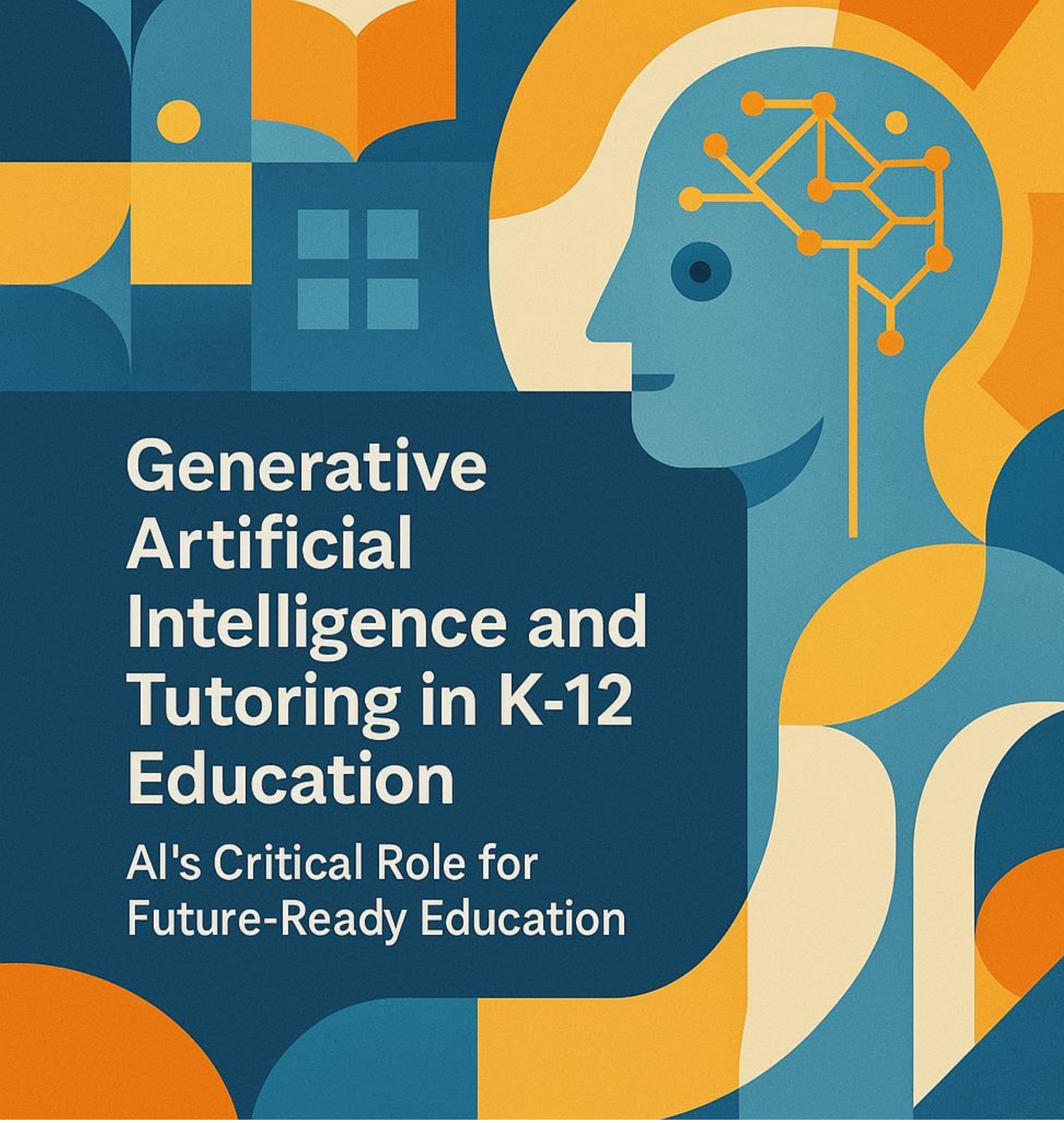

July 2025

Randy LaBonte & Michael Canuel

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Generative Artificial Intelligence and Tutoring in K-12 Education: AI's Critical Role for Future-Ready Education

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About this document

Over the past two years, the Canadian eLearning Network (CANeLearn) has conducted research on LEARN's Online Tutoring program. This document is a modified excerpt of the literature review submitted to LEARN in a June 2025 report. It provides a descriptive overview of new and emerging research on the impact of artificial intelligence (AI) on teachers, students, and schools.

The authors set out to offer background and insight into the developing challenges in the dynamically changing influences created through the use of generative artificial intelligence (GenAI) in schools and communities. At the time of writing, available research studies of AI use were typically based on small sample sizes and short study timelines (most studies discussed in this document were conducted between 2024 to early 2025 prior to publication). However, the results have been consistent among many of these early studies. The authors' focus was on meta-analyses of multiple recent studies of AI's impact on K-12 education to mitigate the limitations of the lack of long-term studies. As such, this report is a 'snapshot in time' of the current context of the impact of AI in K-12 education.

