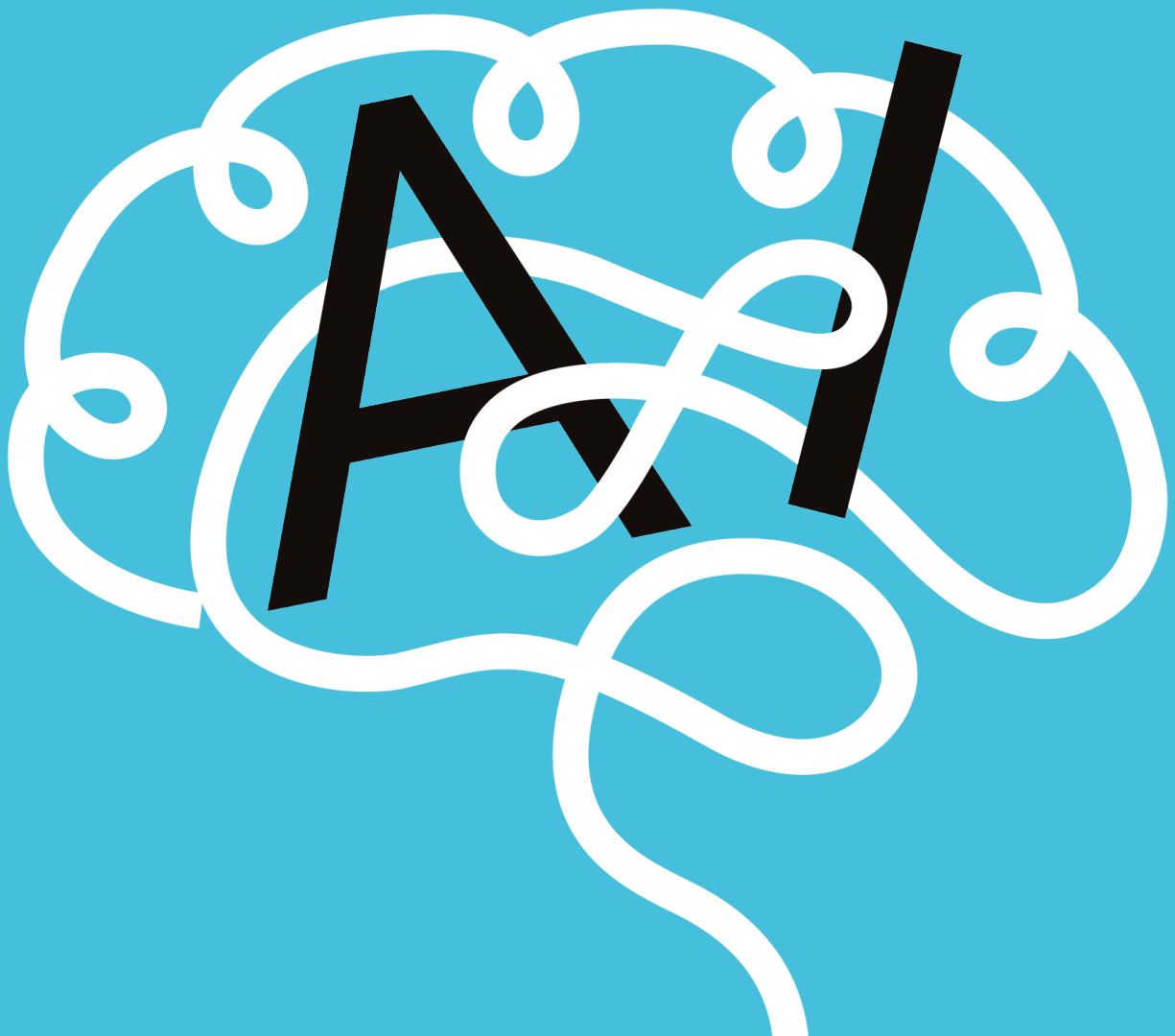
Goodnotes™

Social and Emotional Impact of Generative AI in Schools

A Goodnotes Research Publication



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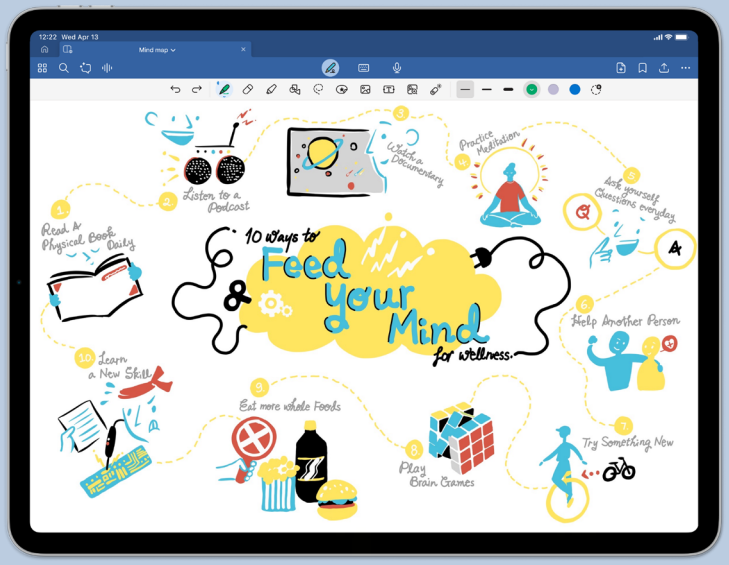
About Goodnotes™

Goodnotes is a highly regarded digital notepad and PDF markup tool, born from the endeavours of its founder and director, Steven Chan, during his time as a student at the University of Queensland. Inspired and driven by the early limitations of Apple's iPad in 2010, Steven sought to bridge the tactile authenticity of pen and paper with the expansive capabilities of digital note-taking. This led to the creation of Goodnotes, an application adept at recognising handwritten characters, drawings, and mathematical equations. Under Steven's leadership, Goodnotes has evolved into a significant education tool with over 21.5 million monthly active users, and was recognised as the Apple iPad App of the Year in 2022. The launch of Goodnotes 6, which integrates AI into digital note-taking, marks a notable stride in the company's ongoing commitment to enhancing educational processes. Central to Goodnotes' operational ethos is a commitment to 'Dream Big' in order to make a meaningful impact on learning, a value that is apparent in their continual push towards innovative solutions. The value of 'Build Great Things' is reflected in their user-centric product design, which is underscored by a commitment to excellence and a curious and ambitious community that drives continual innovation. Through fostering a culture of 'Taking Ownership', Goodnotes encourages individual contributions to its mission of impacting education positively. Its contributions offer a substantive foundation for examining the impacts of generative AI in academic settings, making Goodnotes a pivotal entity in exploring the progressive intersections of new technologies and education.



To learn more about Goodnotes and how we work with schools please do get in touch. We would be delighted to share more about our research and explore opportunities to collaborate: education@goodnotes.com

Foreword

When considering the use of AI tools in education, it is easy to become distracted by shiny new apps or seduced by the most ground-breaking developments. As educators, we spend a lot of time deeply engaged in debates over defining what AI really is (or isn't) and why that matters. There is talk of efficiency, there is talk of productivity. We discuss whether teachers will become somehow obsolete in the constant drive to 'speed things up' and make our lives and those of our students frictionless.

When looking at the impact of this technology on education from a philosophical perspective, the conversation turns towards the purpose and nature of education, including what should be taught, how it should be taught, and why. Our default is often trying to identify the bigger picture. What do our behaviors suggest about how we are showing up in the world? What do they tell us about our current thinking about the nature of knowledge, or the essence of intelligence? What are we inadvertently foregrounding within culture and society, or within our schools?

So, when discussing the 'do's and don'ts of AI in schools', we have been returning to the question: 'What do we mean by a good education?' This is not a new question, but one that has remained at the core of policy, practice, and pedagogy for over 100 years. Our answers to it have reflected our societal values over time, and it is that which makes it especially prescient when considering the world in the midst of the 4th Educational Revolution (Seldon & Abidoye, 2020). It is worth asking, therefore, 'What values do we seem to be foregrounding now?'.

In times gone by, a 'good' education was intrinsically linked to class, gender, and race. Who was allowed to learn what and when meant that different career opportunities and ultimately futures were available to certain groups of society in stark ways. These distinct educational contents were rooted in the division between 'free men and slaves and serfs' (Dewey, 1946).

For many, a 'good' education-related entirely to the needs of an industrialized economy where technical skills, literacy, and numeracy became crucial—it was about being equipped to be a productive economic unit. For example, the children in Victorian poor schools were taught to read, write, and count, with the express intention that they would later become better employees in factories or service roles. Yet, children from wealthy families were afforded the chance to learn for the sake of learning. For them, education was not just a means to an end (securing a job), but also an end in itself and served to cultivate the cultural and intellectual development of the upper classes.

More recently, with greater democratization of education, different approaches have become evident in pedagogic practice – those that are Traditional, with the teacher considered to be the holder of knowledge and the student being an empty vessel ready to be filled; and those that are more Liberal, with the express intention being that students gain autonomy, finding answers within themselves and their peers (merely guided by their teacher) and are ultimately 'freed' through their education.

We see relics of these approaches today – a 'good' education arguably combines aspects from both the productive economic unit and the well-rounded, knowledgeable individual. It contains elements of the teacher as a knowledge holder but increasing levels of autonomy being given over to the student. Alice Johnson (1981) referred to this as the move from the 'Sage on the stage' to the 'Guide on the side'. It is at this intersection—between Sage and Guide—that generative AI in particular can be seen to fit most naturally. Pupils are increasingly using AI tools as a way of researching topics, finding answers to their questions, and developing their understanding of the world. Whether they understand the responses to be 'the answer' or simply 'one answer' seems to depend on their relationship with the tool that they are using—whether they understand it to be Sage or Guide.

Therefore, it is vitally important that we think about the relationship students have with knowledge and decision-making. In wider society, students are continually presented with the notion that technology has the right answer, and even that technology knows them better than they know themselves. We must be sure that schools do not inadvertently reinforce an unthinking "technology knows best" default setting, where pupils will assume that the computer-generated response is somehow better than their own. It is essential that education fosters a sense of critical engagement rather than passive consumption.

Secondly, in a world where technology often provides quick, clear-cut answers, education needs to teach students to be comfortable with ambiguity and uncertainty. As a result, we need to think about our students' relationship with 'wicked problems' and questions that have no answers. Wicked problems such as climate change, poverty, and social inequality are complex issues that do not have clear solutions or may have solutions that are not universally agreed upon. They are important in and of themselves but equally important because young people will be increasingly faced with technologies that do provide an answer, every time—whether or not there is one! Therefore, we need to encourage them to explore multiple perspectives and recognize that some questions are complex and may remain open or have evolving answers. Education (and technologies within that) ought to be about cultivating intellectual humility and openness to continuous learning.

Lastly, it's crucial to ensure that teachers' voices are recognized and valued. Their passion for their subjects and enthusiasm for teaching should not be overshadowed by discussions of technology acting as

the more knowledgeable entity. Their role is central to inspiring and guiding students, and this should be reinforced and respected in the face of technological advancements.

When conducting research on the role of AI in Schools in 2023, Goodnotes focused specifically on homework, coursework, and assessment to provide recommendations for teachers who are struggling to navigate this space. This was at a time when AI was constantly in the headlines, and scaremongering around the negative impacts this technology might have on every sector one might care to name dominated headlines. This research, however, even when looking at practical examples of ways that certain tools might be used in the curriculum, focused on putting pedagogy first. Across the 50+ educators, professionals, and indeed students who took part in this research, it was emphasized that there is a need for more teachers offering support, not less of them. The technology, no matter how advanced or inspiring or 'game-changing', is with us to support strong pedagogy, not to take it away.

In conclusion, technology should, and can, empower. Leveraging technology effectively while also valuing and trusting human intellect, creativity, and professionalism is key.

– Dr Rebecca Mace,
Digital Philosopher & Educational Researcher UCL Institute of Education

Introduction

In early 2023, Goodnotes began conducting research on the state of play surrounding generative AI in schools. The aim of this work was to explore the different ways that this seemingly new technology was already being used and the responses that different school communities around the world had to it. Ultimately, the idea was to offer advice, support, and recommendations to schools that had an interest in AI as a whole, based on practical examples of what was being used already and how that might be improved upon and utilized across different areas of school life in the future. This led to an investigation of the implications for homework, coursework, and assessment in particular, and how schools might navigate alterations to policy for the use of AI in any of these areas.

The research was conducted with over 50 global collaborators, many of whom were educators and students. Following the publication of this work, Goodnotes set out to explore and understand changes to school policies, teacher attitudes to the use of AI tools as well as the evolution of the technology itself. It became quite clear in those months that one of the most under-investigated areas surrounding the subject was the impact certain tools were having on the social and emotional development of young learners. While a substantial amount of current studies examine the development and implementation of AI tools in education, little has shed light on students' and teachers' experiences in relation to these technologies. Many of the participants from that initial research began reporting an increased frequency of use and even some dependence on the technology. Indeed, as this technology becomes more integrated into mainstream teaching and learning, and more integrated into the tools that are already being used widely throughout the sector, we recognized that this under-investigated area needed more attention, and sought to learn more so that we might be able to offer more specific support.

The students we spoke with are already using technology that is more sophisticated than anything they might have used before. They were already using it in ways that shaped their approach to work, their relationships with their peers, and interactions with their teachers. At the same time, teachers are seldom familiar with the technology that is being used. **What are the implications, then, for the social and emotional development that have become increasingly more important within the school environment?**

Our assertion is that the number of young people facing mental health challenges and with neurodiverse needs is increasing year on year, and schools are already struggling to meet the required demands to offer support. **How might we be better equipped to help steer the next wave of change?**

Background

As has been evidenced through more recent research into social media, digital interactions impact hugely upon people's feelings, relationships, and overall mental health (Braghieri et al., 2022; Khalaf et al., 2023). As a result, an exploration into the emerging impact of AI on the day-to-day student experience is vital. Relatively little attention has been paid to understanding its influence on the emotional and social well-being of students, with the current focus of research revolving largely around technological and logistical threats, challenges, and benefits (Ali, DiPaola, Lee, Hong, et al., 2021; Tuomi, 2022). It is in this light that our research focuses on the everyday experience of students in their interactions with AI tools.

With rapid technological developments, it is unsurprising that the answers and solutions offered by AI—and wider technologies with proclaimed objectivity and neutrality––are found to be appealing. However, contemporary education also values critical thinking, which rightfully leads people to fluctuating stances of trust and mistrust towards not only new information and technologies, but also the actors and governance structures involved. This paper aims to offer perspectives and guidance on finding a sensible middle ground in the pendulum-like swing between acceptance and doubt towards AI within a wider social and emotional context of education. The goal is to cultivate an environment where the potential of AI can be used responsibly in educational contexts by thoughtfully considering the benefits while maintaining a critical awareness of its limitations.

