Protecting Cognitive Development from AI Overreliance

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Abstract

As artificial intelligence becomes embedded in our society, educational environments are observing the changes made to student behavior and performance. While AI tools can offer support in terms of personalized learning and efficiency, concerns arise regarding their influence on the cognitive development of K–12 students [1]. This proposal argues that overreliance on AI in pre-collegiate classrooms may impede essential developmental milestones such as problem-solving, creativity, critical thinking, and independent reasoning. Pre-collegiate education is a formative stage in which the cognitive and social skills gained are imperative to higher learning, buildable skills, and future employability; even more than subject-specific learning. Thus, unmonitored integration of AI during these years specifically, could breed passive learning and simplistic inquiry. This report proposes a policy framework to examine and mitigate these risks by: (1) investigating the current cognitive and behavioral impacts of sustained AI tool use in K–12 education, (2) establishing grade-level guidelines for levels of AI integration, (3) implementing educational certifications required for certain AI tools to be used in the classroom. By combining developmental psychology with teacher preparation and educational administration, this initiative aims to protect child development in the era of artificial intelligence.

1   Problem Introduction

How commonly are generative artificial intelligence tools used among today's K-12 students for their schoolwork? Most people would likely expect a large proportion of students to be using these tools, but it's likely much higher than they think. While data is not available for all ages due to surveying young children not being feasible, the College Board has conducted studies of high school students, school administrators, and parents to help answer many questions about AI. According to their survey, 84 % reported using generative AI tools for schoolwork as of May 2025. This is likely already outdated due to the rapid adoption of AI tools by students for their schoolwork. In January of 2025, this was 79%. This is a 5 percentage point increase in 4 months. Right now, in December, it is likely much closer to 90% [4]. Sometime next year, it's probable that virtually all high school students are using some form of generative AI tool to assist with their schoolwork in some capacity. It is unavoidable for students, even when using a search engine such as Google or Bing for a simple question, that an AI-generated summary will be provided as the top result.

While students utilize AI a lot, this is not necessarily beneficial for their cognitive development. A study by Anthropic on how students used Claude, one of the most popular language learning models, displayed that students used Claude primarily for higher-order cognitive functions, especially for creating (using information to generate new content) and analyzing (identifying relationships between known data), these are important skills for the cognitive development of a student, and it is important for students to have sufficient practice with these skills at school. Claude was only used 1.8% of the time for remembering [3]. This would be using a chatbot as a search engine, which is something which would not harm the cognitive development of students. It's important to note this study was done with college students but if the pattern continues for K-12 students, which it likely does, this is a negative indicator.

Students seem to be aware of the negative effects of AI overreliance, despite AI's popularity, only 25% of high school students believe that the benefits of using AI outweigh the risks . 25% believe that the risks outweigh the benefits and 50% of students are unsure. Among parents, almost 60% believe it is better for students to use AI for schoolwork and 85% of administrators believe learning to use AI tools is at least somewhat valuable for students. Despite this 55% of schools report blocking

generative AI tools on the school network. Around 40% do not use generative AI usage in schoolwork at all while among the remainder, there is a lot of variation in the rules, some delegate to teachers, while others have no policy at all, and many schools have their own specific policies [4]. This lack of any universal standards among schools around AI tools and the lack of guardrails around AI for educational purposes only confuses students.

Before we get into our policy for integrating AI into classrooms, it is important to discuss why generative AI tools should not just be banned for students across the board. As stated above, parents and school administrators both believe AI can be beneficial for students to use. Chatbots like ChatGPT (used by 69% of high-school students)[4] can help give students personalized help. These generative AI tools are also increasingly being used in the workforce, Chatbots are increasingly being used to generate written content, generative AI is being used to generate images and videos for content. Coding tools like Github Copilot are being used to help develop software applications. There are many more applications of these tools and students should be familiar with them. This however does not mean students should have unlimited access. A study published in the British Journal of Education Technology in December 2024 was about Chinese students writing in English (which was not their first language). One group had access to ChatGPT, one had a human coach, one was provided a checklist and the final group had no help. The group that used ChatGPT had the best essays but they did not actually learn more about the topic they wrote about, which in schooling is one of the primary goals of making a student write an essay. AI allows students to create better work, but does not lead to the students learning. The students with access to AI were less likely to study the provided reading material. Researchers observed that the students using AI were primarily focused on interacting with ChatGPT instead of properly understanding and completing the assignment [3]. It's important for there to be a moderate solution, through which K-12 students can still use generative AI tools, which are extremely popular in the workforce, and improve the quality of their performance, whilst ensuring that the cognitive development of students are protected.