CANeLearn would like to thank LEARN for supporting this research and for the ability to share it throughout the CANeLearn network. We believe the findings and information provided will support and encourage future research for the expanding use of digital learning technologies, particularly generative AI, for those in Canada and abroad.

Table of Contents

Introduction

Navigating Risks and Realizing Transformative Potential

There is a line from a poem by Robert Frost that refers to the path not taken. The weary traveller stops and contemplates which one he should take as he stands at the crossroads, and ultimately, he decides to take the one less travelled. Education is at a crossroad as well, one for which it is neither equipped nor prepared. The introduction of Generative Artificial Intelligence (GenAI) and its subsequent exponential growth are changing almost every aspect of the world we live in, as well as industry and the workforce. This change is not slowing down and is far from peaking. The question is not whether GenAI will change education, but rather how educators will harness its enormous potential to serve the real and future needs of our students. This report explores the societal and educational context of GenAI while critically assessing its risks and challenges in education, and concludes with a thoughtful, pedagogically sound use of GenAI as a tutoring tool.

Risks and Challenges

The current educational model was built for an industrial age; however, this model no longer fits into the exponential age, where what is cutting-edge technology today becomes outdated within months and where learners need to evolve just as quickly. Clearly, conventional education falls short frequently at moments when learners require personalized and immediate attention (Castro et al., 2024). GenAI is forcing educators to foster learning in adaptive ecosystems that will serve the needs of learners and unlock their human potential, and to do so in a personalized fashion that responds to each learner's needs and context (Leon, 2024; Duane & Fisher, 2025). This represents one of the most difficult, yet promising, aspects of a world filled with GenAI tools and systems. The educational system that integrates GenAI is not merely seeking greater efficiency or automation; it is intended to provide support for both the educator and the learner. GenAI and AI Chatbots are not simply replacements; they must be used as catalysts for a deeper and more meaningful learning process.

Reliability, Accuracy, and Misinformation

This rapid growth of GenAI must be seen and evaluated with a critical mindset, one that must always question reliability and accuracy. There have been countless examples of GenAI's large language models (LLMs) providing incorrect or incoherent responses, and studies have shown that models such as ChatGPT can generate inaccurate responses up to 21% of the time (Zhu et al., 2024). While this is likely to improve over time, it remains a challenge for educators, who must foster and demonstrate to their students the value and importance of critical thinking. GenAI models are created using large datasets that, by their very nature, may contain biases that perpetuate stereotypes and thereby contribute to systemic inequalities (Mellado, 2024). It is incumbent upon all educators using AI platforms to be attentive to these potential hazards.

The Erosion of Critical Thinking

Arguably, the most controversial risk related to the use of GenAI in education is the potential to diminish a student's ability to think critically. Excessive dependence on AI-generated answers can lead students to accept information without reviewing it with a questioning eye, thereby short-circuiting the cognitive struggle that leads to deeper understanding, learning, and independent thought (Heung & Chiu, 2025). At this point, the challenge for educators is to move beyond the question-and-answer mode in which

students strive for the “right answer” and assume a passive posture, rather than actively developing critical thinking skills.

Data Privacy and Security

Parents who see their children using platforms such as ChatGPT[1], Perplexity[2], or Claude[3] instinctively become concerned about issues tied to privacy and security. These are powerful tools which, if used improperly, can become vulnerable to breaches and/or misuse (Mellado, 2024). Moving forward, it is essential that robust security protocols be in place and that clear consent mechanisms exist for learners to safeguard information, which should not be accessible to the general public or private interests.

Motivation and Cognitive Engagement

The proliferation of LLMs in the last two years is strongly linked to their ease of use. The learner enters a prompt and receives the answer, essay, or whatever has been requested. Repeated use can almost certainly be linked to a loss of motivation to engage, challenging intellectual activities or learning tasks. The illusion of knowledge—that is, believing one has mastered material simply because they have generated a quick, easy answer—can hinder genuine understanding as well as the ability to apply knowledge in new or different contexts (Mellado, 2024).

Teacher Role and Professional Identity

From the perspective of teachers and educators, the primary fear is that GenAI will diminish their value or importance in the learning process. The question they ask is whether chatbots will ultimately replace them. However, research and policy statements firmly reject these notions (Duane & Fisher, 2025) and state that, when properly directed by teachers, GenAI will augment rather than replace the vital human elements of teaching, such as empathy, mentorship, and contextual judgment (Wang & Fan, 2025). Kadaruddin (2023) argues that the potential of Generative AI, while bearing in mind the challenges in its use, enables K-12 educators to leverage AI to create a more flexible, student-led instructional style and environment that can readily adapt for tomorrow's learners.

[1] https://chatgpt.com/
[2] https://www.perplexity.ai/
[3] https://claude.ai/

Use of AI in Education: What does the literature say?

What is Artificial Intelligence?