> **It's essential that we take into account the social and emotional impact of this new technology in schools, particularly when it will play such a big role in the lives of the next generation.**
>
> **– Lord Jim Knight, Legislator, FRSA, Chair of the Board of Directors at COBIS, Director at Suklaa**

As well as being useful to those involved in schools, teaching, learning, and mentoring, it is our hope that this research will also be read by developers, so that they may consider the implications of their work from the perspectives of those most likely to be most impacted by it. Of course, we are talking here about products that will be bought, sold, and expected to generate substantial revenue. At the same time, mental health and childhood development are quite often perceived as blockers that are easier to sideline than to address full on. Instead of aiming for quick wins, we are encouraging companies to genuinely consider the profound effects their products and tools can have on holistic development, and engage in co-constructive practices within an ecosystem of collaboration with schools, educators,

parents, and learners to build mutual trust and shared sustainable growth. It is important to note that while AI encompasses various forms, this research focuses primarily on generative AI. Throughout this work, the term 'AI' typically refers to generative AI technology, and 'AI tools' typically describes the specific uses or applications of generative AI technologies.

This paper is divided into six sections.
In Section 1, we begin by looking at the current literature on AI's relation to the value of learning, mental health, the future of work in terms of collaboration and creativity, and the role of trust. Section 2 outlines our research methodology and the stakeholders involved.
We then present our research findings. In Section 3, we examine how AI impacts socioemotional well-being, focusing on four key areas of concern: social relationships, learned helplessness, unregulated advice, and fear of the future. Section 4 explores the role of trust in addressing these issues and promoting a positive environment within the context of AI in education.

Finally, in Sections 5 and 6, we offer recommendations for staff with a student support function and for schools based on the issues raised in this research, exploring how positive scaffolding may take form when it comes to adopting AI in educational settings.

Section 1
What's at Stake

AI and the Value of Learning

With AI becoming increasingly more mainstream, we see a proliferation of AI-driven assistant and management tools designed to enhance teaching methods and improve student learning outcomes. Nonetheless, teachers' reliance on AI for tasks such as quiz creation and progress monitoring, alongside students utilizing AI to undertake assigned tasks and assessments, raises concerns about the potential 'hollowing out' of the authenticity of education.

In his book Good Education in an Age of Measurement, Biesta (2010) raises concerns about the 'learnification' of education, problematizing the trend of equating education with a narrow conceptualization of learning as individual mastery of specific information or skills. While these acquisitions are undeniably necessary for societal and professional qualifications, they overlook the broader and more critical dimensions of education like socialization, collaboration, and the cultivation of holistic individuals who act with curiosity and agency. As suggested by Holmes and his colleagues, the present use of personalized AI in education seems to be primarily focused on the narrow aspects of learning, inadvertently neglecting the broader educational goals regarding the socioemotional well-being of learners and educators (Holmes, Porayska-Pomsta, et al., 2022).

In this research, we posit that social and emotional well-being in the educational context entails both mental health support in providing authentic care, and the broader values of learning in building authentic social relationships, creative and critical thinking, and trust. With AI, how should we leverage it in ways that do not 'hollow out' these values?

AI and Mental Health Support

While there are growing AI applications aimed at promoting socioemotional and mental health, their implications are often under-addressed (Fiske et al., 2019; Timmons et al., 2023). Many of these applications highlight how AI can be a therapeutic tool rather than a threat to social and emotional development. The example of Kai.ai, a commercially developed AI-powered conversational bot aimed at facilitating teenagers' mindfulness and self-care, illustrates how some companies are focusing on the creation of nonjudgmental, accessible platforms for teenagers to explore their feelings and mental health challenges. Integrated with top messaging apps (e.g., iMessage, WhatsApp, Discord), Kai.ai delivers Acceptance Commitment

Therapy (ACT) as a form of psychotherapy guiding users to develop their psychological flexibility and deal with challenging experiences via daily check-ins, mindfulness exercises, and reflective journaling (Hayes, 2016; Vertsberger et al., 2022). Upon conducting pre-post studies and longitudinal design to assess changes in measures of well-being among its users, researchers affiliated with Kai.ai conclude that "mobile-based ACT interventions are effective means to improve individuals' well-being" and that their findings "demonstrate Kai.ai's great promise in helping individuals improve and maintain high levels of well-being and thus improve their daily lives" (Naor et al., 2022).

Nonetheless, despite the perceived benefits, other research has demonstrated mixed results regarding the use of AI chatbots in mental health settings. Some AI chatbots have shown potential in short-term emotional support and companionship by offering a semblance of belonging and mitigating feelings of loneliness, as well as engaging those who may otherwise be unable or unwilling to receive mental health care. However, the use of AI with human-like characteristics as an intervention or replacement for mental health support could lead to cycles of dependency in the long term: **Those who are already lacking genuine social support and bonding are more susceptible to chatbot addiction and over-reliance, further inducing withdrawal from community life** (Pani et al., 2024). For example, Maples et al.'s (2024) research found that students using AI chatbots like Replika, which is designed to serve as a virtual companion or 'AI friend' by simulating human-like conversation and developing its own personality through interactions with users, tend to experience higher rates of loneliness compared to their peers.

Research on 'social media addiction' has demonstrated how phone notifications trigger users to continuously seek dopamine surges by repeatedly checking their devices for new messages that give them temporary spikes in dopamine levels (Macit et al., 2018). When it comes to AI chatbot applications, we should also recognize similar risks concerning dependency, especially for those lacking positive real-world interactions and seeking virtual stimuli as a way of fulfilling their reward system. At present, limited research exists on the long-term psychological impacts of using AI chatbots, including social withdrawal, alienation, and addiction. Meanwhile, concerns have been raised about the ethical implications and potential negative effects on human-to-human relationships if emotional connections with AI become normalized (Sepahpour, 2020). The dominant view in current literature suggests that while chatbots can provide a form of social engagement, they lack the ability to deliver the same benefits as face-to-face human interactions in mitigating loneliness and cultivating authentic social bonds.

In the same way that uncritical designs of AI tools for learning may undermine the authenticity of learning experiences, unexamined AI tools for socioemotional and mental health support risk compromising the authenticity of care

in education. As such, regardless of the intended purposes of AI in education, it is crucial for decision-makers in schools to shift away from technocentric and techno-solutionist ways of adoption to critically examine the implications of novel technologies, not only for our education system but also the educators and learners as central stakeholders within this system.

Future of Work: Collaboration and Creativity with AI

When it comes to AI's implications on the future of work, there is a major discourse on how it affects human collaboration and creativity. As AI becomes widespread, we see more diverse forms of interactions–not only traditional human-human interactions, but also human-AI interactions. However, as Wang et al. (2020) point out, interaction is not the same as collaboration, which involves understanding mutual goals, co-managing tasks, and tracking progress together.

The extent to which AI can be effectively and critically integrated into human workflows depends on the levels of trust concerning human-AI collaboration (Berretta et al., 2023). For example, Saßmannshausen et al. (2021) find that high levels of trust in human-AI collaboration are significantly associated with certain characteristics from both the human and the AI sides: the human's digital affinity (the extent to which one has interest or pleasure in using technologies), and the perceived AI's ability and comprehensibility (the competence of AI in performing tasks and explaining its decisions). Furthermore, while conventional perspectives tend to deterministically view humans and AI as dyadic components, and that AI is either a mere tool subjected to human desires or an omnipotent actor capable of replacing humans, more critical perspectives highlight how AIs are evolving "beyond their role as just tool[s]" (Arslan et al., 2021, p. 77) and becoming players in their own right by supporting and mediating human decisions-making (Cabitza et al., 2021).

Therefore, when it comes to conversations about collaboration and creativity, rather than posing human-AI interactions as opposite to human-human interactions, we need to examine how they might mutually and cooperatively augment each other.

A recent national survey in the United States commissioned by the Walton Family Foundation in partnership with the Learning Engineering Virtual Institute's AI Lab found that teachers believe that AI can boost creativity, and are most likely to use tools like ChatGPT for coming up with creative ideas for classes (Impact Research, 2024). This is evidenced across the research literature. For example, using Bruner's test for thinking styles and levels of creativity, Liu et al. (2024) demonstrate that the use of AI significantly increases the creative potential of teachers across all physical (hands-on), visual, and symbolic pedagogical domains. Main et al., (2022) similarly demonstrate how AI

tools could serve as "engines of chance or randomness" (p. 463) that support and augment the personal creativity of practitioners, researchers, and artists, introducing elements of serendipitous combinations and novel juxtapositions that inspire their creative practices.

In many ways, the majority of debates around AI and the future of work have been around whether people will have jobs in the future; although this is indeed a significant reality, the scope of such debates is often narrow and misses out on broader dynamics and long-term change (Khandwala, 2024). In a recent working paper, Dell'Acqua et al. (2023) asked consultants to perform a sample of 18 different tasks representative of their daily work, and found that those who used AI significantly outperformed those who did not on every dimension. Elsewhere, however, Dell'Acqua (2022) also shows that an over-reliance on high-quality AI can backfire, where users begin to "fall asleep at the wheel" (p. 29) and perform even worse than those who used low-quality AI or no AI at all. This situation where users become so reliant on AI tools that they stop attempting to think or solve problems independently is a form of 'learned helplessness', a state where people give up trying because they believe they cannot change their situation (Le-Nguyen & Tran, 1 C.E.; Seligman, 1972).

As such, disparities in the future of work will not necessarily be on the lines of whether AI is used or not or whether AI will replace humans, but rather on how AI is proactively and thoughtfully leveraged in human workflow (Mollick, 2023).

In the context of education and the widely contested digital divide, this implies a movement beyond simply democratizing 'access' to AI. Rather, we need to not only thoughtfully integrate pedagogical designs in AI systems, but also build the human culture and resources for constructive scaffolding of AI use. For instance, Khanmigo, an AI-powered teaching assistant and tutoring tool developed by Khan Academy, engages students in improv writing activities by taking turns crafting a narrative one line at a time. With AI writing a sentence, then asking the student to write the next, Khanmigo is developed with the intention of benefiting children's creativity by "providing them with a tool to help them generate, play, and get feedback on ideas in a judgment-free zone" (Khan, 2024, p. 48).

> **The best ideas will come not from the AI creating for us but when the AI is creating and riffing with us.**
>
> **– Salman Khan (2024)**

Looking at the bigger picture, we see that there is an increasing number of AI tools informed by critical pedagogical stances aimed at fostering learners' curiosity, creativity, and critical thinking through approaches such as inquiry-based and experiential learning (Abdelghani et al., 2023; Henriksen et al., 2023; Yeh, 2024). However, minimal system-wide attention has been devoted to whether and how these AI tools are sustainably and effectively adopted by schools (Castañeda & Williamson, 2021; Reich, 2020).

With any educational technologies, transformations to our education systems are not brought by "heroic developers or even technology firms," but rather enabled through "a long process of tinkering and continuous improvement" (Reich, 2020, p. 232) with communities of educators, learners, researchers, and industry stakeholders co-creating context-sensitive solutions and strategies conducive to their local educational and institutional environments. This, in itself, requires collaboration and creativity.

Perceptions of Trust in AI

The role of trust in shaping student perceptions and attitudes towards emerging technologies like AI is increasingly pivotal in both educational and social contexts. In a survey of 399 undergraduate and postgraduate students in Hong Kong, Chen et al. (2023) demonstrated that students acknowledged AI's benefits in personalized learning support, aid in writing and ideation, and assistance in research and analytical tasks. Nonetheless, they also raised concerns regarding the accuracy and reliability of AI, ethical and privacy issues, and the impacts on personal growth and career prospects, along with broader socio-cultural consequences regarding potential misuse and reduced human interactions. Furthermore, student perceptions of and attitudes towards AI significantly correlate with their knowledge of the technology and frequency of use (Chen et al., 2023). This highlights the significant implications of trust and acceptance of novel technologies in broader educational and societal contexts.

Nonetheless, the concept of 'trust' itself can be variously constructed. For instance, trust in AI systems can be interpreted and influenced by perceptions of AI's technical capabilities (e.g., affordances, usefulness, extent of anthropomorphism) and ethicality (e.g., fairness, transparency, explainability, accountability), confidence in the benevolence and integrity of institutional actors that govern or develop AI, and a wide range of personal factors including demographic background, technological competence, and prior familiarity with AI (Novozhilova et al., 2024).

Furthermore, trust in AI systems is dynamic and context-specific, where tasks or domains that demand more 'human' qualities (e.g., emotional support, intuition, empathy) and involve a higher degree of collaboration tend to result in lower trust in AI's capability and benevolence. For example, AI is generally viewed favorably for more independent tasks like essay writing and answering queries. In contrast, AI faces persistent skepticism when it comes to roles traditionally handled by teachers, like providing personalized learning support to individual students, despite the potential touted by many developers and businesses (Novozhilova et al., 2024).This implies that despite technological advancements, the unique qualities of human interaction and authentic relationships remain indispensable in many aspects of our lives.

Section 2
Methodology

Our approach was designed to capture a comprehensive understanding of experiences from both students and teachers. In addition to a review of the literature, we also conducted one-on-one interviews and facilitated group discussions on a range of subjects relating to AI in school. The interviews and group discussions took place from November 2023 to February 2024. The students who took part in this research signaled different types of use as their familiarity with AI tools has changed shape; this included using AI tools as personal tutors, involving AI tools as a 'group member' in educational group work, asking AI tools to generate formative feedback on their work, as well as using AI to test ideas about how to approach social situations. In each case, it seemed there was a different emotional connection with the technology, and that has implications for personal development.

Although the research shines light on some interesting aspects of AI use, it is worth noting that there are several notable limitations and areas for potential future development. Firstly, the recruitment strategy suggests the findings may not be fully representative across different educational contexts. Participants were recruited exclusively from affiliated partner schools and institutions where pre-existing relationships are in place, possibly introducing bias and limiting the diversity of the participant pool. Secondly, the digital divide is a huge concern, and while this study focuses on those young people who have had access and support accessing AI, a large proportion of pupils across the world have limited access to the internet at best. Therefore, while interviews provide valuable insights into students' interactions with AI technologies and their impact on academic performance and behavior, the study's reliance on these observations does not capture the full spectrum of student experiences and outcomes.

As revealed by the review of existing literature, there is a gap in the exploration of the social and emotional dimensions of AI in education, with current literature predominantly focusing on the broader implications of technology or the technical capabilities and limitations of AI systems. This lack of depth in understanding the nuanced effects of AI on students' social and emotional well-being indicates a need for further research. The limitations of this research include the number of individuals that contributed to it and the backgrounds that they come from. For the most part, the students and educators we spoke with have been involved in AI related conversations, debates and research in the past, though our recommendations and findings are likely to impact those who do not fall within this category. Our hope with this work, however, is that this paves the way for broader and deeper investigation in this area.