2 Proposed Policy Framework

However, this is not a be all and end all as the harms of AI overreliance can be reversed when AI is integrated in a regulated way, and the core goal of our policy seeks to do just that as we seek to make AI a supportive learning tool rather than a replacement for students' brains. The first part of our policy reframes AI as a resource that guides students through the thinking process rather than simply giving them answers. Tools such as GPT study-mode encourage step by step reasoning, giving students chances to explain their ideas, evaluate different answer possibilities, and identify mistakes along the process in order to refine their thinking.

A second component is teaching students to question AI instead of accepting its outputs blindly. Our proposed AI literacy courses train students to ask why an answer is correct, check information against trusted sources, and identify inconsistencies in AI's answers. When students practice verifying information, they retain ownership of the intellectual work required for genuine problem-solving.

The third component to our policy that introduces federal grade-level AI guidelines is implemented in order to give students the right amount of AI support at the right developmental stage. UNESCO recommends limiting AI exposure in early grades to prevent premature cognitive offloading, and gradually increasing usage as students become more capable of independent reasoning [7]. Our framework reflects this as K–5 students receive minimal AI exposure and focus on exploration, grades 6–8 use AI for guided help without losing the core thinking step when doing assignments, and high school students engage with advanced tools while still being required to demonstrate their reasoning. This structure prevents early dependence on AI while allowing older students to benefit from its productive uses. UNESCO places a large emphasis on the importance of this structured, age-appropriate AI use in schools as their 2023 guidance warns that unregulated AI access for younger students can disrupt the development of foundational reasoning skills, and recommends that early learners only receive limited, exploratory exposure to AI, with more advanced and guided use introduced gradually at later grade levels [7].

Finally, our fourth complement of the policy that allows teachers access to AI tools helps with solving the issues of a lack of critical thinking and problem-solving because AI can help reduce repetitive workload for teachers. By removing said repetitive tasks, teachers have more time to create more creative lessons, collaborative thinking activities, and multi-step problem-solving tasks in assignments.

According to Gallup, AI-assisted teachers report increased classroom engagement and more opportunities to focus on higher-order reasoning skills [2]. Rather than replacing human instruction, AI becomes a tool that amplifies the parts of teaching that build problem-solving ability. Therefore, overall, our policy on AI in Education ensures that students learn to use AI deliberately and reflectively, maintaining control of their learning and strengthening the cognitive skills needed for long-term problem solving.

3 Our Policies and Problem Solving

A core concern surrounding the implementation of generative AI in K–12 education is its impact on students' problem solving ability. As AI tools become increasingly more capable of producing accurate answers, many students are beginning to rely on AI to do their work completely for them. This, in turn, skips the essential thinking processes that support long-term cognitive development that is needed to develop strong problem solving capability. Research shows that when individuals rely on AI for quick solutions, they engage less deeply with the underlying logic of a task, leading to weaker analytical skills over time. A 2024 study found that heavy reliance on AI-generated responses reduces students' willingness to attempt problems independently and undermines their ability to detect errors or inconsistencies in solutions [9]. Similarly, another article that discusses "cognitive offloading" mentions how students who don't independently and progressively walk through their work, the brain stops practicing those skills, which leads to measurable decline in problem-solving capacity if not supported by structured learning environments [6].

These ripple effects are especially concerning in K–12 settings, where critical thinking, productive struggle, and trial and error problem solving form the foundation of intellectual growth from adolescence. When students skip these stages by lazily relying on AI to do everything for them, they lose the opportunities to make mistakes and learn from them in order to revise their thinking and build mental endurance. A 2025 TIME analysis summarizing emerging MIT findings reported that high school students, especially, who assign too much of their work to AI show significant decreases in creativity and the ability to break down unfamiliar and challenging problems in exams and assignments, which are skills that cannot be automated because they rely on internal reasoning rather than external outputs [5]. Furthermore, generative AI tools often present answers confidently even when incorrect, meaning students who do not come to question AI or verify responses develop bad habits of passive acceptance that weaken evaluative thinking. Students may end up producing high quality work, but they also end up sacrificing their own individual cognitive development that will only hinder them in the long run.