Artificial Intelligence (AI) has three general categories: Reactive (mobile phone, FaceID, or voice assistants), Predictive (algorithms that create preferred music or video lists), or Generative (creating new text, images, and content). AI can understand language and patterns, carrying out complex tasks. It's a rapidly evolving technology that is already a part of our everyday lives.

AI has been a part of technological development for years, but ChatGPT[4] caught the world's and educators' attention as the 2022 calendar year closed. ChatGPT (Chat *Generative Pre-trained Transformer*) is an AI created to generate responses ("chat") to text-based inputs. ChatGPT can generate formulaic writing and explanations, and can even comment on CODE. At the time of its release, it was trained on data sets curated from the Internet up to 2021. OpenAI[5], the developer, released a free version of ChatGPT for research purposes with a subscription model that followed in 2023. Within two months after its release, ChatGPT set a record for the fastest growing user base (Hu, 2023). Since that time, new competitors have launched similar large language models (LLMs, a descriptive term for how the AI is "trained") such as Anthropic's Claude[6] and Alphabet/Google's Gemini[7].

LLMs collect a lot of data from users, and most privacy policies typically enable the companies hosting the AI to share that data with third-party vendors, law enforcement, affiliates, and other users (Chan & Hu, 2023; Kadaruddin, 2023; Mellado, 2024). While you can request to have your accounts deleted, the information you input into the LLM may not be deleted. Also of note, to make up for knowledge gaps (e.g., lack of training data to pull information from), LLMs will respond to the best of their ability (often generalized from any related information they might have using rudimentary reasoning, in other words, made up). As such, responses may be completely wrong, but given LLM's language capabilities, it sounds correct. Despite the limitations, LLMs can be useful tools for educators (Chen et al., 2020; Labadze et al., 2023; Laun & Wolff, 2025).

Why should educators pay attention?

The current literature on generative artificial intelligence (GenAI) in K-12 education offers only a "snapshot in time" of a rapidly evolving landscape. The rapid evolution of AI in recent months closely parallels the transformative impact of the Internet; however, not in scale nor the speed of change (Frick, 2020). In 1999, the Internet was an emerging force, rapidly expanding its user base and fundamentally altering how people accessed information, communicated, and conducted business. This period saw the birth of new industries and business models, such as e-commerce and digital media, and demanded massive new infrastructure and regulatory

[4] https://chatgpt.com/
[5] https://openai.com/about/
[6] https://www.anthropic.com/claude
[7] https://gemini.google.com/app

frameworks (Jedryszek, 2025). Similarly, the current surge in AI development is characterized by exponential growth in both capability and adoption. AI models are proliferating and improving at an unprecedented pace, driving new business models and transforming work environments in ways reminiscent of the early Internet era. The Internet's arrival created an environment where information became vastly more accessible, shifting the role of teachers from gatekeepers of knowledge to guides in a world overflowing with resources (Frick, 2020). However, while the Internet focused on communication and information sharing, AI is centred on automation and decision-making, with the potential to both disrupt and create jobs across sectors that will impact all of education.

The sense of untapped potential and rapid change that happened in the 1999 Internet change has been described as the equivalent of "dog years", where each year brings the equivalent of seven years of progress. Now, the challenge of keeping up with AI changes is more like playing "whack-a-mole", as new issues and opportunities are so pronounced and frequent that some describe the pace of AI advancement as exponential in its growth (Braaten & Farnsworth, 2024; Arizona Institute for Education & The Economy, 2024). Notwithstanding, both revolutions have required education systems to adapt quickly. The current AI wave, however, is distinguished by its speed, unpredictability, and the profound ways it may reshape teaching, learning, and the very nature of education. Just as schools navigated the sudden influx of online resources and the need for digital literacy in 1999, today's educators are grappling with AI's potential to personalize learning, automate routine tasks, and foster student agency, while also confronting concerns about equity, ethics, and the very nature of knowledge and skill building for everyone (Hays et al., 2024; Heung & Chiu, 2025).

However, GenAI's promised impact is also tempered by its limitations. These systems generate content by predicting word patterns based on vast datasets of past human writing, which means they can "make things up," reflect biases, or reinforce assumptions embedded in their training data. In this sense, GenAI can act as a distorted mirror: it reflects not just the best of human knowledge but also its flaws, gaps, and prejudices (Braaten & Farnsworth, 2024). As the literature makes clear, the challenge for K-12 leaders is not only to keep pace with technological change, but also to ensure that the integration of artificial intelligence supports powerful, ethical, and equitable teaching and learning for all students.

How should educators respond?