One-on-One Interviews

We conducted a series of in-depth interviews (see Appendices) with a diverse group of students from around the world, aiming to gather personal insights into their interactions with different AIs. These interviews were semi-structured, allowing for the exploration of specific topics while providing the flexibility for participants to share their experiences and perceptions openly. We have only used student's first names to ensure confidentiality. Our student participants were aged 16-22, allowing us to capture those in the final years of high school and the first years of university and also those who are able to make a clear distinction between self-study methods prior to the introduction of AI on a mass scale and the state of play just now. Those older students focusing here are reflecting on their time at school, as opposed to divulging ways that AI is impacting them at university. Though we appreciate that young learners are likely to access AI tools at a younger age as well, these students have been using or have been exposed to AI in a school setting since its emergence in the mainstream.

Focus Groups

Focus group discussions were held with both student and adult educator groups to facilitate a collective exploration of experiences and viewpoints. The discussions were designed to encourage open dialogue, with prompts based on themes identified in the literature review and initial interview findings. This method provided valuable insights into the community's collective perceptions and the social dynamics influencing individual experiences with AIs.

Data Synthesis

The data collected from interviews, literature review, and group discussions were synthesized to develop a basic level of understanding of the social and emotional impacts of AI on students. We made every effort to employ thematic analysis to identify common patterns and divergent viewpoints across the data sets and map that with other literature we were seeing on this subject. This process involved highlighting patterns, identifying themes, and drawing connections between the experiences of students and teachers and the broader academic discourse.

The synthesis of these sources provided a solid foundation for our paper, enabling us to offer a series of recommendations for supporting students' social and emotional development as they navigate this seemingly bewildering frontier.

Section 3
Implications of AI on Social and Emotional Development

Following our interviews and our group discussions, there were a number of subjects that continued to emerge that were worth exploring in more detail. At this point, these areas are only hints at emerging developments as far as AI technologies are concerned, though in each case it was clear that where there is a lack of structure and guidance around how these tools might be used, the more likely it is that detriment is being caused and this is what we need to do something about with our recommendations. If schools don't take some responsibility for ways that young people are using this technology, we only have hints about what the impact is going to be, but from our understanding of the information we have gathered so far, there are many challenges that need to be considered.

These headlines have been identified as key points that continued to emerge through our interviews and group discussions. The context and broader conversation around these subject areas merely hint at what is coming as the technology continues to evolve. What was evident throughout, however, is that where there is a lack of structure and guidance around how AI tools might be used, the more there is a risk for detriment from a social and emotional development perspective. If schools don't take some responsibility for ways that young people are using this technology, the negative impact of these tools is only set to increase.

Social Relationships: Is AI diminishing the value of group work and collaboration?

Concerns About Diminishing Collaboration

Learning how to collaborate effectively and work alongside other people is an essential part of what going to school is about. Being able to navigate complexity and ambiguity in collaboration and having a strong understanding of how to manage tasks and workload is crucial when preparing young learners for the world of work. This doesn't happen naturally, particularly when taking the impact of technology into account, which means that these skills need to be carefully honed and embedded into a curriculum in order for them to have an impact. The young people that we spoke with understand that these are skills that they will need in the future of work as well as in their social lives, and they are keen to ensure that they practice them. For example, Conrado emphasizes the importance of in-person collaboration as a means of socialization:

> I would say that it is really important to be able to be on site... to be able to discuss, work together really. Because if not, there are some aspects of socializing... that I consider them as a key to a proper education.

In spite of acknowledging this, they also see AI tools as having the potential to decrease the depth of interactions between students when they prompt for advice and for guidance more than they do with their peers. Instead of having conversations or working together on tasks to develop those vital skill sets, they are resorting to text-generating AI tools that are able to seemingly complete the tasks at hand for them. For instance, Cemre describes how, when preparing for a group presentation, her classmates "don't really engage with the conversation but just themselves sitting and inputting prompts to AI." She further elaborates on how the over-reliance on AI during teamwork could diminish human interaction and thereby "kills this diverse thinking process in schools because students are more likely to depend on AI rather than discussions."

In other words, while students understand the value of in-person collaboration for developing crucial soft skills, the convenience and efficiency offered by AI tools may be inadvertently undermining these learning opportunities. This growing tension between the recognized importance of collaborative skills and the increasing reliance on AI tools is a significant challenge posed by educators.

Creativity and Collaboration

However, it is not at all accurate to say that AI tools are responsible for diminishing the value or the impact of collaborative work. In many cases, teachers and students suggest that they proactively incorporate it into creative group tasks. For example, Eric Walters, a teacher at Marymount School of New York, notes that his school is offering a new in-house course called 'Creativity and AI', focusing on "the ethics of AI and then the creative aspects of it." Walters further describes that for the final class project, the students have to "put together a workshop for faculty CRE [Culturally Responsive Education] like creative applications for AI." The school is also "thinking about ways to produce movies and podcasts using [AI]" and exploring "how these tools can support student learning and how they can support faculty learning." This points to the importance of intentional scaffolding when incorporating AI in class, where teachers not only make recommendations for task completion with AI tools in mind, but also actively learn from their students who tend to "be the ones to discover the best tools for themselves and then they'll share it with [the teachers]."

Similarly, the students we talked to also note how the rise of generative AI has challenged and inspired their teachers to rethink assessment. For instance, Kerem describes how his teachers have "decided to convert [traditional in-class assessments] to some creative projects, like designing a museum about a book or going to a real museum and investigating an artifact."

In this sense, when the technology becomes part of the task and teachers are able to specify the level of input that the AI tools might have or the ways in which the group interact with them, this is where we can start to see some benefits that will have a positive impact on the skills that such work encourages the development of.

When it comes to artistic uses of AI, Cemre expresses her excitement for its potential in creative storytelling:

> Since the beginning of history, people have wanted to tell their stories and share their stories… And AI just gives us another opportunity to think creatively about storytelling… I mean, traditional things—those key things for human beings—like art, music, storytelling and sciences. Can we think in a different way with AI? That makes me excited because it just pushes you to get out of your comfort zone and think more creatively for the future.

Furthermore, our conversations demonstrate that students and teachers perceive collaboration as closely associated with creativity. As Conrado states,

> For example, talking about past leadership, teamwork, even emotional intelligence, creativity… If not grouped together in order to solve the task, then [the qualities] wouldn't be nurtured in any way…

When asked about how AI impacts group work, Conrado elaborates that when collaborative tasks are divided in a way where group members individually engage and explore with AI, the "creative and interconnections between [the humans] are lost."

As we have outlined in our previous research (Goodnotes, 2023), an important recommendation for schools when it comes to AI adoption is to in fact prioritize the non-AI and distinctly human elements of tasks that cultivate creative, collaborative, and critical thinking—domains where AI cannot fully replicate human abilities. This is not to advocate for a false dichotomy between human-human and human-AI collaboration, but rather posit that AI-assisted work should consistently augment and facilitate, rather than replace, direct human interaction and cooperation.

Learned Helplessness: Does regular AI use encourage transactional relationships?

When using search engines, students are used to asking for something and receiving a response back. In the 1990s, there was a popular search engine called Ask Jeeves, where a butler would bring the user a response in the theme of a humble servant. The user could be as limited and impolite with their phrasing as they wished, and the butler would bring whatever was being asked for. Similar transactions existed with the Microsoft paperclip, an animated graphic that would try and help the user in Microsoft Word, but with often quite limited results. The same principles apply to most mainstream AI tools; the user asks for something and receives it as a response. The major difference is that AI tools will interact in a way that goes well beyond the capabilities of more traditional technology. It will give the user what they are asking for, and it will respond in a way that's tailored specifically around the framework of a prompt; teachers and students alike are building relationships with this technology in a way that we have not seen before.

The depth of these relationships may be limited at the moment, but the notion of having access to tools that will respond in such a way that a young learner might begin to believe that maybe it isn't just a piece of technology, that maybe there is something there that is worth investing in, has profound implications for social and emotional development. For example, Walters notes that his students are already experiencing a range of social and emotional issues, and he worries that such issues would be exacerbated when students see AI as "the easy way out as opposed to talking to an adult or to their friends." While older students are "cognizant of the fact that they're not gonna get good relationship advice," younger students lack the capability to discern and evaluate the impacts of AI on their socioemotional well-being.

In addition, there is a level of expectation; the user wants something, and provided they offer the right level of detail in their prompt, they are given it immediately, in a way that is customizable, adaptable, and entirely based on a unique set of

circumstances. **This is purely transactional engagement: The lack of friction and emotional investment in thinking and decision-making inevitably leads to dependency.**

Cemre, for instance, notes that she often challenges herself "to think better than AI" by improving her creative work by comparing it to the versions that she asked AI to generate. However, she also admits that AI can "kill our creativity" when it is perceived as a shortcut when "we just give a prompt and just ask for things without thinking about it because the deadline is approaching or we are lazy." This, again, points to the dual nature of AI: while it can enable freedom and creative thinking, it can also reduce these same qualities if improperly implemented.

From a more content-focused perspective, so much learning happens when students are not concentrating on the facts that they need to pass their next exam, but on the broader subject knowledge and tangents that they might take when they are investigating a certain area. Tick-box learning has never served a purpose other than to demonstrate recall of a specific fact or piece of information. Given the specialized nature of exams and the constant pressure to meet standards and deadlines, it is likely that students are resorting to uncritical uses of AI solely to cope with assignments and assessments without being given the exploratory space to leverage the technology creatively. As Radwa observes, when her students were asked whether they used ChatGPT, they admitted and explained that "they were very stressed about [the assignments] and they felt like they might not be able to meet the deadline… and that's why they have just decided to recourse to [ChatGPT]." This is validated by Cemre, who describes her tendency to rely on AI under stressful circumstances:

> I feel like [getting help from AI] is not good because I don't really focus my attention on that assignment to learn the stuff that my teacher is actually asking for me to do. I feel like my thinking kind of gets dependent when I feel overwhelmed… Our English teachers always say 'Depend on your thinking. It's always the right thing.' But sometimes when the deadline is very close, I feel overwhelmed.

From these accounts, it can be inferred that the use of AI in academic settings does not inherently stifle creativity; rather, the issue lies in its unfiltered introduction without concurrent structural shifts in broader educational frameworks. As Radwa and Cemre have illustrated, the pressure to meet stringent deadlines and standards interlinks both learned helplessness and transactional relationships with AI, where it is used as a coping mechanism rather than a means to foster meaningful and creative engagement with their subjects.

Unregulated Advice: Is AI able to give sound advice to young people about their social lives?

Plenty of 'advice', but a lack of advice based on human experiences

When considering the ways that students are engaging with AI tools in a non-academic context, one of the emerging patterns in this work was formed around ways that young learners are asking for advice and support concerning friendship groups and peers. This is of course an area that AI tools are able to help with; Perplexity, for instance, can write articles about how to navigate difficult social situations, while more commonplace AI tools have the ability to provide solutions and reflect on difficult 'should I or shouldn't I questions'. There are three main concerns with this that ultimately stem from a lack of scaffolding around adopted use.

1. Lack of context. Not just from the level of detail in the prompt but also from knowing about and understanding the young person who might be asking for advice. As Walters explains:

> I worry that having a conversation with ChatGPT or Snapchat AI—it's not gonna give them good advice, but also it's not gonna give them advice based on experience. It's gonna give them advice based on whatever the language model was telling them is really good advice.

In other words, all the AI tool is able to process is how the young person has interacted with the tool in the past, in addition to any information that they might have already shared. This 'context' is likely to be considerably skewed and not at all suitable for basing decisions or choices regarding friendship groups or social predicaments. It is implausible for AI tools to fundamentally account for the material realities of the students, leaving them at risk of basing decisions around decontextualized and impersonalized information.

2. Data privacy. While the lack of context could be mitigated by more technical background work on how AI tools might respond to such questions, doing so inadvertently raises a dilemma: The need for gathering more contextualized student data to fine-tune these systems inadvertently further intrudes students' privacy. In other words, when young people provide considerable information, context, and perhaps even imagery so that the AI tool can provide them with accurate and supportive recommendations, they lose control of that data. A worst-case scenario might be that the AI tool is then trained on that data, and there is no way to know how it might be used in the future.

3. Even if the right safeguards are in place and the AI tool in question is considered 'trustworthy', the young learner misses the opportunity to speak with a trusted adult or a peer about the problem they are facing. For example, Ajla Duckollari notes

that while AI chatbots could be helpful in answering "straightforward questions that do not really need time or when the amount of emotional impact on [students] is minimal," they are not suitable for complex cases involving trauma or mental health issues. Likewise, Crispin Dawson expresses his concern about oversimplified interactions with AI:

> You know, kids and even adults that we've spoken to... You say, 'how are you today?' and they tell you they're absolutely fine, but you can tell on the face they're not. It's all of those bits that I think are an important part of being human and I would be very reluctant to have anything that was too simplistic. I worry that that would cause more problems.

Face-to-face interaction is a crucial part of personal growth, and one that is integral to social and emotional development. Every time an opportunity is missed for a young person to engage with another human being and address a subject that might be daunting or challenging for them, they are losing out on a chance to build their emotional resilience, to feel more comfortable with risk and to develop a broader set of communication skills.

Our suggestion, therefore, is to ensure that whenever AI tools are considered as a way of practicing for or acting out social dilemmas, they are done in consultation with peers or trusted adults at school. **In-person interaction and dialogue should be promoted ahead of consultation with technology in every instance, and that is a priority that should be set even in schools where the use of AI tools is commonplace and standard practice.**

AI as a prism for re-examining the root problems

While AI can offer advice in the form of a 'tool', it can also offer various insights when served as a 'prism' through which we engage in new perspectives to examine and reflect on some of the root problems structurally embedded in our education systems.

For example, the growing use of AI is prompting communities of educational stakeholders to rethink and redesign curricula and assessment. As Conrado states, "The assessment that schools are delivering perhaps might not be the best in terms of incorporating generative AI to our daily basis... We would have to think about schools not doing their job properly." This points to the need for system-wide changes that enable educators and learners to collaboratively reflect on and experiment with pedagogical and curricular innovations, incorporating AI not only as a tool but also as a prism through which alternative learning experiences can be reimagined and enacted.

The same can be said for what young people learn about PSHE (Personal, Social, Health and Economic Education) content while they are at school. Rather than isolatedly or deterministically focusing on AI's threats to students' socioemotional well-being, a systemic approach must be adopted to leverage the burgeoning use of the technology as a lens to illuminate the structural problems at stake with PSHE education. As Conrado further elaborates

> If schools or universities have these psychological and emotional support and students prefer to use AI instead of these kinds of support to solve their emotional issues, then I would say that I will question whether the university or school support is actually failing or not now, because perhaps it's how they are approaching the students that it is not effective.

Similarly, Walters states that despite the growing research on the opportunities and threats of AI on health and wellness, it should not obfuscate or deprioritize the existing range of social and emotional issues students are facing:

> Just looking at our student population, I would say they have a number of other health and wellness issues that need to be, that they need to focus on. I don't think generative AI would even crack the top ten.