Our policies can mitigate many of these concerns with problem-solving. National standards ensure students use AI in developmentally appropriate ways and maintain problem-solving ability. GPT Study-mode AI helps students walk through how to solve a question, not just what the answer is, which improves reasoning and long-term understanding. AI literacy classes train students to ask why something is right and to verify information using multiple sources, which in turn can help them score do better on logic and problem-solving tasks when comparing AI responses with their own critical thinking. Finally, with AI handling repetitive tasks, teachers can run more inquiry-based lessons.

4 Our Policies and Creativity

Another reason why these policies' implementation is urgent is the impact of the implementation of generative AI on creativity and social skills in K-12 education. Creativity is an important developmental milestone that impacts how precollegiate students create goals, ideas, and their personalized learning style. Creativity also has a impact on the collective of groups, and organizations or corporations continue to value this even more. Harvard professor Ying Xu states that children's development is driven by their social interactions, like parents, teachers, and peers [1]. When exposed to this notion with AI chatbots, younger students especially might not be able to differentiate a real companion from a digital agent. Many commercial AI systems are intentionally designed to feel personable and attentive, which can make it difficult for young users to recognize that they are interacting with a machine rather than a peer. This effects how children form relationships and how they learn to interpret social cues. Ying Xu emphasizes how AI does not have this empathy to relate to and that could transfer, as she observed children speaking in demands more often than not with sustained use [1]. This also

influences their writing style and personal expression, with tone and phrasing that doesn't represent them, but rather a template. It can also make them less likely to question or verify the information the AI provides.

Another issue is that these AI systems are not built to express children's fledgling creativity. Very awkward and stilted at times which comes with growing pains, a University of Washington study observes how this period of their creativity was able to come to fruition with these AI chatbots. It was observed that these systems cannot interpret their ideas due to the skill mismatch, and it leads to frustration. When the AI fails to understand what a child is trying to convey, the student may adjust or even abandon their original ideas to "fit" the AI's expectations. This tendency to reshape creative concepts around the limitations can reduce the variety of ideas students are willing to explore. In the study, students even indicated they felt creatively constrained after relying on AI because the system's suggestions seem more "correct" than their own original thoughts[8]. Children also abandoned an innate sense of ethics when compromising with AI. They recognized it shouldn't be used to cheat, but wanted to compromise when used for writing recreational books or cards, when that can take out emotional value. This was recognized when a student said finding out his favorite book was written by AI would "dismantle the joy for him." This raises concerns about how AI may subtly shape moral reasoning at younger ages [8]. Many of these hiccups showed why extra teacher instruction is needed and cannot be substituted with AI.

Our policies can also mitigate many of these concerns. Implementing age-based guidelines that restrict certain AI tools to students who have a sense of self-expression and understand the limitations of the technology. This helps ensure that these systems are used by older students who can engage with AI more responsibly. Certification systems for which AI products can truly be in the classroom can also play an important role. By formally describing procedures and feedback mechanisms, schools can make more informed decisions about what enters the classroom and not support unrestricted use. Finally, when AI reduces teachers' administrative workloads, it can indirectly support creativity by giving them more time to design engaging lessons, hands-on activities, and collaborative projects. This allows the developmental milestone to remain centered on personal expression and human interaction while still benefiting from the efficiency that AI offers.

5   Collaborations

We collaborated with the group Moral Authority. When we started comparing our two policies, it became clear pretty quickly that we were actually working toward the same bigger goal. On one side, we were looking at how AI should be used in K-12 classrooms without taking away students' ability to think critically or come up with their own creative ideas. On the other side, the focus was on protecting artists through watermarking, transparency in training data, and holding AI systems accountable for how they use creative work. Once we talked it through, we realised that both policies were about making sure AI supports human creativity instead of replacing it. That connection helped us think about how responsible, transparent AI practices in schools could also encourage students to experiment more safely, learn originality instead of copying, and build habits that could influence creativity and innovation far beyond just the arts. One thing their group brought up that really shaped our thinking was the idea that protections shouldn't only apply to famous or profitable artists. A lot of artists create for expression, not money or recognition, and they deserve the same level of respect and protection. That point helped us refine our stance so that our policy wouldn't unintentionally leave out hobbyists, small creators, or communities whose work is often overlooked. It ended up making our combined approach more fair and inclusive.