There have been three predominant responses from the education system regarding the use of AI: **Ban, Bend, or Benefit**. As LLMs can generate human-like responses (writing, formulas, answers to questions, etc.) from their large databases of information and writing samples, they have been banned in some school jurisdictions to avoid students using them to "cheat" on assignments. Lee et al. (2024) point out the failures of *banning* the use of AI, thrusting teachers into having to check and detect its use for cheating purposes, or forcing students into proving they did not use AI for graded assignments (New York Times, 2025). *Bending*, or adapting and adopting, is where educators teach students about the strengths and weaknesses of AI. *Benefitting* from the use of AI can be for the automation of routine tasks, a "shortcut", or using AI as a "collaborator" to augment creations (e.g. writing, designing activities, creating images, assessments, etc.).

Harmful Effects of Generative AI on Student Learning

GenAI use leads to detrimental educational outcomes

Emerging research presents concerning evidence about the negative impacts of generative artificial intelligence (GenAI) tools on student learning outcomes and academic behaviours. An often-referenced study by Abbas, et al. (2024) examined both the causes and consequences of ChatGPT usage, revealing correlations between frequent AI use and detrimental educational outcomes. An examination of the actual study indicates that, while ChatGPT can aid students in academic work, excessive use *could be* linked to procrastination, memory loss, and poorer grades. The study's methodology, which tracked students across multiple surveys on procrastination, memory retention, and academic performance, was based on a hypothesis derived from a literature review and tested on a small sample of 165 university students from several universities in Pakistan. While a causation conclusion of harm from the use of ChatGPT had been drawn by many who referred to the study based on others citing the research, the actual conclusion was that ChatGPT was useful to manage academic workloads, students should be encouraged to use it as a complementary resource for learning instead of a tool for completing academic tasks. The authors clearly stated that, without investing cognitive efforts, students would not gain from its use, and that institutions should teach students to strike a balance between technological assistance and personal effort when using artificial intelligence tools (Chen et al., 2020; Bastani et al., 2024; Labadze et al., 2023; Laun & Wolff, 2025; Wang & Fan, 2025).

GenAI-Enabled cheating

The challenges in the use of GenAI extend to encompass broader issues of academic integrity and institutional response mechanisms. Despite widespread concerns about AI-enabled cheating, Stanford researchers found that cheating rates among U.S. high school students remained relatively stable before and after ChatGPT's release (Lee et al., 2024). The researchers analyzed anonymous survey data from three high schools before and after the November 2022 introduction and widespread use of ChatGPT to determine if self-reported cheating numbers changed. They found that self-reported cheating frequency remained relatively stable; however, the types of cheating reported now included AI-related ones.

Institutional responses to GenAI have also created new problems, as AI detection tools prove unreliable and can lead to false accusations (Bhattacharjee & Lui, 2023; Wang, H. et al., 2024). Many tools struggle with false positives, incorrectly flagging human-written work as AI-generated, with false negatives and missing AI-generated content entirely (Wu, J. et al., 2025). These errors are particularly problematic in educational settings, where they can result in unwarranted academic penalties, emotional distress, and increased distrust between teachers and students. Research also shows that AI detectors often exhibit bias, disproportionately flagging work by non-native English speakers, neurodiverse students, and students from marginalized backgrounds, thereby exacerbating existing educational inequities. For example, research from Liang et al. (2023) found that detectors consistently classified non-native writing

as AI-generated and that prompting strategies employed by students could bypass GPT detectors.

To fend off false accusations, students have begun engaging in extensive self-surveillance behaviours, with some recording their entire writing processes or maintaining detailed keystroke histories to prove their work's authenticity (New York Times, 2025). This creates a paradoxical situation where the fear of being wrongly accused of AI use has led to more intrusive monitoring practices than the actual cheating itself. Such surveillance-based approaches may undermine the collaborative relationships necessary for meaningful learning experiences. Despite their widespread adoption in schools, the literature cautions that AI detection tools are neither consistently accurate nor reliable, and their use can undermine fairness and inclusivity in assessment practice (Wang, H. et al. 2024; Wu, J. et al., 2025).

Where to from here?

The speed and scope of AI's integration into educational systems have outpaced institutional capacity to respond appropriately, creating what some critics describe as a systematic disruption of educational foundations. Technology analysts point to the disconnect between rapid technological adoption and thoughtful pedagogical integration (Heung & Chin, 2025). OpenAI (2025) research found that over one-third of 18- to 24-year-olds in the US were using ChatGPT, and three out of four college-age students wanted to use AI in their education and workplaces. Among these users, over one-quarter of their messages were about learning, tutoring, and school work, according to OpenAI user data. Use included sharing papers and projects, summarizing and editing text, brainstorming, researching, tutoring, and exam preparation. So, while many students are using AI tools for legitimate study support, the lack of clear institutional guidance means that educational applications exist alongside potentially harmful uses without clear boundaries or supervision (Wang & Fan, 2025). This unregulated environment challenges educators as they struggle to provide appropriate guidance and structure when they lack a comprehensive understanding of these rapidly evolving technologies. The result is an educational landscape where students navigate AI integration independently, often without the critical thinking skills or ethical frameworks necessary to distinguish between appropriate and inappropriate uses (De Simone et al., 2025).