Some of the most useful and productive discussions in this space emerge when students feel comfortable sharing experiences and insights from their lives, which gives more context and meaning to the advice and support that they are looking to seek. Although it is easier to seek information or ask for words of wisdom through an AI tool that will not cast judgment, doubt, or provide a condescending response, the non-specific subject content of the topic is likely to be missed. The benefits of integrative or tangential learning are significant, and AI tools pose a threat to experiencing them.

Fear of Future: Is there despondency caused by fear of the future?

With conversations around the ways that AI tools are likely to change the future of work and productivity in the coming years, it's no wonder that young learners are also feeling uneasy about the impact that this will have on them once they graduate. If they can see that AI tools are already able to produce the written content, art, music, and video that they are working hard to know about and understand, how is that going to make them feel about how they are spending their time and what they are working towards?

Many students have expressed concerns and feelings of demotivation due to the capabilities of AI, driven largely by a sense of fear and uncertainty around the relevance of their current learning in relation to their future careers. For example, Khadijah noted how her friend once complained about how she "doesn't really feel like learning because what's the point [given that] AI is gonna take our jobs in the future." Similarly, Conrado reflected on how his peers are discouraged from completing assignments independently, deeming tasks that could be completed by AI as irrelevant and worthless, "Some students seem to think that perhaps the projects or homework that the teacher gives us is not worth putting [our] time in doing them as they could be easily made by GPT AI tools."

However, the fear of being replaced by AI does not always lead to a lack of motivation. In many cases, it has prompted students to rethink and re-strategize their educational pathways. Khadijah, for instance, explains how the proliferation of AI prompted her to broaden her degree specialization:

> Artificial intelligence kind of scared me like I did start believing that, you know, what if in the future there's less scope for journalism because of AI? So it scared me to a point that I changed my major from just journalism to media as a whole, so I would have more options.

Furthermore, she elaborates on her opinion and observation on the shift in learning away from the sole acquisition of subject- or career-specific skills:

> In a more general point of view, there would be students right now who are probably not going towards a specific career or specific skill that they want to learn because they feel like there's no need for it anymore, or there would be no need for it in the future. So, like, why waste our time right now learning this when in the future there'll be AI to take care of it?

Khadijah's comments resonate with broader speculations about pivoting the purpose of learning from procedural how-tos towards deeper questions of 'what does one care about?' and 'why do you care?' (Fridman & Wolfram, 2023).

Exploring nuanced and alternative perspectives on the relationship between AI and future careers is a first step. Conrado explained that AI does not simply replace jobs in totalizing ways but rather "changes every aspect of our jobs." For example, there is increasing evidence that AI can improve programming "in some particularly interesting ways." It is also important to examine the role of AI when "thinking about politics'' and "solving different global issues like climate change."

> **A core tension has emerged: Many teachers want to keep AI out of our classrooms, but also know that future workplaces may demand AI literacy. What we call cheating, business could see as efficiency and progress. The complexities, opportunities and decisions that lie between banning AI and teaching AI are significant.**
>
> **– Watson & Bowen (2024)**

As such, conversations must be encouraged on broader institutional and ecosystemic levels. For example, Ben Hunter noted how he recently went to a university career fair hosted by multiple universities but "not a single [presentation] touched on AI." This lack of awareness and forward-thinking is further materialized in the attitudes of current seniors approaching university, who are "not really taking AI in consideration when planning their careers, and then they're going forward as if it was just normal business as usual."

Relating back to social and emotional development, it is essential that we also take into account the sense of purpose and motivation that young people derive from their experiences with teachers and peers as learners. If there is no sense of aspiration or an unrelinquished fear

about what is coming next, then this is sure to have an impact on the social and emotional development of young learners across the school community. When considering ways that young people might be better supported and encouraged as the capabilities of the technology are enhanced, providing ground reassurance and confidence has to be high on the list of priorities.

Section 4
The Role of Trust

When taking the previous chapters into consideration, it is clear that trust plays an underpinning role in directing AI's implications for students' socioemotional well-being. However, as we will further elaborate, the role of trust is fluid, context-dependent, and can be variously interpreted.

Blind Trust and Demystified Trust

Here, we distinguish between 'blind trust' and 'demystified trust' towards AI—the former denoting uncritical adoption and dependence on AI, the latter denoting scaffolded adoption with a critical understanding of AI. Specifically, in terms of demystification, we want to clear up a common misconception: Many people think that data and algorithms are 'neutral' technologies that make 'objective' and 'rational' decisions to reduce human biases. However, this is not true (Bassett, 2023). It is crucial to cultivate a critical understanding that the data sources and algorithms underpinning AI-generated content in fact come from, and thereby mirror, the inequalities present in our educational and social environments (Williamson, 2023). In this sense, a certain degree of 'distrust' and skepticism is, in fact, a crucial step away from 'blind trust' towards 'demystified trust'.

Different Aspects of Trust

Can AI be trusted with the information it provides?

A prominent concern voiced by both students and teachers is their distrust of AI's capability to produce accurate and unbiased information. When given a prompt, the large language model (LLM) underpinning the AI does not find answers from a single fact-checked source, but rather taps into its large dataset curated from numerous sources, then synthesizes the information with the most probabilistic relevance. In other words, LLM-driven AI does not produce what is definitely correct, but rather what is most probably correct (Gulson et al., 2022). As a result, AI often 'hallucinates'—generating textual information without knowing or fact-checking its accuracy. Furthermore, the ways in which AI hallucinates are highly unpredictable (Kalai & Vempala, 2024). For example, Felicita describes how when she and her classmates asked AI to generate computer codes, the code was wrong, but "not wrong in the way that [they] thought it might be."

As such, extra steps of validation are always needed to compensate for any inaccurately produced information. As Victoria describes, AI-generated content often sounds "robotic" and "doesn't always make sense," thereby it requires "deeper investigation into its authenticity." Similarly, Cemre notes that when "the things that AI gave [her] are wrong or not valid,"

she checks whether they are "something searchable on the internet." This is substantiated by Walters, who observes that his students "implicitly trust what they get from Google as being true and factual, but ChatGPT they tend not to."

Distrust in AI stems not only from its production of inaccurate information but also from biased information. Given that AI is trained on large amounts of data and big data itself reflects the material inequalities in our lives (Williamson, 2023), AI inevitably generates and reinforces biases. As Cemre describes, when using AI to practice speaking during French class, "Without even saying whether the voice should be women or men, AI was giving men voices, men scenarios."

Furthermore, AI's evaluations are often based on a homogenized standard due to it being trained on data from the majority population, disregarding the cultural differences of marginalized groups or simply the contextual factors within a classroom environment (Treviranus, 2023). As Kerem explains his case,

> I asked for feedback from ChatGPT and it gave me an approximate score which was like twenty points lower than the grade I got from my teacher... So I don't know, I am not trusting it as much as I used to.

The biased and inaccurate AI evaluation of Kerem's essay is, as Broussard (2023) would argue, 'more than a glitch'. Within education, the systemic injustices produced by personalized AI and intelligent tutoring systems (ITS) have been increasingly documented. For example, Dixon-Román et al., (2020) analyze how Essay Helper, an essay scoring algorithm, is predominantly trained upon sample essays written by native English speakers and scored according to standardized state rubrics. As a result, the algorithm assumes that all students have similar background knowledge and writing approaches, systematically discriminating against the non-native English speakers or simply those writers whose rhetorical styles fall outside the 'norm'.

AI, like any other technology, is not neutral and bias-free. The data and algorithms that constitute AI systems are largely derived from, and thereby perpetuate, our everyday contexts and environments pervaded by biases. It is with this understanding we contend that biases are not necessarily undesirable; rather, they are intrinsic to social relationships and core to diverse thinking. Instead of bluntly advocating for eliminating bias as a solution to all problems, it is more important to engage in conversations and with diverse viewpoints and positionalities. This allows young learners to reach an open understanding as to why people have different relationships with AI, and therefore different degrees of trust and distrust in AI.

Is AI considered to be more trustworthy than teachers?

A more nuanced dynamic we found, however, is the delicate balance between students trusting AI and trusting their teachers. Although AI does not always provide completely accurate or unbiased information, students generally find AI useful because of its expertise across a broad array of subjects and topics. For example, Victoria states, "I was really surprised how well I understood things and how it could give me some answers that my teacher couldn't," yet also acknowledges, "Maybe I'm trusting too much in ChatGPT." Sawaira adds that AI enhances her knowledge expertise, "My textbook has such outdated information… I'm considered a biology expert because I get all my information from GPT now." Felicitas also commends AI for being capable of "introduc[ing] complex, yet accurate, problem-solving approaches."

Beyond AI's vast knowledge base drawn from diverse sources and subject areas, students perceive it as useful in offering both immediate feedback for academic learning and mental health guidance. "It was really great to have [AI] at my time in that time of need," states Victoria as she highlights AI's role as a readily available tutor for immediate clarifications. Conrado similarly expresses that he feels "more comfortable asking AI to give [him] feedback on [his] essay or on [his] research."

Additionally, the ease of striking up an immediate conversation with AI also means reliance on AI in terms of mental health issues. Selin notes how her friend "was suffering from really bad mental health issues" and "talked to an AI system that helped them to be more at ease…" Cemre similarly describes her experience:

> Even though I don't use AI's advice, I just feel kind of comfortable with the situation [of using AI] when there is something bad going on there's something inappropriate going on… I ask AI, what should I do? I feel really sad. I feel really sorry. And it just says, 'It's OK, maybe you can talk to someone, maybe you can do this.' And it kind of makes me feel better about the situation.

However, these instances do not indicate that AI is replacing the role of teachers. Students continue to express the need for human interactions, and contend that they typically use AI only when in-person support is not available. For example, Khadijah states that AI has given her the ease to go through projects and assignments on her own if she ever needs help, but it is "honestly not that helpful in the sense that there is still the need for feedback from an actual being."

Similarly, Conrado emphasizes that despite AI being useful, it can only at maximum be considered as "an academic professional rather than an advisor." Specifically, AI "brings problems with regard to socializing" and does not provide the same benefits as "being able to communicate with the teachers who are in charge of supporting students throughout their learning paths in the emotional way." This is because the teachers "have more information and more context that [AI] wouldn't have even if a student is writing an essay about it."

We can see here that students are not necessarily turning to AI because it is more trustworthy than teachers. Rather, they view it as a useful alternative when in-person support and feedback from educators fall short. This suggests that while AI can provide personalized guidance, it cannot fully replicate the nuanced social and emotional support inherent in human interactions. In education, true personalization remains rooted in the irreplaceable authenticity of teacher-student relationships.

How does AI affect trust in academic integrity?

Another recurring theme is feelings of distrust and unfairness regarding students' use of AI to cheat on assignments. For example, Cemre expresses her discontent with her peers using AI, "Sometimes it feels like other people are cheating and not everybody is getting the grade that they earned." On the other hand, Khadijah talks about how unfairness and distrust can also manifest in the absence of using AI:

> So our teachers would get more suspicious about our work like 'Oh, did you just use ChatGPT for it?' And then like, I feel like that can impact a student very negatively if you're gonna, you know, not give them credit...

Ashish, however, demonstrates that as a teacher, he is not concerned about his students' academic misconduct per se, pointing out that cheating can happen with or without AI either way. Instead, he gestures towards building a supportive and trustworthy space that cultivates integrity and personal growth over merely policing dishonest behavior:

> It's not ChatGPT, like I've seen people cheat when there was no technology. So it depends on them and that's where an educator can really mold them if you make an environment which is safe for them. They won't even think about those [acts of cheating]... Maybe the goal is to help them be better people... I'm strictly against the idea of cheating. I've never endorsed it. But I also know that if people want to do it, they will, they'll find ways of doing it.

This perspective is substantiated by Horace Luk, "Trust means... How do we understand our students? I think if we understand our students, well, we have to trust them because we know them before." In creating an environment where students feel valued and understood, students are less likely to resort to cheating and more inclined to embrace the learning process genuinely.

Building an Ecosystem of Trust

How, then, do we shift from blind trust to demystified trust in AI? We argue that this requires broader trust-building efforts on institutional levels through positive scaffolding and support. In the following, we outline three factors contributing to building an ecosystem of trust when it comes to AI in education.

Positive Perceptions and Scaffolding
Firstly, when considering fostering a supportive ecosystem for AI adoption in schools, we note that students' attitudes towards AI can be heavily influenced by their teachers. For instance, Luis Cravioto comments that in cases where students do not proactively use AI, it could be attributed to the lack of introduction from teachers:

> There's no scaffolding... 'My teachers are not using it. My teachers are not mentioning it,' so [the students] will go like, 'You know what, I'm not trusting it just in case if they don't, they don't think it's useful. I don't think it's useful then.'

Similarly, Hunter highlights that students tend to look for signals and confirmation from their teachers when it comes to using or trusting AI:

> It is difficult for students to trust AI when they are often dissuaded from using it by teachers and adults, adults don't trust it enough. And thankfully, it seems students are taking this as a consideration to whether or not to trust it... So students are looking for guidance or signaling from teachers before they're able to even consider developing trust in this technology.

While it is true that students nowadays are increasingly exposed to multiple streams of influences from their social environments and the media, teachers remain as an important source of authority and role model. Felicia, for instance, elaborated on how her perspective on AI changed when her computer science teacher proactively introduced AI to the class:

> I tried to not to use [AI] because it happened to me before that in many cases, it gave me answers that were not the ones that I needed. But at this subject, it was a teacher who invited us to use it... He just showed us that it is interesting to use [AI], but to always trust in the process of learning of ourselves and to see that what we think is not always wrong... This changed my perspective on ChatGPT because I said 'OK, it is useful and it depends on the way that you introduce your problem'.

As demonstrated, what we mean by scaffolding 'positive perceptions' here is not asking teachers to extol the transformative capabilities of AI, but rather to adopt an affirmative approach that centers on students' learning processes. In this way, students can develop confidence in their ability to effectively engage with AI, rather than blindly trusting the AI systems themselves.

AI Literacy as Proactive Experimentation

We do recognize, however, that oftentimes teachers themselves may not have the resources or support in developing the skills and confidence to effectively use AI in the first place. As Luk notes, "Some of the teachers may not be well-equipped [to use] the technology... They also have the uncertainty about building on trust and also the AI."

Like any form of IT skills training, it is important to recognize that teachers' applied knowledge of AI should not be assumed but rather taught and modeled. However, unlike traditional computer literacy training where one passively learns how to install and run Excel, type and edit texts, or browse the internet by mostly following step-by-step instructions (Kegel et al., 2019), **AI literacy training is a highly proactive process of ongoing usage and reflective experimentation. It is through this activeness that one becomes a critical user who not only knows how to use AI, but is also aware of its potential and limitations** (Ng et al., 2021).