At the same time, their feedback helped us see some of the ways AI is already limiting K-12 students without people fully noticing. For example, students relying on AI to produce finished work instead of learning the process, or AI tools giving answers that cut off opportunities for exploration. Hearing their perspective pushed us to clarify how our policy could fix those issues by making AI something that supports learning, rather than replacing the parts of learning that actually build creativity and critical thinking. Overall, the collaboration helped both sides reach clearer conclusions, and it showed how aligning ethical protections for artists with intentional AI use in education can create a stronger foundation for future creativity and innovation.

We also collaborated with the group Red Flags. Their group focuses on misinformation in K-12 environments, and we found ourselves tackling a lot of the same questions about how students should

be taught to use technology responsibly. Both of our policies were trying to address different parts of the same problem: students are surrounded by AI and digital content, but they aren't always taught how to navigate it. Through our discussions, we realised that teaching proper use of AI tools and teaching how to recognise misinformation require similar forms of instruction and reinforcement. That led us to a shared conclusion that the best way to measure whether students are actually understanding these concepts is through some form of testing. Not just traditional tests, but skills-based assessments that show whether students can critically analyse information, identify trustworthy sources, and use AI in ways that support rather than replace their thinking.

We were also able to help them refine the structure of their policy. Since education varies so widely across states, it wasn't realistic to assume a one-size-fits-all approach. Through collaboration, we discussed building the policy in a way that sets clear national expectations while still giving states flexibility to adapt based on their needs. A major part of this was recognising that social media and AI evolve far too quickly for a static policy to stay relevant. Because of that, we agreed that yearly policy iterations would be necessary to keep up with new platforms, new misinformation tactics, and new AI tools students may be exposed to.

At the same time, they helped us understand something we hadn't fully considered before: teaching students how to use AI in a controlled educational setting, like when they use ChatGPT for assignments, is completely different from teaching them how to interpret AI-generated content they see on social media. Those two contexts create different risks, different misunderstandings, and different learning opportunities. Their perspective pushed us to think more broadly and to emphasize in our own policy that AI literacy needs to be taught across the different environments in which students encounter AI, not just in the classroom. Overall, the collaboration strengthened both policies by grounding them in the reality of how students actually use technology today.

6   Contributions

As for contributions, everyone did their best in contributing to the success of the project. As mentioned earlier in the mid tech report, everyone had a specific part they had to do and continue to do for the final presentation. For the final presentation, Jerold focused on giving a summary of the problem we are attacking with the possible pros and cons on the use of AI in the early stages of education. Sohan was focused on our policy proposal and the things we need to implement so that we could protect the cognitive development of K-12 Students. Matthew talked about how our proposed solution could help with children's problem solving skills while using AI and not overrelying, while Uche talked about how the proposal could help children's creativity and not limit them in the long run. Finally we finish with Vincent talking about our collaborations between group 8 (Red Flags) and group 10 (Moral Authority) and how it led us to incorporate certain things into our proposal that we wouldn't have thought of otherwise.

References

[1] Anderson, J.: The impact of ai on children's development (2024), https://www.gse.harvard.edu/ideas/edcast/24/10/impact-ai-childrens-development, accessed 9 November 2025.

[2] Ash, A.M.: Three in ten teachers use ai weekly (2025), https://news.gallup.com/poll/691967/three-teachers-weekly-saving-six-weeks-year, gallup.com, Accessed 2 December 2025

[3] Barshay, J.: Proof points: Offload critical thinking to ai? (2024), https://hechingerreport.org/proof-points-offload-critical-thinking-ai/, the Hechinger Report, Accessed 9 November 2025.

[4] Board, C.: New research: Majority of high school students use generative ai for schoolwork (2024), https://newsroom.collegeboard.org/new-research-majority-high-school-students-use-generative-ai-schoolwork, college Board Newsroom, Accessed 9 November 2025.

[5] Chow, A.: Chatgpt may be eroding critical thinking skills, according to a new mit study (2025), https://time.com/7295195/ai-chatgpt-google-learning-school/, tIME, Accessed 4 December 2025.

[6] Gerlich, M.: Ai tools, cognitive offloading, and critical thinking decline. Societies, vol. 15, no. 1 (2025)

[7] UNESCO: Guidance for generative ai in education and research (2023), https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research, accessed 2 December 2025

[8] Wilne, S.: Q&a: How ai affects kids' creativity (2024), https://www.washington.edu/news/2024/05/29/ai-kids-creativity-chatgpt/, uW News, Accessed 2 December 2025

[9] Zhai, X.: Effect of over-reliance on ai tools on critical thinking. Computers & Education: Artificial Intelligence (2024)