Using Generative AI in Support of Learning

AI tutoring effectiveness

In his influential 1984 study, Benjamin Bloom found that students who received individualized tutoring performed, on average, two standard deviations better than those in conventional classroom environments (Bloom, 1984). Numerous studies continue to reinforce the substantial advantages of one-on-one tutoring (Nickow et al., 2020; Elbaum et al., 2000; Allen & Chavkin, 2004). However, providing personalized instruction to all students is prohibitively expensive for most education systems. Bloom described this as the "two-sigma problem": the challenge of achieving the learning gains of individualized tutoring on a large scale without incurring unsustainable costs. With the advent of generative artificial intelligence (GenAI), a growing body of evidence suggests that, when used as a tutor with instructor guidance, GenAI has significant positive effects (Bimpong, 2025; Bozkurt, 2023; Deng et al., 2025; Pardos & Bhandari, 2024; Wang et al., 2025). However, when used alone by students to get help with homework, it can act as a shortcut, restricting learning (Bhattacharjee & Lui, 2023; Wang, H. et al., 2024).

Since the widespread release of ChatGPT, use of GenAI in K-12 education began to flourish (Hays, et al., 2024) resulting in a growing body of empirical research demonstrating that GenAI, particularly large language models (LLMs) such as ChatGPT, can enhance student learning outcomes when implemented within structured pedagogical frameworks (Deng & Yu, 2023; Labadze et al., 2023). Research examining the moderating factors of AI effectiveness reveals that educational context, instructional design, and implementation approach significantly influence learning outcomes (Labadze et al., 2023). The authors describe how the integration of GenAI in education impacts three key areas: homework and study assistance, a personalized learning experience, and the development of skills. For educators, the main advantages are the time-saving assistance and improved pedagogy. However, the research also emphasized significant challenges and critical factors that included concerns related to AI applications, such as reliability, accuracy, and ethical considerations.

To expand on the trends of GenAI's influence in K-12 education, Wu and Yu (2024) performed a meta-analysis of 24 randomized studies to examine the effects of AI chatbots on students' learning outcomes and concluded that AI chatbots were having a demonstrable influence. However, the use of AI chatbots appeared to have a greater effect on students in higher education compared to those in primary and secondary education. A more recent study, conducted by Laun and Wolff (2025), analyzed 62 studies across diverse educational contexts. While the studies revealed a positive effect of chatbots on learning performance in each context, the authors found that, after controlling for what they termed publication bias, GenAI was found to have a small to moderate effect in most. The authors concluded that the interaction mode, field of study, intervention duration, and educational level emerged as significant factors in GenAI's effect, and that most studies had small sample sizes over short time periods.

Another comprehensive meta-analysis examined 51 studies published between November 2022 and February 2025 revealed that ChatGPT usage produced substantial positive effects on student learning performance and academic achievement, with a moderate positive impact on higher-order thinking skills (Wang & Fan, 2025). The findings indicated that students who integrated ChatGPT into their learning processes demonstrated improved academic outcomes compared to control groups. However, the authors' analysis found that the benefits were contingent upon proper implementation and pedagogical structure rather than unrestricted access to AI tools.

It is becoming clear that the effectiveness of AI-powered tutoring is highly dependent on the presence of instructor guidance and structured learning environments. A particularly compelling example about the structure of those environments comes from a randomized controlled trial conducted by the World Bank in Nigeria (De Simone et al., 2025). The study involved secondary students who participated in a six-week after-school program using ChatGPT-4 as a virtual tutor with teacher guidance. The students using the GenAI achieved learning gains equivalent to 1.5 to 2 years of traditional schooling. The mediated program demonstrated the transformative potential of AI tutoring when properly structured, even in rural, low-resource settings. The study indicates that core to success is simply combining AI capabilities with human oversight, where teachers provide guidance and initial direction, while the AI system delivers personalized, one-on-one tutoring support that would otherwise be prohibitively expensive to provide at scale. De Simone et al.'s (2025) findings highlight that artificial intelligence-powered tutoring, when designed and used properly, can have transformative impacts in the education sector, even in low-resource settings such as those in Nigeria. However, as noted earlier, the study was completed over a short time period (six weeks), and like most studies, the long-term effects have yet to be measured.

Additional research on self-regulation indicates that AI chatbots can effectively support self-directed learning and promote self-regulated learning among students when integrated thoughtfully into course design (Behforouz & Algaithi, 2024). A qualitative review of 14 studies examining AI applications in higher education found that tools including chatbots, adaptive feedback systems, and intelligent tutoring systems successfully supported student autonomy while maintaining the delicate balance necessary to avoid undermining student self-efficacy (Chen et al., 2020).