> **On some tasks AI is immensely powerful, and on others it fails completely or subtly. And, unless you use AI a lot, you won't know which is which.**
>
> **— Ethan Mollick (2023)**

We note that the degree of demystified trust in AI is highly correlated with one's AI literacy. As Walters summarizes, one way to demystify AI is to "treat it as a learning opportunity and support for student learning without the sort of visceral response." Indeed, the constructive process of learning and navigating through hands-on experimentation with AI reduces alarmist attitudes, as Victoria notes:

> I feel like at the beginning of the whole development of AI, I didn't really know much. So I didn't really trust it at all. I felt like it was gonna give me the wrong answers. I wasn't gonna be able to navigate it because I didn't have the skills or the tools to do it. No one ever taught me how to navigate AI and so I didn't really trust it at the beginning. It wasn't until I started learning more about it like getting in touch with it actually using it.

There is a growing body of literature and initiatives underscoring the need to cultivate learners' and educators' AI literacy and more general digital competency (Chandra et al., 2023; Falloon, 2020; Faruqe et al., 2021). We will further explore how a holistic AI literacy curriculum should look like in our recommendations section.

Building a Scale of Care

> **What if school was the scale at which we could care for each other and move together. In my view, at this moment in history, that is really what we need to learn most urgently.**
>
> **— Alexis Pauline Gumbs (2021)**

As we have highlighted throughout the paper, authentic in-person interaction remains at the core of schooling, regardless of the level of AI adoption. For example, Cemre emphasizes the importance of the 'classroom climate':

> I think this classroom climate is important for keeping those relationships between teachers and students genuine, because if a student doesn't feel comfortable talking with a teacher or maybe a counselor, then they won't talk to them. Instead, they find another way to solve their problem to get feedback.

While students may have various alternative support systems beyond the school, we have already seen that more recently, many are becoming increasingly reliant on AI for social and emotional guidance, particularly when they feel a lack of genuine care and trust in their immediate social environment.

More broadly, it is also important to recognize that whenever new technologies are introduced to schools, the scaling of innovative educational ideas does not happen through mere technology distribution, but through movement-making and community building: Engaging communities of faculty, teachers, and learners in an ecosystem where pedagogical exploration can thrive alongside technological innovation (Reich, 2023).

Section 5
Recommendations for Student Support Staff

We refer to both 'pastoral' and 'student support' staff in schools in this paper. These terms refer to school staff with similar responsibilities, though we understand that titles and terminology may change from country to country.

We fully understand that timetables are jam-packed as they are and that teachers are already overburdened with the amount that they have to fit into an academic year, without having to make room for 'nice to have' extras. However, based on our findings so far, the conversations that we are continuing to have with teachers and students, and the cases that we are being presented with from schools, finding ways to support these recommendations is no longer a 'nice to have'. If 'preparing young people for the future' is a part of your school's mission, then these recommendations will prove more critical than achieving the highest academic results.
Indeed, although we have provided recommendations for educators here specifically, we understand that decisions will be made by Senior Leaders, Board of Governors, and the Department for Education. Regardless of your position in your school community, we encourage you to champion these initiatives wherever possible.

Educators with a remit for student emotional support in schools may not always have full oversight of day-to-day programming. However, we encourage as much student support in navigating this new technology as a consequence of this research and our understanding of the short-medium implications of its evolution in education, the world of work, and beyond. These recommendations are not technology-focused, but are implementable regardless of levels of access to digital tools.

1. Prioritizing Genuine Connections

We promote the idea of organizing regular group activities, such as team projects and collaborative problem-solving tasks. This could involve group discussions where students can engage face-to-face and build interpersonal relationships. For example, allocate time during class for group brainstorming sessions or organize electives outside of standardized curricula that focus exclusively on teamwork and communication skills.

2. Encourage Activities that Promote Resilience Building and the Development of Coping Mechanisms

Integrate mindfulness practices into the curriculum by offering short meditation sessions or relaxation exercises during the breaks. Additionally, establish peer support groups where students can share coping strategies and provide emotional support for one another. For instance, create a peer mentoring program, where older students offer guidance and encouragement to younger peers facing social challenges, then ensure the older students have the opportunity to reflect and give feedback to a member of school staff with a student support function on their experiences.

3. Address AI-Related Concerns Head On

Host regular, student-led, forums or town hall meetings where students can express their concerns and ask questions about AI and its impact on life, learning, and work. Invite speakers, such as AI developers, experts, and educators, to provide accurate information and debunk disinformation around AI and its use. This could involve panel discussions on AI ethics or practical ways that students can use this technology to help them in day-to-day life.

4. Make Time in the Timetable for Reflection

Incorporate case studies or real-world examples of ethical dilemmas related to AI into classroom or form time discussions. Encourage students to analyze and discuss the implications of AI tools on various aspects of society, including employment, data protection, relationship advice, privacy, and social interactions. This could involve group projects where students research and present on ethical issues in AI development, use, or implementation.

5. Highlight Best Practice of Student Advocacy

Establish student-driven committees or councils focused on technology integration and digital citizenship. Provide opportunities for students to propose ideas, suggest improvements and advocate for changes in AI guidelines and policies across the school. Ensure that their recommendations are fully taken into consideration and that this process is transparent, no matter the outcome. Creating student advisory boards tasked with reviewing and providing feedback on new AI tools or platforms being considered for implementation would be a helpful way of achieving this.

6. Ongoing Education for Staff and Students

Offer workshops and training sessions on digital literacy and online safety to mitigate some of the concerns raised throughout this research. This could cover topics such as identifying misinformation or hallucination, protecting personal data, and perhaps adopting a framework for positive online relationships. Common Sense Media is a great place to start for this. Provide access to resources such as educational videos and articles that address the social and emotional implications of technology use. For example, partnering with local organizations or experts to deliver presentations and seminars on digital well-being and responsible technology usage could make a positive difference.

Section 6
Recommendations for Schools

What does positive scaffolding look like? Because there is a lack of structuring and a lack of scaffolding around how these tools can be used. That's not to say that these tools are inherently bad. But unless there is a specific curriculum or there are electives that can be built around these new behaviors, the issues and concerns raised within this research are likely to become amplified.

1. Pay Attention to Local Contexts

When developing new AI strategies and solutions for schools, we stress that there are no one-size-fits-all approaches. Each school, each classroom, each student and teacher may be facing different challenges and opportunities, hence, evaluating and catering to local contexts should be at the core of any systemic adoption of AI in educational settings.

> **We need to ensure that enough people understand the subtler and more nuanced implications of what AI can and cannot achieve either directly or indirectly, in order to ensure that the appropriate ethical and regulatory mechanisms are in place.**
>
> **– Rosemary Luckin (2018)**

Based on our conversations, we summarize four key aspects to consider when localizing AI adoption. In the following questions, we use the term 'innovation' instead of solely 'AI' to recognize that AI adoption in education is not as simple as implementing and scaling up the use of the technology. Rather, it must be accompanied by systemic changes in culture and educational practices to facilitate a positive and healthy use of AI.

1. **A**ttitude: How open or risk-tolerant is your school when it comes to innovation?

2. **B**andwidth: What are the enablers and blockers that influence your schools' capacity to innovate?

3. **C**ultural capital: Who are the people at a structural advantage or disadvantage when innovation is adopted?

4. **D**emand: To what extent is there a genuine demand for innovation, given other priorities and factors at stake?

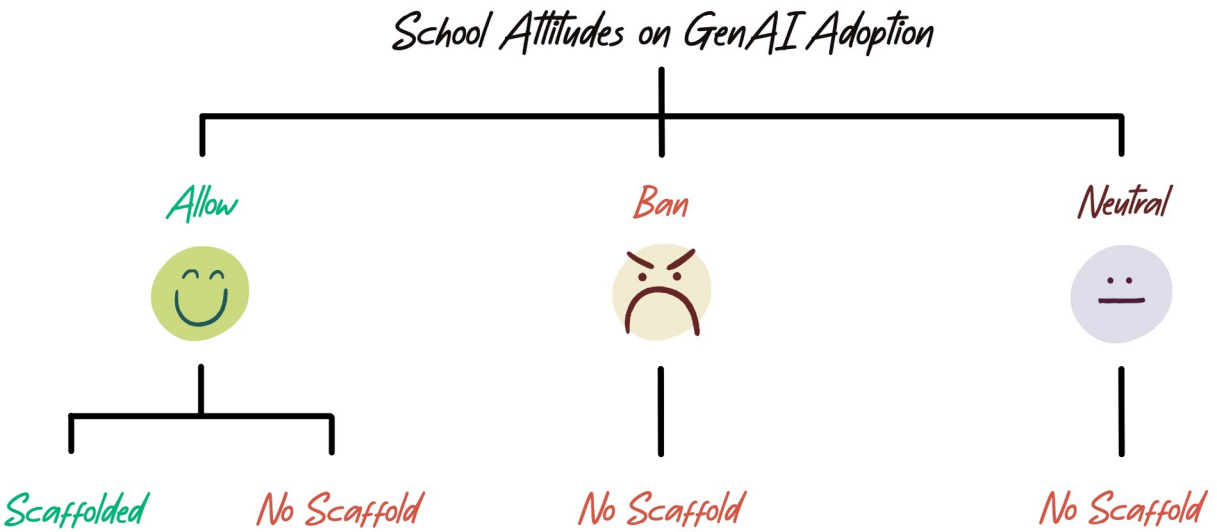
In the following, we further elaborate on each aspect.

Attitude

When it comes to schools formally adopting AI, we distinguish them by three categories: those that allow AI, those that ban AI, and those with a neutral or uncertain stance. Inevitably, there is no scaffolding provided by schools that take on the latter two stances. However, even for schools that allow students to use AI, they might not have developed a systematic approach that directs students to understand how, why and under what circumstances AI could be used to enhance their learning experiences.

Indeed, a recent policy note by Higher Education Policy Institute revealed UK-wide, "students are very apathetic overall with the support they have received from their institution" in terms of AI adoption (Freeman, 2024, p. 10): Only a fifth of students (22%) are satisfied, while 17% are dissatisfied and a majority (62%) of students are either neutral or say they do not know. This suggests that both students and institutions remain largely unclear about the appropriate support for using AI.

We understand that different schools, depending on their values, traditions, and organizational structures, may have varying degrees of risk tolerance and openness to innovation. However, we believe that those who actively engage with transparent multi-stakeholder conversations on how to best appropriately position and leverage AI in educational settings are those who strive sustainably.



Bandwidth

Another aspect to consider is whether the school has sufficient bandwidth to facilitate AI adoption. Even when a school allows and is willing to scaffold the use of AI, it may or may not have the capacity to do so on an operational level. This includes various factors, such as IT infrastructures and maintenance, training and professional development opportunities, staff time constraints, financial resources, administrative barriers, distribution of roles and accountabilities, risk assessments, and metrics (Lee, 2024).

Cultural Capital

On top of considering the attitude and bandwidth for AI adoption as a school, we note that it is equally important to consider the 'cultural capital' of individual students and their varying demographics. Cultural capital, as coined by Bourdieu (1973), is a set of assets including knowledge, skills, and behaviors with implicit economic, cultural, and social values that a person accumulates over time from their background and experiences, understood to be contributing to their 'social status' and how well they 'get on in life'.

Both the Ofsted (2019) school inspection update and the new Ofsted (2024) school inspection handbook state that school curricula should be designed to enable pupils to acquire the self-belief and cultural capital to succeed in life. They emphasized that this is particularly important for disadvantaged pupils, including those with Special Educational Needs and Disabilities (SEND), who are most likely to miss out on the exposure to the culture and situations paramount to their ongoing successes and appreciation of human creativity (Riches, 2020).

A good analogy to illustrate cultural capital in an educational context is the 'virtual schoolbag', where children do not enter school equally as a blank slate, but rather bring an invisible bag "full of things they may have already learnt at home, with their friends, and in and from the world in which they live" (Thomson, 2002, p. 1). We would like to apply the idea of the 'virtual schoolbag' to consider children using AI. As Luk points out, there is a "huge diversity of learning" where some students may be eager and well-equipped to engage with AI tools, while others may face significant challenges due to lack of access, lack of trust, or lack of necessary skills and knowledge. Similarly, Cory suggests that there may be disparities in AI adoption rates across students of different abilities and age groups, noting that "there are some people who are accelerating in it and some people who are not." For instance, "lower ability students may feel confused" and the same applies to "demographics lower down as well."

Beyond the obvious divisions by age groups and ability, we also note how more implicit cultural capitals contribute to students' relationship with AI. For example, having taught internationally, Radwa observes variations in AI adoption based on gender and sociocultural background,

with "male students [being] more excited or interested about dealing with AI tools than the female students" and "Western students—like coming from Europe or the United States—they are more comfortable than Middle Eastern or Arab students in dealing with AI in general." Radwa further elaborates that,

> Even the Middle Eastern students who study in the United States or in Europe… Although they changed the studying environment, they are still hesitant [to use AI]. So it doesn't really matter where they are based. It depends on where they originally came from and whether their original environment had promoted their confidence in artificial intelligence… It comes mainly from lack of trust and lack of experience in dealing with artificial intelligence in general.

Indeed, this is substantiated by the recent policy note from the Higher Education Policy Institute, which noted the emergence of a new 'digital divide' in AI, where "men, students of Asian ethnicity and those from more privileged backgrounds may use generative AI more and be more tolerant of it than women, White and Black students, and those from less privileged backgrounds" (Freeman, 2024, p. 14).

As such, when we encourage students to effectively use AI, we need to first acknowledge that not everyone has the same level of digital literacy, confidence, and relationship to the technology. In his talk on rethinking digital wellness, Nunez (2024) raised the issue of how students of color are disproportionately accused of using AI for cheating. Consequently, many of them are more hesitant about using AI tools, worried about academic dishonesty, and feeling that AI systems tend to 'sound white'. Similarly, in our conversations, Bettina Hohnen explains how "kids who are really stuck, like kids with ADHD or executive function challenges" are reluctant to leverage AI for learning due to fear of being accused of cheating. This phenomenon is increasingly documented, where AI fails to recognize or interpret the behaviors of neurodiverse individuals, leading to discriminatory judgments of their academic integrity (Mouta et al., 2023; Swauger, 2020).
Luis, on the other hand, also postulates the potential of AI for neurodivergent students:

> Some students in the autistic spectrum, they don't all trust people. So it might be a bit more difficult to get into a conversation with someone because we don't always respond in the same way… That's why they [could be] more tilted to bots and machines because the response is always consistent in which they can relate to.

As such, while AI typically sounds robotic and lacks socioemotional context, Luis emphasizes how "[AI chatbot] could work for some people, but it would not work for others."

Because of these different cultural capitals (or 'virtual schoolbags') that

students carry when they come into contact with AI, we call for a differentiated and contextual approach to AI implementation in educational settings. This involves asking the questions: Who is at a structural advantage when it comes to adopting AI? And who is at a structural disadvantage? We advocate for a culturally-responsive approach where not only additional support and scaffolding are provided for students who are struggling to engage with these AI tools, but also inclusive dialogues are encouraged to take into account their diverse needs and experiences.

