificial intelligence efforts in education center on generative AI, which has quickly and dramatically transformed the ease in which users can create impressive artifacts. Additionally, through appropriately chosen applications, generative AI offers the potential for adaptive learning experiences tailored to individual students' needs and abilities, as well as opportunities to increase learning through a variety of other pedagogical methods. Finally, generative AI may help educators close the otherwise widening equity gap by providing students access to high-quality, individualized, interactive educational experiences.

Yet, like all newly minted technologies, AI carries both known and unknown risks that need careful navigation. Some risks include the systemic presentations of characteristically error-filled responses, unexpected and unpredictable potentially-evasive responses, and the friction that accompanies learning to use a new and imperfect tool. Most importantly, and connected to standard labor concerns, AI has the potential to help students learn, but it may also mean that students will not learn fundamental skills such as writing, summarizing, outlining, analyzing information, and drawing conclusions with which the now-overburdened and under-performing education system can provide them.

To reap the rewards of AI's potential and activate hard thinking while simultaneously protect against its risks, educators need to play an active role in teaching students how to and when to use AI. This includes first teaching what constitutes best practice in AI-assisted learning, then teaching a canon of applications that adhere to those best practices, while finally modeling and debriefing the good, the bad, and the ugly of their use. Because AI in education will not go away and may widen gulfs previously hard to cross, educators need to get into the mix now.

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