Fostering effective adoption of AI-enhanced tutoring

Professional development and institutional readiness emerge as critical success factors for effective GenAI implementation in educational settings, particularly important for the adoption of AI chatbot use (Wang, H. et al., 2024). Studies examining teacher preparation reveal that successful AI integration requires not only technical training but also pedagogical understanding of how to structure AI interactions to support learning objectives (Wang & Lester, 2023). The research suggests that institutions must move beyond simply providing access to AI tools toward developing comprehensive frameworks and policies that include teacher training, ethical guidelines, and structured implementation protocols to enhance teachers' readiness and facilitate responsible integration of AI into educational practices (Purnama et al., 2025). De Simone et al.'s (2025) Nigerian study demonstrates that when these elements are properly

aligned, AI can deliver educational benefits that rival the most effective traditional interventions while remaining cost-effective and scalable. However, the research equally demonstrates that without proper structure and guidance, AI tools risk becoming counterproductive shortcuts that undermine rather than enhance learning outcomes.

Summing it all up

The synthesis of current research reveals that while generative AI holds tremendous promise for educational enhancement, its effectiveness is fundamentally dependent on thoughtful integration within established pedagogical structures. Meta-analyses consistently show positive learning outcomes when AI tools are embedded within structured models such as Bloom's taxonomy, paired with formative assessment, and combined with instructional design that positions AI as a supplemental rather than replacement tool (Chen et al., 2020). Mollick (2025) states that evidence suggests a clear distinction between structured and unstructured AI use: when AI is employed as a tutor with instructor guidance, it produces significant positive effects, but when used independently by students for homework assistance, it can function as a counterproductive shortcut that undermines learning. This underscores the critical importance of embedding AI tools within established pedagogical frameworks rather than allowing unrestricted access and providing training and support for teachers. The evidence strongly suggests that the value of AI in education lies not in its autonomous operation but in its role as an amplifier of effective teaching practices, requiring institutional commitment to proper training, ethical implementation, and ongoing support for educators.

Organizational Response: Policy and Practice

The challenges

Since its maiden release into the public domain on November 30, 2022, ChatGPT garnered more than one million subscribers within a week (Brockman, 2022). The generative artificial intelligence (GenAI) tool took the world by surprise with its sophisticated capacity to carry out remarkably complex tasks, reaching 100 million active users in January 2022, two months after its release (Hu, 2023). The extraordinary abilities of ChatGPT and other large language models (LLMs) to perform complex tasks within the field of education have caused mixed feelings among educators, as this advancement in AI has challenged existing educational practices (Baidoo-Anu & Ansah, 2023). Canada has been a leader in policy directions on the integration and response to AI, and was the first country to implement a national AI strategy to address the potential impacts of AI systems (Attard-Frost et al., 2024).

The rapid adoption of GenAI models among K-12 students has created unprecedented challenges for educational institutions and policymakers, with usage statistics revealing both the scale of adoption and the complexity of regulatory responses. Recent surveys demonstrate exponential growth in student GenAI usage, with Canadian data showing that 59% of students now use generative AI for schoolwork, representing an increase from 52% just one year earlier (KPMG, 2024). In the United States, Pew Research Center findings indicate that 25% of teenagers use GenAI tools, double the rate from 2023, with usage concentrated primarily among K-12 students in grades 11 and 12 (Sidoti et al., 2025).

These statistics represent a fundamental shift in how students approach academic work, with implications that extend far beyond simple tool adoption. According to John Biggs' 3P model (Barattucci, 2017), student perceptions significantly influence learning approaches and outcomes. By understanding students' perceptions, educators and policymakers can tailor GenAI technologies to address needs and concerns while promoting effective learning outcomes (Chan & Hu, 2023). The need for education systems to teach students at the K-12 level to live in a society where AI is predominant could never be more paramount and undeniable. Preparing students for the world *today,* where we have no choice but to interact with AI, is a primary and urgent matter. AI literacy is the most pressing pedagogical and cognitive challenge at the K-12 level, and one that cannot be ignored (Otero, et al., 2023).

How have educators responded?

Most educators are enthusiastically exploring how GenAI can support them, simplifying administrative tasks, supporting instructional design, streamlining assessment practices, and offering feedback support (Alier et al., 2024). Yet, Fütterer et al. (2023) found that enthusiasm among educators about GenAI's potential to support student learning is mixed. Many educators are concerned about how GenAI could circumvent learning opportunities

(e.g. cheating) or contribute to misinformation (e.g. GenAI accuracy). As indicated earlier in this report, most educational organizations' responses to the use of GenAI in schools are to "ban, bend, or benefit". As discussed, attempting to ban its use creates more student learning management problems than it solves. More importantly, it ignores the fact that we already live in an AI-saturated world and shirks our collective responsibility to instill the skills in our students to understand, thrive, and interact ethically as responsible citizens. Adapting pedagogical practices for the use of AI in education and adopting new instructional strategies is key for educators to teach students to become knowledgeable about the strengths and weaknesses of AI (AI literacy) while becoming proficient and effective in its use (AI fluency).