Demand

Relatedly, we also ask the extent to which the school has a genuine demand for adopting AI, given its broader context including current priorities and other sociocultural factors at stake. For instance, working in an under-resourced area where young people constantly struggle with "gangs, drugs, alcohol, homelessness" and their parents are "disenfranchised with schools" and "disillusioned with what schools could be," Patricia Andrews-Wardell engages them in "reflective practice" and "trauma-informed practice" to help them out of their complications and circumstances. Observing how young people "put up such a defense because the world's been against them from the minute," she states, "They do need face to face. They do need to see nuance. They do need to see body language. They need to have that trust… Interacting with a computer is not really the best solution."

2. Establish Constructive Norms and Habits

In our previous research (Goodnotes, 2023), one of our primary recommendations for schools was creating school-wide AI guidelines and frameworks. In this research, we recognize that constructive AI adoption, particularly with consideration for students' socioemotional well-being, goes far beyond written guidance documents: It orients towards building the culture and behaviors for positive norms and habits.

For example, Victoria describes that in the International Baccalaureate (IB) program that she pursued, "accuracy verification and fact checking was a huge thing and getting a good framework to work with was essential." She further emphasizes that she has internalized these frameworks to the point where they become "engraved in [her] brain." As a result, she learned to engage with AI with a healthy skepticism, always questioning its outputs to ensure she does not unconditionally trust AI without verifying its accuracy.

Indeed, having well-defined structures and frameworks that guide students and teachers on how to interact with AI tools is crucial. But to sustainably address issues of misuse, overreliance, and learned helplessness in the long run, we need to ensure that these structures do

not exist as rigid or draconian rules, but rather flexibly adopted by and embedded within the greater efforts of building a culture of trust conducive to learning and socioemotional well-being, where critical and creative approaches become the norm when it comes to engagement with AI. This leads to our next recommendation addressing the question: How do we foster these constructive norms and habits?

3. Engage in Co-Creation Through Working Groups

We recognize that one of the most effective ways to build a constructive culture of trust and critical engagement with AI is to encourage frequent discussions and sharing of best practices within peer groups. This could be student-to-student, teacher-to-teacher, or a mix of both.

For example, the Marymount School of New York where Eric Walters and Don Buckley work is initiating a working group involving both students and teachers to center their perspectives in decision-making about AI adoption, as he summarizes,

> Number one, some overly draconian policy is not gonna solve the problem. Number two, bring your students into the conversation. They're the ones that are gonna be using it. Bring your teachers into the conversation as well. And like I said, that's why we're bringing them together in one group is because we want them all to have the conversation.

This collaborative, ground-up approach fosters ongoing dialogue and iteration, where students exercise their curiosity and tech-savviness in discovering AI tools, while teachers provide their expertise and experience in evaluating these tools. As Walters further notes,

> [Students] will often be the ones to discover the best tools for themselves and then they'll share it with [the teachers]... The reason we like that model is because the students are really the end users... So if that's a tool they feel that supports their learning, the best we will do our best as a teacher or as an administrator to support their use of that tool.

As such, the co-creation process requires a shift in mindset from the traditional teacher-centered model to one that values student agency. Educators need to relinquish some degree of control and to trust in the insights and capabilities of their students. This not only ensures that the AI tools chosen are both effective and engaging for the students, but also cultivates a sense of ownership and investment in the learning process. More essentially, we note that engaging in co-creation through diverse working groups is not only conducive to scaffolded and constructive AI adoption, but also a necessary form of in-person collaboration that many fear would diminish as AI becomes increasingly ubiquitous. As we have underscored throughout this research, genuine face-to-face interactions are essential to socialization, creativity, and socioemotional well-being.

> **Change won't come from heroic developers or even technology firms, but from communities of educators, researchers, and designers oriented toward innovative pedagogy and a commitment to educational equity. We need villages, not heroes.**
>
> **– Justin Reich (2020)**

4. Prepare to Handle Exposure to Inappropriate AI Content

Given the unpredictability of generated content from AI, teachers should have guardrails in place and be prepared to respond or help students navigate potentially disturbing or harmful content both within and outside of the classroom. In the past few years, there has been a growing number of resources, research, and guidelines on promoting safe online environments for children and adolescents, addressing cyber risks such as cyberbullying, exposure to inappropriate content, and privacy intrusion—primarily when it comes to social media use and gaming (Hellfeldt et al., 2019; OECD, 2019; Yusuf et al., 2023). Like any concerns with online social environments, the risk of students encountering misinformation or inappropriate content with AI tools is significant and cannot be ignored, as Walters states,

> I'm guessing that the dark side of generative AI [is that] there's probably some really disturbing stuff there that's being created and probably shared… I think we do have to have that same kind of conversation with them about generative AI, like what do you do if you get an image that's disturbing or what do you do if you do a prompt and you get text that is equally disturbing?

Indeed, child safety experts noted that AI-generated child sexual abuse material (CSAM) created by predators on the dark web has escalated since 2022 (McQue, 2024). An investigation by Stanford researchers later revealed that hundreds of known images of CSAM in an open dataset of more than 5 billion images—which anyone can access—were deployed to train popular AI image generation models (Thiel, 2023). In a parallel finding, the Internet Watch Foundation's most recent July 2024 report update on AI CASM also reported an increase of more than 3,500 AI CSAM deep fake images uploaded onto the dark web since October 2023, with over 90% of images realistic enough to be considered under the same legal assessment as real CSAM (IWF, 2024).

Given this context, schools should start engaging with multi-layered protocols and strategies that combine proactive and reactive measures. Proactive measures may include engaging students in age-appropriate discussions about online safety and digital citizenship specific to

the context of AI, such as supporting them to understand and recognize the creation and spread of deep fakes and misinformation (Ali, DiPaola, Lee, Sindato, et al., 2021; McGowan-Kirsch & Quinlivan, 2024), as well as teaching them how to critically evaluate the AI content they encounter (Walczak & Cellary, 2023). Reactive measures may include providing support services and reporting mechanisms, where students, parents, and educators can report inappropriate materials and seek help when needed (Elgersma, 2024).

5. Foreground Transparency by Documenting the Use of AI as a Learning Journey

When discussing school AI policies, a primary principle that everyone agrees on is foregrounding transparency in the use of AI to maintain academic integrity and foster trust between students and educators. As Cemre states,

> [The school and the teachers] don't really punish us for using AI, but they want us to use it transparently. If we use AI for looking for sources in research papers… Or if something is written by AI, we have to mention it.

While this approach is supposed to encourage responsible use of AI and facilitate open communication, Luk points out the challenges of implementing AI declaration policies, noting that "the students would be afraid of declar[ing] whether they have to use AI or not." This is due to the dilemma where "If [students] don't declare about the usage of AI, they may be disqualified from the proper exam. But when they declare all the stuff, they may reveal that to [the teachers]."
In response, the school collaborates with a third-party platform that tracks user prompts and can trace down "what actually [the students] prompt the message and [their] corresponding results." While these platforms are not yet common, there is emerging research and development. For instance, Kim et al. (2024) recently prototyped a Prompt Analytics Dashboard (PAD) that records essay editing history and chat logs between students and ChatGPT to support learning, mitigate misuse, and provide teachers with contextual analysis of student behaviors to improve their teaching. Luk explains that having these platforms in place signals to the students that the school "allows [them] to use the ChatGPT to do their projects… as long as they have the record." In other words, the platforms serve as an external mechanism of trust by providing an independent and verifiable record of students' interactions with AI, allowing the school to ensure transparency and accountability via external oversight while enabling students the freedom to appropriately leverage AI for learning.

However, one ethical tension is that while transparency is foregrounded through these platforms, such continuous tracking inevitably comes at the cost of privacy intrusion and might also be thought of as surveillance (Koedinger, 2023). We acknowledge that this type of tension needs to be more widely discussed and addressed.

Another more powerful and thoughtful strategy is to promote transparency by encouraging students to document their use of AI as part of a learning journey. As Walters describes, his school has developed a policy about students documenting their use of AI "not just saying like this is when [they] used it," but also reflecting on "why they used it" and "thinking about [documentation] as a journey that supports their learning." The key here is to position transparent documentation as a trustful, insightful and reflective process that scaffolds students to develop healthy and meaningful relationships with AI, rather than a punitive or controlling mechanism that deprives students of their agency and privacy.

6. Cultivate Holistic AI Literacy

What should AI literacy consist of? We argue for a holistic approach to critically using and understanding AI in terms of both its technical capacities and its social implications.

Using and Understanding AI

AI technologies such as ChatGPT automatically generate content in response to input prompts written in human languages (Wolfram, 2023). While it is easy to use on a superficial level, getting complex and more sophisticated responses from it often involves 'prompt-engineering': a skilled practice where a person carefully crafts clear instructions or questions to guide the AI's responses more effectively (Giray, 2023). Why, then, is prompt engineering an important skill to develop when it comes to AI literacy? From our conversations, we note that AI literacy should not be merely limited to knowing how to deploy AI tools to automate existing teaching and learning practices, rather, it should involve cultivating a deep understanding of the workings behind AI and ongoing experimentation with prompt engineering to improve learning and pedagogical practices.

Luk spoke about hosting workshops in his school on writing good AI prompts, including how to conduct "first principle thinking [with] the AI model" and "let AI know more about the background, the role, the information, the scenario, and so on." This process of prompt engineering requires constant refinement, and, when done rigorously, serves as an exercise for teachers and students to reflect on their circumstances, identify their stages of understanding, and explicate their teaching and learning objectives. We notice that teachers are beginning to leverage the flexibility enabled by prompt engineering to improve and innovate pedagogical practices. As Luk describes, to critically and creatively use AI to engage the students requires the teachers to "think about what the students need, what the students like." For example, he recalls how, in a lesson on learning English dialects, his colleague prompts AI to "change the dialect to Korean because the Korean K-pop is very popular in Hong Kong." This way, students could translate and compare the Korean dialect to English, and are encouraged to engage with broader perspectives by thinking beyond their usual topics and language.

All teachers we talked to came to the consensus that AI tools should be applied to nurture, rather than diminish, creativity and independent thinking. For instance, Walters states that when considering AI as a writing tool, it "should be a thought-starter, not a thought-finisher." Similarly, Hohnen expressed that she would like more young learners to access and use AI "for the benefits that it can provide and then seeing it as part of a tool [and] not the end point."

Indeed, students are leveraging AI for the same rationale. Felicitia, for instance, describes how she and her peers use AI in group work:

> Many times when we are given a task and do not really know how to start it, many of my friends type the instruction in ChatGPT and it introduces us to suggestions. From that step onwards we start thinking, 'OK, we can start like this and then change it this way.' Maybe it has facilitated us in some way and by providing that first step. I do not see it as a bad point because at least in our cases, we do not fully trust what it suggested. We just take it and start thinking over that.

One contrasting and contentious example that emerged out of our conversations with the teachers is a popular AI solution for schools—a platform that provides a suite of AI tools to help teachers effectively automate and save time on tasks such as planning lessons, creating assessments, devising individualized education programs (IEPs), and writing reports. Despite the convenience provided, Luk notes that using some AI tools often feels like streamlining the practice of teaching to "just like the fast food" or even "junk food and then a junk system," in that teachers "just select click and then put the keywords and then [they] can do the generation, but this kind of UI/UX would bring the other issue, that is they would not know how to do prompt-engineering at all." Luk's observations point to the concern that the uncritical proliferation and adoption of AI tools may lead to the authenticity of education being hollowed out, where education becomes constrained to narrow definitions of learning and measured solely in terms of efficiency (Biesta, 2010; Holmes, Persson, et al., 2022).

Indeed, one of the drawbacks of AI tools in education is their lack of a clear educational approach to how they behave. Since AI models primarily aim to give convenient answers by rendering teaching and learning 'frictionless' and 'efficient', they might not encourage students to actively engage with the learning process. This can lead to more passive learning and 'learned helplessness', where students' curiosity and critical thinking are diminished unless these tools are explicitly designed or prompt-engineered with educational goals in mind (Abdelghani et al., 2023).

In short, AI literacy is not simply knowing how to use or deploy AI tools and automations. Rather, it is about deeply understanding the affordances and limitations of the technology to thoughtfully leverage it for innovative educational use. As Walters vividly summarizes it,

> Our mission here is when it comes to using technology in education, it has to connect your learning objectives with your learning outcomes… So our goal here is that we want our students to be technologically literate so that they know which tool to use when to support their learning.

The 'Technological' and 'Human' Dimensions of AI Literacy

Globally, educational AI literacy programs and frameworks including AI Literacy: Competencies and Design Considerations (Long & Magerko, 2020), The Machine Learning Education Framework (Lao, 2020), AI4K12 (AI4K12.org, 2021) and MIT's The DAILy Curriculum for Middle School Students (Breazeal & Lee, 2022) are being increasingly adopted in schools (Miao & Shiohira, 2022). However, these AI literacy curricula predominantly focus on the 'technological' dimensions of AI, like how it works and how to create it. Meanwhile, the 'human' dimensions of AI, such as its socio-technical and ethical implications, are usually sidelined. Even when the ethics of AI are discussed, the focus often only superficially touches on biases, without delving into the deeper issues of social injustices and socioemotional impacts.

> **Yes, frequently there is a nod to the ethics of AI (usually instantiated as biases), but often this is almost as an afterthought, once the 'sexier' topics (e.g., machine learning and large language models) have been studied.**
>
> **— Wayne Holmes (2023)**

In our conversations, educators stress the importance of critically engaging with ethical considerations alongside using and understanding the technical aspects of AI, as Walters states, when it comes to AI literacy, it is important to consider, "How do you use this to support teaching and learning both by teachers and by students? And then thinking again, paralleling that with the ethical considerations to go along with it." Since AI affects all parts of society, it needs to be understood from both human and technical perspectives. For students, this means being guided on how to judge whether the AI tools they are using are effective and ethical—for example, the extent to which AI chatbots can provide genuine mental health support. For educators, this means learning and teaching how AI impacts their specific subject—for example, how AI may affect literature and art, and what it means to be human (Holmes, 2023).

The UNESCO (2022) K-12 AI curricula - a mapping of government-endorsed AI curriculum sets out three broad categories for AI literacy learning outcomes: 1) AI foundations (e.g., algorithms and programming, problem-solving and data literacy); 2) understanding, using, and developing AI (e.g., existing and new AI techniques, technologies and development); 3) ethics and social impact (e.g., privacy, bias, transparency, misinformation, advantages and disadvantages). However, a quick mapping of the hours of time allocated to each of these categories across 21 government-endorsed AI literacy curricula worldwide demonstrates that by far the most attention has been devoted to AI foundations, and substantial

efforts towards understanding, using, and developing AI. However, the commitment to ethics and social impact seems to be relatively minimal—only one-third of the hours are devoted to its more technical counterparts. As we have demonstrated throughout the research, the ethical and social implications of AI in educational settings are profound, if not essential, to consider.

7. Rethinking Critical AI Pedagogy and the Role of Educators

With AI tutors' increased capabilities to provide personalized learning and their proliferation in the market, many teachers fear that their jobs will be replaced. However, we propose that AI should not be regarded as a threat to teaching, but rather as a lens that enables teachers to reflect on and reimagine their pedagogical practices and their roles as educators.

For instance, Ashish contends that in the age of AI, educators are "not just somebody who knows stuff but somebody who knows how to facilitate a better discussion." This requires them to teach "more than just the knowledge of maybe Chemistry or Math… [just] because they have a repository with them," and become "somebody with interpersonal skills" who guides and co-creates with the students in a rapidly evolving landscape. Cravioto further adds that, more broadly, the shift in educators' pedagogic practices and roles necessitates broader systemic changes, such as rethinking "the way of assessing the knowledge from the students, not just memorizing and writing essays, but also critical thinking that will come from [engaging with AI]."

Any creative or collaborative tasks require constructive scaffolds and guardrails. In the case of AI for education, the process of designing and implementing these scaffolds and guardrails itself must be a cooperative effort: On the human-human level, involving explicit guidance and co-creative exploration on innovative pedagogies; on the human-AI level, examining how these innovative pedagogies can be thoughtfully integrated with the technical affordances AI systems. Don Buckley, for example, cultivates his students' understanding of digital systems by having them critically engage with different voice assistants developed by big tech companies:

> It was a 'build a bot' activity. So I got these prompts and tried to see how [the students] would interact with [the bots]… How would the bot respond to provocative things?… What does Siri say? What does Alexa say? What does Google say?… [The students] kept asking and asking and getting responses and seeing what would happen. So that part was engaging for them… It's super interesting.

Smart home devices and digital assistants often provide light-hearted responses and magical user experiences that divert users' attention from the opaque nature of the underlying technology. Nonetheless, by making explicit the often invisible interactions that students have with these technologies, teachers can help students become more aware of both their poten-

tial and risks (Main & Yamada-Rice, 2022). Buckley's activity design and pedagogic experimentation speak to our broader recommendation to value learning experiences outside of standardized curricula and assessments––in this context, for instance, the importance of digital citizenship in young generations' lives. At Buckley's school, new programs including "design thinking, entrepreneurship, design abilities, digital fabrication, creative computing, physical computing" are offered as electives, with more and more students recognizing them as equally important as traditional academic subjects.

Rather than allowing technology to dictate educational practices, we advocate for a critical pedagogical approach that foregrounds students' learning needs and engagement. This means starting with what is beneficial and compelling for the students, and working upwards to renovate curricula and assessments to ensure that AI adoption serves educational goals, not vice versa.

In this new paradigm, the role of educators expands beyond academic teaching to encompass mediating between AI technology and students' holistic development. This means cultivating environments where students can critically engage with AI while developing essential human skills such as empathy, collaboration, creative, and ethical decision-making, so that they do not become passive consumers of the technology. It also means helping students navigate the complex social and emotional challenges in an AI-infused landscape. This includes addressing anxieties about AI's impact on future careers, fostering a growth mindset in the face of rapid technological change, and encouraging healthy relationships with not only AI tools, but also with each other.

Of course, this is not any easy task for a single educator, but requires collaborative effort from a diverse community of multi-level and multi-disciplinary stakeholders proactively exploring and shaping what the future holds for our young generations.

Call to Action

This research is merely the tip of the iceberg. Since we began working on this project in November 2023, so much has happened in the world of GenAI, particularly from an education and a school perspective.

Instead of concluding this work by summarizing what we believe are the key points, with the hope that they might be addressed, utilized, and implemented, we want to issue a call to action for further research, dialogue, and of course, action concerning the social and emotional impact of this relatively new technology in schools.

It is pleasing to see that some governments around the world are starting to take this seriously and are thinking more broadly about the implications of the widespread use of AI from a policy level. However, beyond technical and compliance-related formalities, it would seem that we are on a cliff edge.

We hope that it won't take a tragic event or, what is more likely, a series of tragic events to take place in order for more comprehensive action to be taken from a child protection and safeguarding perspective. We need to be mindful of what this technology is already doing to the minds and behaviors of the young generation. As we have seen, AI is already impacting how they engage with the real world, and there is still time to ensure that this level of engagement is happening in a way that is beneficial instead of detrimental. Now is the time when we can start making change happen, and this can and should be starting in schools.

School staff are, for the most part, under-resourced and overworked, and there are ways that AI can be served to address that. But as communities, schools will need help and guidance in navigating this new and uncharted territory.

This is why a call to action is so imperative. If you have the resources and the capability to instigate change in education, to share knowledge and experiences as far as AI is concerned, we encourage you to explore this, to partner with educators who care enough to make a change and to keep this ball rolling. We know that we still have a huge amount of work to do in this space, and if you would like to be a part of it, we encourage you to reach out and connect with us.

References

Abdelghani, R., Sauzéon, H., & Oudeyer, P.-Y. (2023). Generative AI in the Classroom: Can Students Remain Active Learners? (arXiv:2310.03192). arXiv. https://doi.org/10.48550/arXiv.2310.03192

AI4K12.org. (2021). The State of K-12 AI Education in Your State Workshop: Executive Summary. AI4K12 Initiative. https://ai4k12.org/wp-content/uploads/2021/08/Executive-Summary-AI-Education-in-Your-State-v1.0.docx.pdf

Ali, S., DiPaola, D., Lee, I., Hong, J., & Breazeal, C. (2021). Exploring Generative Models with Middle School Students. Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems, 1–13. https://doi.org/10.1145/3411764.3445226

Ali, S., DiPaola, D., Lee, I., Sindato, V., Kim, G., Blumofe, R., & Breazeal, C. (2021). Children as creators, thinkers and citizens in an AI-driven future. Computers and Education: Artificial Intelligence, 2, 100040. https://doi.org/10.1016/j.caeai.2021.100040

Arslan, A., Cooper, C., Khan, Z., Golgeci, I., & Ali, I. (2021). Artificial intelligence and human workers interaction at team level: A conceptual assessment of the challenges and potential HRM strategies. International Journal of Manpower, 43(1), 75–88. https://doi.org/10.1108/IJM-01-2021-0052

Bassett, C. (2023). The Cruel Optimism of Technological Dreams. In J. Browne, S. Cave, E. Drage, & K. McInerney (Eds.), Feminist AI: Critical Perspectives on Algorithms, Data, and Intelligent Machines (p. 0). Oxford University Press. https://doi.org/10.1093/oso/9780192889898.003.0015

Berretta, S., Tausch, A., Ontrup, G., Gilles, B., Peifer, C., & Kluge, A. (2023). Defining human-AI teaming the human-centered way: A scoping review and network analysis. Frontiers in Artificial Intelligence, 6, 1250725. https://doi.org/10.3389/frai.2023.1250725

Biesta, G. (2010). Good education in an age of measurement: Ethics, politics, democracy. Paradigm Publishers.

Bourdieu, P. (1973). Cultural Reproduction and Social Reproduction. In Knowledge, Education, and Cultural Change. Routledge.

Braghieri, L., Levy, R., & Makarin, A. (2022). Social Media and Mental Health (SSRN Scholarly Paper 3919760). https://doi.org/10.2139/ssrn.3919760

Breazeal, C., & Lee, I. (2022). The DAILy Curriculum for Middle School Students. MIT RAISE. https://raise.mit.edu/daily/

Broussard, M. (2023). More than a Glitch: Confronting Race, Gender, and Ability Bias in Tech. The MIT Press.

Cabitza, F., Campagner, A., & Simone, C. (2021). The need to move away from agential-AI: Empirical investigations, useful concepts and open issues. Int. J. Hum.-Comput. Stud., 155(C). https://doi.org/10.1016/j.ijhcs.2021.102696

Castañeda, L., & Williamson, B. (2021). Assembling New Toolboxes of Methods and Theories for Innovative Critical Research on Educational Technology. Journal of New Approaches in Educational Research, 10(1), Article 1. https://doi.org/10.7821/naer.2021.1.703

Chandra, J. C., Irawan, I., & Irawan, H. (2023). Enhancing Learning with Artificial Intelligence for Yadika 1 Primary School Teachers. ICCD. https://doi.org/10.33068/iccd.v5i1.667

Chen, J., Hu, L., & Wu, F. (2023). Investigation into the Transformation of Knowledge-Centered Pedagogy with ChatGPT/Generative AI. Journal of East China Normal University(Educational Sciences), 41(7), 177. https://doi.org/10.16382/j.cnki.1000-5560.2023.07.016

Dell'Acqua, F. (2022). Falling asleep at the wheel: Human/AI Collaboration in a Field Experiment on HR Recruiters. Working paper. https://www.fabriziodellacqua.com/s/Fabrizio-DellAcqua-Falling-Asleep-at-the-Wheel-Dec-2.pdf

Dell'Acqua, F., McFowland, E., Mollick, E. R., Lifshitz-Assaf, H., Kellogg, K., Rajendran, S., Krayer, L., Candelon, F., & Lakhani, K. R. (2023). Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4573321

Dewey, J. (1946). Problems of Men. Philosophical Library.

Dixon-Román, E., Nichols, T. P., & Nyame-Mensah, A. (2020). The racializing forces of/in AI educational technologies. Learning, Media and Technology, 45(3), 236–250. https://doi.org/10.1080/17439884.2020.1667825

Elgersma, C. (2024, March 6). ChatGPT and Beyond: How to Handle AI in Schools. Common Sense Education. https://www.commonsense.org/education/articles/chatgpt-and-beyond-how-to-handle-ai-in-schools

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. Educational Technology Research and Development, 1–24. https://doi.org/10.1007/s11423-020-09767-4

Faruqe, F., Watkins, R., & Medsker, L. (2021). Competency Model Approach to AI Literacy: Research-based Path from Initial Framework to Model. Adv. Artif. Intell. Mach. Learn., 2, 580–587. https://doi.org/10.54364/aaiml.2022.1140

Fiske, A., Henningsen, P., & Buyx, A. (2019). Your Robot Therapist Will See You Now: Ethical Implications of Embodied Artificial Intelligence in Psychiatry, Psychology, and Psychotherapy. Journal of Medical

Internet Research, 21(5), e13216. https://doi.org/10.2196/13216

Freeman, J. (2024, February 1). New HEPI Policy Note finds more than half of students have used generative AI for help on assessments – but only 5% likely to be using AI to cheat. HEPI. https://www.hepi.ac.uk/2024/02/01/new-hepi-policy-note-finds-more-than-half-of-students-have-used-generative-ai-for-help-on-assessments-but-only-5-likely-to-be-using-ai-to-cheat/

Fridman, L., & Wolfram, S. (2023, May 9). Stephen Wolfram: ChatGPT and the Nature of Truth, Reality & Computation (Vol. 376) [Podcast]. https://lexfridman.com/stephen-wolfram-4/

"Gifted Students" Classess Offered. (1981, August 6). The Harlan Daily Enterprise.

Giray, L. (2023). Prompt Engineering with ChatGPT: A Guide for Academic Writers. Annals of Biomedical Engineering, 51(12), 2629–2633. https://doi.org/10.1007/s10439-023-03272-4

Goodnotes. (2023). Generative AI in Schools: Evolving Coursework, Homework and Assessment in the Age of AI. Goodnotes. https://www.goodnotes.com/research/generative-ai-in-schools

Gulson, K. N., Sellar, S., & Webb, P. T. (2022). Algorithms of Education: How Datafication and Artificial Intelligence Shape Policy. University of Minnesota Press. https://www.jstor.org/stable/10.5749/j.ctv2fzkpxp

Gumbs, A. P. (2021). Undrowned: Black feminist lessons from marine mammals. Soundings, 78(78), 20–37. https://doi.org/10.3898/SOUN.78.01.2021

Hayes, S. C. (2016). Acceptance and Commitment Therapy, Relational Frame Theory, and the Third Wave of Behavioral and Cognitive Therapies—Republished Article. Behavior Therapy, 47(6), 869–885. https://doi.org/10.1016/j.beth.2016.11.006

Hellfeldt, K., López-Romero, L., & Andershed, H. (2019). Cyberbullying and Psychological Well-being in Young Adolescence: The Potential Protective Mediation Effects of Social Support from Family, Friends, and Teachers. International Journal of Environmental Research and Public Health, 17(1), Article 1. https://doi.org/10.3390/ijerph17010045

Henriksen, D., Woo, L. J., & Mishra, P. (2023). Creative Uses of ChatGPT for Education: A Conversation with Ethan Mollick. TechTrends, 67(4), 595–600. https://doi.org/10.1007/s11528-023-00862-w

Holmes, W. (2023). AIED—Coming of Age? International Journal of Artificial Intelligence in Education. https://doi.org/10.1007/s40593-023-00352-3

Holmes, W., Persson, J., Chounta, I.-A., Wasson, B., & Dimitrova, V. (2022). Artificial Intelligence and Education a Critical View Through the Lens of Human Rights, Democracy and the Rule of Law. In The Council of Europe: Strasbourg, France. [Report]. The Council of Europe. https://rm.coe.int/artificial-intelligence-and-education-a-critical-view-through-the-lens/1680a886bd

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Shum, S. B.,

Santos, O. C., Rodrigo, M. T., Cukurova, M., Bittencourt, I. I., & Koedinger, K. R. (2022). Ethics of AI in Education: Towards a Community-Wide Framework. International Journal of Artificial Intelligence in Education, 32(3), 504–526. https://doi.org/10.1007/s40593-021-00239-1

Impact Research. (2024). AI Chatbots in Schools: Findings from a Poll of K-12 Teachers, Students, Parents, and College Undergraduates. Walton Family Foundation. https://www.waltonfamilyfoundation.org/learning/the-value-of-ai-in-todays-classrooms

IWF. (2024). How AI is being abused to create child sexual abuse material (CSAM) online (AI CASM Report Update). Internet Watch Foundation. https://www.iwf.org.uk/about-us/why-we-exist/our-research/how-ai-is-being-abused-to-create-child-sexual-abuse-imagery/

Kalai, A. T., & Vempala, S. S. (2024). Calibrated Language Models Must Hallucinate (arXiv:2311.14648). arXiv. https://doi.org/10.48550/arXiv.2311.14648

Kegel, R. H. P., SinCemre, M. V., & Wieringa, R. (2019, April 1). Towards More Individualized Interfaces: Automating the Assessment of Computer Literacy. BCSS@PERSUASIVE. https://www.semanticscholar.org/paper/Towards-More-Individualized-Interfaces%3A-Automating-Kegel-SinCemre/81cb445d0e08335bac2f300ea7dceb4d6315e677

Khalaf, A. M., Alubied, A. A., Khalaf, A. M., & Rifaey, A. A. (2023). The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. Cureus, 15(8), e42990. https://doi.org/10.7759/cureus.42990

Khan, S. (2024). Brave new words: How AI will revolutionize education (and why that's a good thing). Viking.