The need for AI literacy training

The rapid expansion in the use of AI, and our everyday interactions with it, is causing educators to address only the inappropriate student use of GenAI, rather than focusing on AI literacy and developing student skills for its responsible use (Hays et al., 2024; Wu, J. et al., 2025). AI literacy needs to become a recurring theme in professional development online and in site-based workshops, conferences, and networking discussions. Yim and Su (2024) investigated AI literacy and found that its promotion has seen significant progress in the past two decades. The research shows that project-based, human–computer collaborative learning, and other approaches have been applied frequently in AI literacy education. According to the authors, cognitive, affective, and behavioural learning outcomes, course satisfaction, and soft skills acquisition have been reported. Their paper informs educators of appropriate learning tools, pedagogical strategies, assessment methodologies in AI literacy education, and students' learning outcomes.

However, as Velander et al. (2023) report, rapid development of new AI initiatives and tools increasingly impacts us as individuals and can stymie AI literacy initiatives. The continual changes create an environment equivalent to playing the game of "whack-a-mole" with repeated changes and new strategies required. While AI literacy is trying to close the gap between research and the practical knowledge transfer of AI-related skills, teachers' AI-related technological, pedagogical, and content knowledge skills require constant updating as they are critical factors for supporting continued AI literacy.

The need for new policies on AI

There are emerging concerns about how students perceive and utilize AI tools, particularly regarding academic integrity and learning outcomes. A KPMG (2024) survey indicated that, while 75% of Canadian students reported that AI improves the quality of their work, 82% claimed AI-generated content as their own work, even though 65% acknowledged they knew it constituted cheating and 63% expressed worry about being caught. Perhaps most significantly, two-thirds of students admitted they were not learning or retaining as much knowledge when using AI tools, suggesting that short-term productivity gains may come at the expense of deeper learning (KPMG, 2024). This pattern is compounded by evidence of systematic underreporting, with approximately 60% of students reporting using AI themselves compared to 90% reporting that their peers use it, indicating potential social desirability bias in self-reporting (Ling & Imas, 2024).

The frequency and scope of student AI usage indicate that these tools have become integral to academic workflows rather than occasional supplements. Among Canadian students, 63% use generative AI tools multiple times per week, primarily for generating ideas (46%), research (41%), and editing and reviewing assignments (38%) (KPMG, 2024). International data from the Center for Digital Education (2025), citing a 2024 Chegg survey, indicates escalating usage patterns, with 57% of students inputting one or more questions daily in 2024, up from 50% in 2023. Students report using AI most commonly for breaking down complex topics and assisting with assignments, including research support, idea generation, draft creation, and essay writing and editing. However, more than half of AI users express concerns about receiving inaccurate information, highlighting awareness of reliability issues even as usage continues to increase.

The disconnect between student usage patterns and institutional policy development has created significant governance challenges for educational administrators. eSchoolNews (2025) reports that, while edtech leaders see AI having a positive impact, it is more common for US school districts to allow or disallow AI use on a case-by-case basis. A CoSN (2025) survey of educators found that, while 94% of educational technology leaders view AI as having a positive impact on education, with productivity cited as the top benefit, only 18% of employees report that their institutions have comprehensive AI policies in place. This policy gap is particularly concerning given that 80% of districts are working with generative AI initiatives, yet the majority of users describe their institutions' policies as either vague or nonexistent (CoSN, 2025). Chiu (2023) argues for policy development that focuses on three initiatives: new policies on student assessment, required teaching about generative artificial intelligence, and professional standards for AI use.

On the political front, the regulatory landscape has become further complicated by recent US federal policy developments, including proposed legislation that would prohibit states from enforcing AI regulations for 10 years, potentially creating a regulatory vacuum at precisely the moment when educational institutions need clear guidance (CNN, 2025). In Canada, a new regulatory framework, the *Artificial Intelligence and Data Act* (Government of Canada, 2025), is designed to protect communities and individuals from the adverse effects of AI systems and, as such, influences provincial education policies in a proactive manner, unlike the US policy proposal.

New directions for AI policy and practice

Student perspectives on AI regulation reveal a desire for structured guidance rather than outright prohibition, with calls for institutional leadership in developing appropriate use frameworks. Survey data from the University of Illinois, Chicago, indicates that while 50% of students express concerns about AI and academic dishonesty, 45% view AI as beneficial for learning when used properly (McKearin, 2024). Significantly, 30% of students call for more education on AI tool usage, indicating a perceived gap in AI literacy that institutions have yet to address systematically. Students consistently request clarity and guidelines, literacy programs, open dialogue about ethical use, and transparent policies that distinguish between appropriate and inappropriate applications. This student-driven demand for guidance contrasts sharply with

the current policy landscape, where only 1% of districts have implemented complete bans on AI use, while 57% use or are exploring tools to detect AI-generated work (CoSN, 2025).