Khandwala, N. (2024, January 30). Redefining work in the age of AI (beyond the mere existence of jobs): Part I [Substack newsletter]. Future Histories. https://inklingswithnikita.substack.com/p/redefining-work-in-the-age-of-ai

Kim, D., Borowiec, K., Yatsu, D. K., & Wortham, S. (2024). Voices From the Industry: How EdTech Leaders Responded to the COVID-19 Pandemic. ECNU Review of Education, 20965311241237239. https://doi.org/10.1177/20965311241237239

Koedinger, K. (2023). Navigating Ethical Benefits and Risks as AIED Comes of Age. International Journal of Artificial Intelligence in Education. https://doi.org/10.1007/s40593-023-00350-5
Lao, N. (2020). Reorienting machine learning education towards tinkerers and ML-engaged citizens [Massachusetts Institute of Technology]. https://dspace.mit.edu/handle/1721.1/129264

Lee, S. (2024, February). AI Adoption Framework for L&D. Paradox Learning. https://paradoxlearning.com/wp-content/uploads/2024/02/AI-Adoption-Framework_v4.pdf

Le-Nguyen, H.-T., & Tran, T. T. (1 C.E.). Generative AI in Terms of Its Ethical

Problems for Both Teachers and Learners: Striking a Balance. In https://services.igi-global.com/resolvedoi/resolve.aspx?doi=10.4018/979-8-3693-0074-9.ch006. IGI Global. https://www.igi-global.com/chapter/generative-ai-in-terms-of-its-ethical-problems-for-both-teachers-and-learners/www.igi-global.com/chapter/generative-ai-in-terms-of-its-ethical-problems-for-both-teachers-and-learners/334776

Liu, Z., Vobolevich, A., & Oparin, A. (2024). The Influence of AI ChatGPT on Improving Teachers' Creative Thinking. International Journal of Learning, Teaching and Educational Research, 22(12), Article 12. https://www.ijlter.myres.net/index.php/ijlter/article/view/1817

Luckin, R. (2018). Machine learning and human intelligence: The future of education for the 21st century. UCL Institute of Education Press.

Long, D., & Magerko, B. (2020). What is AI Literacy? Competencies and Design Considerations. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, 1–16. https://doi.org/10.1145/3313831.3376727

Macit, H. B., Macit, G., & Güngör, O. (2018). A Research on Social Media Addiction and Dopamine Driven Feedback. Mehmet Akif Ersoy Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 5(3), Article 3. https://doi.org/10.30798/makuiibf.435845

Main, A., Grierson, M., Yamada-Rice, D., & Murr, J. (2022). Augmenting Personal Creativity with Artificial Intelligence: Workshop proposal for Creativity and Cognition 2022. Proceedings of the 14th Conference on Creativity and Cognition, 462–465. https://doi.org/10.1145/3527927.3531205

Main, A., & Yamada-Rice, D. (2022). Evading Big Brother: Using visual methods to understand children's perception of sensors and interest in subverting digital surveillance. Visual Communication, 21, 147035722210935. https://doi.org/10.1177/14703572221093559

Maples, B., Cerit, M., Vishwanath, A., & Pea, R. (2024). Loneliness and suicide mitigation for students using GPT3-enabled chatbots. Npj Mental Health Research, 3(1), 1–6. https://doi.org/10.1038/s44184-023-00047-6

McGowan-Kirsch, A. M., & Quinlivan, G. V. (2024). Educating emerging citizens: Media literacy as a tool for combating the spread of image-based misinformation. Communication Teacher, 38(1), 41–52. https://doi.org/10.1080/17404622.2023.2271548

McQue, K. (2024, June 12). Child predators are using AI to create sexual images of their favorite 'stars': 'My body will never be mine again.' The Guardian. https://www.theguardian.com/technology/article/2024/jun/12/predators-using-ai-generate-child-sexual-images

Mollick, E. (2023, July 15). Centaurs and Cyborgs on the Jagged Frontier. https://www.oneusefulthing.org/p/centaurs-and-cyborgs-on-the-jagged

Mouta, A., Pinto-Llorente, A. M., & Torrecilla-Sánchez, E. M. (2023). Uncovering Blind Spots in Education Ethics: Insights from a Systematic Literature Review on Artificial Intelligence in Education. International Journal of Artificial Intelligence in Education. https://doi.org/10.1007/s40593-023-00384-9

Naor, N., Frenkel, A., & Winsberg, M. (2022). Improving Well-being With a Mobile Artificial Intelligence–Powered Acceptance Commitment Therapy Tool: Pragmatic Retrospective Study. JMIR Formative Research, 6(7), e36018. https://doi.org/10.2196/36018

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. Computers and Education: Artificial Intelligence, 2, 100041. https://doi.org/10.1016/j.caeai.2021.100041

Novozhilova, E., Mays, K., Paik, S., & Katz, J. E. (2024). More Capable, Less Benevolent: Trust Perceptions of AI Systems across Societal Contexts. Machine Learning and Knowledge Extraction, 6(1), Article 1. https://doi.org/10.3390/make6010017

Nunez, J. (2024, March 5). AI's Impact on Students of Color: Rethinking Digital Wellness [Audio recording]. https://schedule.sxswedu.com/2024/events/PP142166

OECD. (2019). Educating 21st Century Children: Emotional Well-being in the Digital Age. Organisation for Economic Co-operation and Development. https://www.oecd-ilibrary.org/education/educating-21st-century-children_b7f33425-en

Ofsted. (2019, January). School inspection update. Ofsted. https://assets.publishing.service.gov.uk/media/5c41e555ed915d38a6a87aeb/School_inspection_update_-_January_2019_Special_Edition_180119.pdf

Ofsted. (2024, April 5). School inspection handbook. Ofsted. https://www.gov.uk/government/publications/school-inspection-handbook-eif/school-inspection-handbook-for-september-2023

Pani, B., Crawford, J., & Allen, K.-A. (2024). Can Generative Artificial Intelligence Foster Belongingness, Social Support, and Reduce Loneliness? A Conceptual Analysis. In Z. Lyu (Ed.), Applications of Generative AI (pp. 261–276). Springer International Publishing. https://doi.org/10.1007/978-3-031-46238-2_13

Reich, J. (2020). Failure to disrupt: Why technology alone can't transform education. Harvard University Press.

Reich, J. (2023). Iterate: The secret to innovation in schools. Jossey-Bass.

Riches, A. (2020, January 22). What does Ofsted mean by 'cultural capital'? Tes Magazine. https://www.tes.com/magazine/archive/what-does-ofsted-mean-cultural-capital

Saßmannshausen, T., Burggräf, P., Wagner, J., Hassenzahl, M., Heupel, T., & Steinberg, F. (2021). Trust in artificial intelligence within production management – an exploration of antecedents. Ergonomics, 64(10), 1333–1350. https://doi.org/10.1080/00140139.2021.1909755

Seldon, A., & Abidoye, O. (2020). The fourth education revolution reconsidered: Will artificial intelligence enrich or diminish humanity? (COVID edition). The University of Buckingham Press.

Seligman, M. E. (1972). Learned helplessness. Annual Review of Medicine, 207–412.

Sepahpour, T. (2020). Ethical Considerations of Chatbot Use for Mental Health Support [Johns Hopkins University]. http://jhir.library.jhu.edu/handle/1774.2/63294

Swauger, S. (2020, August 7). Software that monitors students during tests perpetuates inequality and violates their privacy. MIT Technology Review. https://www.technologyreview.com/2020/08/07/1006132/software-algorithms-proctoring-online-tests-ai-ethics/

Thiel, D. (2023). Identifying and Eliminating CSAM in Generative ML Training Data and Models. Stanford Digital Repository. https://doi.org/10.25740/KH752SM9123

Thomson, P. (2002). Schooling the rustbelt kids: Making the difference in changing times. Allen & Unwin.

Timmons, A. C., Duong, J. B., Simo Fiallo, N., Lee, T., Vo, H. P. Q., Ahle, M. W., Comer, J. S., Brewer, L. C., Frazier, S. L., & Chaspari, T. (2023). A Call to Action on Assessing and Mitigating Bias in Artificial Intelligence Applications for Mental Health. Perspectives on Psychological Science, 18(5), 1062–1096. https://doi.org/10.1177/17456916221134490

Treviranus, J. (2023). Learning to learn differently. In W. Holmes & K. Porayska-Pomsta (Eds.), The ethics of artificial intelligence in education: Practices, challenges, and debates. Routledge, Taylor & Francis Group.

Tuomi, I. (2022). Artificial intelligence, 21st century competences, and socio-emotional learning in education: More than high-risk? European Journal of Education, 57(4), 601–619. https://doi.org/10.1111/ejed.12531

UNESCO (with Miao, F., & Shiohira, K.). (2022). K-12 AI curricula—A mapping of government-endorsed AI curriculum.

Vertsberger, D., Naor, N., & Winsberg, M. (2022). Adolescents' Well-being While Using a Mobile Artificial Intelligence–Powered Acceptance Commitment Therapy Tool: Evidence From a Longitudinal Study. JMIR AI, 1(1), e38171. https://doi.org/10.2196/38171

Walczak, K., & Cellary, W. (2023). Challenges for higher education in the era of widespread access to Generative AI. Economics and Business Review, 9, 71–100. https://doi.org/10.18559/ebr.2023.2.743

Wang, D., Churchill, E., Maes, P., Fan, X., Shneiderman, B., Shi, Y., & Wang, Q. (2020). From Human-Human Collaboration to Human-AI Collaboration: Designing AI Systems That Can Work Together with People. Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems, 1–6. https://doi.org/10.1145/3334480.3381069

Watson, C. E., & Bowen, J. A. (2024, July 16). OPINION: What teachers call AI cheating, leaders in the workforce might call progress. The Hechinger Report. http://hechingerreport.org/opinion-what-teachers-call-ai-cheating-leaders-in-the-workforce-might-call-progress/

Williamson, B. (2023). The Social life of AI in Education. International Journal of Artificial Intelligence in Education. https://doi.org/10.1007/s40593-023-00342-5

Wolfram, S. (2023). What is ChatGPT doing ... And why does it work? Wolfram Media, Inc.

Yeh, H.-C. (2024). The synergy of generative AI and inquiry-based learning: Transforming the landscape of English teaching and learning. Interactive Learning Environments, 0(0), 1–15. https://doi.org/10.1080/10494820.2024.2335491

Yusuf, S., Teimouri, M., Ibrahim, M. S., Megat Ibrahim, N. Z., Nazri, S. M., & Victor, S. A. (2023). Let's Think They are Safe Online!: An Asian Perspective on the Classification of Children's Cyber Risks. Intellectual Discourse, 31(1). https://doi.org/10.31436/id.v31i1.1864

Appendices

Questions for Educators

1. Can you describe your initial experiences or observations with generative AI (GenAI) technology in the classroom?

2. How has the introduction of GenAI in your school impacted student engagement and learning?

3. What are your thoughts on the balance between technology-focused and traditional teaching methods in education?

4. Has your school integrated AI tools into any existing curriculum and teaching practices? If so, how?

5. In what ways have you noticed GenAI technology influencing students' social interactions and emotional well-being?

6. Can you compare the classroom dynamics before and after the introduction of AI tools?

7. What potential developments in GenAI for education are you most excited or concerned about?

8. What challenges have you encountered with GenAI in education from a social, emotional or behavioral perspective, and how have you addressed them?

9. Based on your experience, what advice would you give to other educators considering implementing GenAI in their schools?

10. Is there anything else you would like to share about your experiences or insights on GenAI in the educational sector?

Questions for Students

Twelve questions focused on the social, behavioral, and emotional impact of GenAI, for students aged 16-22:

1. Does GenAI technology impact your classroom experience in any way at this point?

2. In what ways do you think GenAI has changed your interactions with teachers and classmates if at all?

3. Have you noticed any impact of GenAI on your motivation and engagement in learning activities?

4. Can you share any experiences where GenAI has affected your stress levels or well-being?

5. How do you think AI tools influence your approach to group work and collaboration?

6. Have you experienced any challenges with GenAI and how have you managed them?

7. What are your thoughts on the balance GenAI brings between digital and traditional learning methods?

8. How do you perceive GenAI's role in shaping your future career and life skills?

9. Do you think GenAI in education has the potential to impact creativity and problem-solving skills?

10. Is there anything about GenAI in education that you feel particularly passionate about or concerned with?

11. There has been speculation regarding whether increased interaction with artificial intelligence means people-to-people relationships have become more transactional. Is this something you would agree with?

12. Are you finding more punishments are being given out for less empathetic types of behaviors (e.g., unkind behaviors, bullying, 'bad' language, expectation of teacher-pupil relationship, etc.)?

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Dr. Bettina Hohnen,
Clinical Psychologist, UCL

Cemre K,
Student, Robert College

Chelsea Luna Takao,
Senior Product Designer, Goodnotes

Chukwuemeka Ekeowa,
Secondary School Teacher, Newham PRUs

Colleen Worrell,
Director of the Burgess Center for Innovation in Teaching and Learning, St. Mark's School

Conrado T,
Student, Torcuato Di Tella University

Cory Lowde,
Former Head, Box Hill School

Crispin Dawson,
Principal, Padworth College

Daniel Davies,
Assistant Headteacher for Digital Development, Woodland Academy Trust

Don Buckley,
Entrepreneurship and Design Thinking Teacher, Marymount School of New York

Dr Lulu Shi,
Research Associate, University of Oxford

Eric Walters,
Director of STEM Education, Marymount School of New York

Felicitas QM,
Student, St. Catherine's Moorlands

Francisco Lehmann,
AI and EdTech Researcher, Head of R&D at Belgrano Day School

Horace Luk,
Assistant Principal, CCC Ming Yin College

Lord Jim Knight,
Legislator, FRSA, Chair of the Board of Directors at COBIS, Director at Suklaa

Dr Karina Baum,
Director of Global Education, BB&N School

Kerem B,
Student, Robert College

Khadijah Q,
Student, Kadir Has University

Dr. Logan Chen,
Assistant Professor in STEM Education, The University of Hong Kong

Luis Cravioto,
Digital Lead, Newham PRUs

Maia A,
Student

Meher P,
Student, Modern High School for Girls, Kolkata

Mubin H,
Student, Hong Kong University of Science and Technology (HKUST)

Patricia Andrews-Wardell,
School Governor, Felsted School

Rafał Pisz,
Chief Executive Officer, QuantUp

Sawaira A,
Student, SuperNova College

Selin O,
Student, Robert College

Thando N,
Student

Theresa Glasmacher,
Managing Director, Barbara Glasmacher Schulberatungs GmbH

Valeria S,
Student, Pontificia Universidad Javeriana

Victoria P,
Student, Universidad del Salvador

Yetty Williams,
Responsible Digital Citizenship Advocate, Founder of LagosMums

Research by:
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Dr Rebecca Mace, and
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