The emergence of increasingly powerful AI technologies calls for the design and development of K-12 AI literacy curricula that can support students who will be entering a profoundly changed labour market. However, developing, implementing, and scaling AI literacy curricula poses significant challenges. It will be essential to develop a robust, evidence-based AI education research foundation that can inform AI literacy curriculum development (Wang & Lester, 2023).

The research evidence suggests that current approaches to student AI use are characterized by reactive rather than proactive policy development, with institutions struggling to balance the acknowledged benefits of AI tools against concerns about academic integrity and learning effectiveness (Fütterer et al., 2023). The high rates of usage combined with students' own admissions about reduced learning retention indicate that non-interfering or laissez-faire approaches may be insufficient to maximize educational benefits while minimizing risks (Lan & Zhou, 2025). Educational administrators face the challenge of developing comprehensive frameworks that provide clear guidance for appropriate use while fostering AI literacy and maintaining academic standards.

Finally, professional development and institutional readiness emerge as critical success factors for effective AI implementation in educational settings (Granström & Oppi, 2025). Research emphasizes the need for targeted professional development programs, ethical guidelines, and policy support to enhance teachers' readiness and facilitate responsible integration of AI into educational practices (Velander et al., 2023). Studies examining teacher preparation reveal that successful AI integration requires not only technical training but also pedagogical understanding of how to structure AI interactions to support learning objectives (Yim & Su, 2024). The research suggests that institutions must move beyond simply providing access to AI tools toward developing comprehensive frameworks that include teacher training, ethical guidelines, and structured implementation protocols.

Conclusion

The rapid emergence and integration of Generative Artificial Intelligence (GenAI) and tutor chatbots in education mark a watershed moment for teaching and learning. Our review has illuminated a landscape in flux, where the promise of technological innovation is matched by the complexity of its challenges. The findings from our research, along with a growing body of scholarly literature, underscore the urgent need for educational systems to adapt, innovate, and reimagine their core practices for a future that is already unfolding at an unprecedented pace.

Recent research demonstrates that, when thoughtfully integrated, AI chatbots can enhance student engagement, provide personalized feedback, and support the development of critical thinking skills (Abriata, 2025; Baidoo-Anu & Ansah, 2023; Wu & Yu, 2024). These technologies enable flexible, scalable, and equitable access to educational resources, which is especially important for underserved populations (Zhu et al., 2024). However, it is essential to recognize and address potential challenges, such as ensuring the reliability and accuracy of AI-generated information and maintaining data privacy and security (Cardona et al., 2023). Educators must also be vigilant to prevent overreliance on AI, which can hinder the development of independent learning and critical analysis (Mellado, 2024).

The findings of our review also point to an urgent need for decisive action with little time for politics and bureaucratic wrangling. The window for educational transformation is narrowing as the pace of AI development accelerates. Failure to adapt risks leaving students ill-equipped for the demands of the future workforce and society. Conversely, proactive engagement with AI-related technologies that employ sound pedagogy, integrate ethical considerations and a commitment to equity can position educators as a force for empowerment and social progress. All invested education partners must collaborate and create frameworks that will allow for the effective and thoughtful integration of AI. Furthermore, continuous research and dialogue are essential to ensure that the deployment of GenAI in education remains aligned with the best interests of learners and society at large.

Ultimately, the successful integration of GenAI-supported chatbots requires a balanced approach that leverages technological innovation while upholding pedagogical best practices and ethical standards. By doing so, educational organizations can better prepare learners for the rapidly evolving demands of the 21st century, fostering lifelong learning, adaptability, and global citizenship.

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Appendix One: How AI was used for the report

1. Search alerts, curated notes, and general Internet searches were conducted to create an environmental scan of the literature on AI.
2. Google Scholar was used to search for and source publications matching themes derived from the environmental scan.
3. AI was used as a writing assistant, with multiple generative AI tools employed to help refine writing, including ChatGPT, Claude, Perplexity, Google Gemini, and Grammarly.
4. AI tools were primarily used to transform initial concepts into draft sentences for further refinement. For example, tools were frequently prompted to "revise and update this text/paragraph(s)".
5. These revised sentences were frequently re-inputted into different AI tools to be shortened or to use simpler language. Assuming the output was satisfactory, adjustments were made to fit the context of the surrounding text.
6. An intelligent writing assistant that uses advanced natural language processing was used to detect and suggest spelling and grammar edits.
7. Finally, Microsoft's Word AI, Keenious, was used to identify additional relevant articles relevant to our research, helping us find potentially missed articles.

Human Oversight

Every output was thoroughly evaluated for accuracy and tone before being included. Most importantly, humans were in the lead so as not to limit creativity and collaboration. Humans envisioned, discussed, drafted, reviewed, and revised the resources. Finally, at all times, humans carefully checked every sentence to ensure accuracy and tone before including it and were in charge of the entire process.

The use of GenAI-supported resources in this report reflects what the authors consider to be an optimal utilization of these resources, especially in the field of research and composition. Moreover, it signals a direction for future research and applications of GenAI-supported resources.