Part III:

Research paper draft

[AI is Growing, but are We Growing with It? Exploring the Impact of AI on Student Learning and Cognitive Development in Educational Settings]

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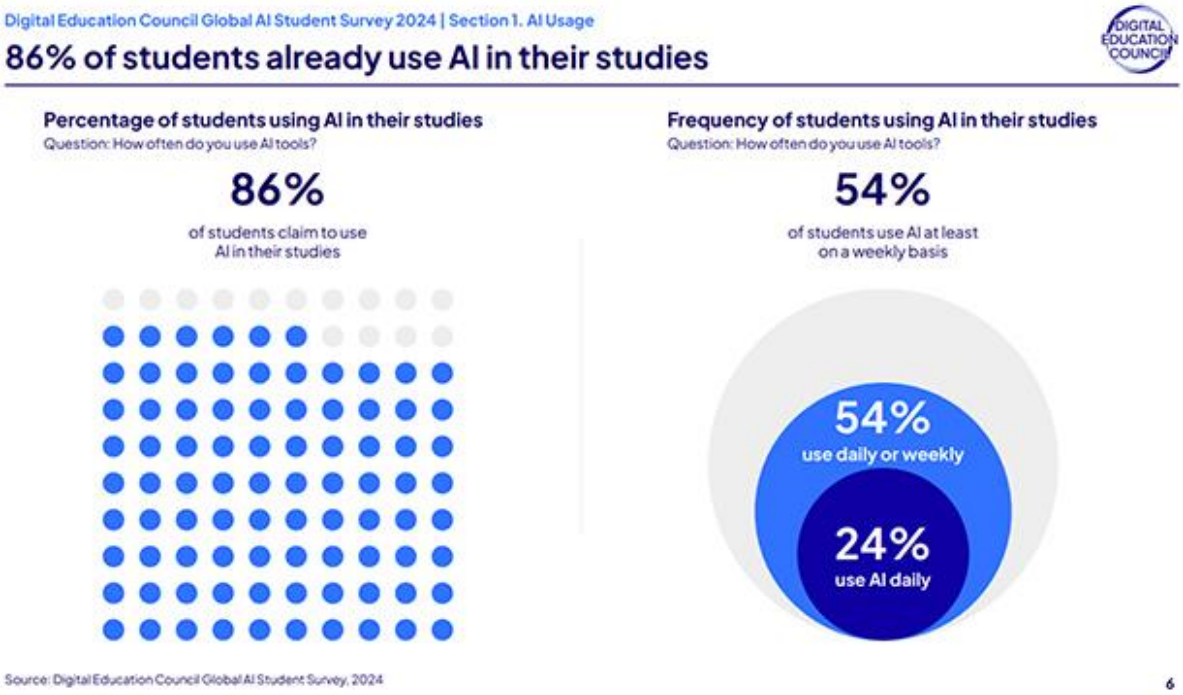
Introduction

This research paper's aim is to discover the effects of artificial intelligence (AI) on student learning and development. AI is becoming more accessible and incorporated into daily life day by day from Alexa to ChatGPT. In schools the use of different tools such as AI tutoring, AI grading, and AI personal learning have become increasingly popular. This study is dedicated to exploring the effect on the students who use these programs, but the question lies in whether it is for the better or worse. This research explores the way the current implications of AI tools help or harm students' cognitive abilities and academic performance.

Background of your Research



(Kelly, 2024) This graph shows the strong implementations of AI in students' life already

Artificial Intelligence (AI) in education traces its origins to the early development of computer systems that could simulate basic learning tasks. In the 1960s and 1970s, the first AI systems in education were designed to serve as "tutors," aimed at offering personalized learning experiences. One of the earliest examples was the creation of Intelligent Tutoring Systems (ITS), which could tailor lessons to the unique needs of individual students, based on their performance (Copeland, 2022). The goal was to provide more effective and personalized instruction, especially in areas where traditional methods struggled to address the diverse needs of students. By the 1980s and 1990s, AI applications expanded to include automated grading systems and early forms of computer-assisted learning. Today, AI tools such as adaptive learning platforms, virtual tutors, and AI-powered feedback systems are commonplace in classrooms around the world (Teachflow.AI, 2023). These systems promise to revolutionize the way students learn,

offering real-time adjustments based on individual performance, theoretically leading to smarter, more efficient learners. However, debates persist about whether reliance on AI can truly enhance a student's intellectual abilities or whether it could, in fact, hinder critical thinking and deeper understanding (Kazmi, 2024).

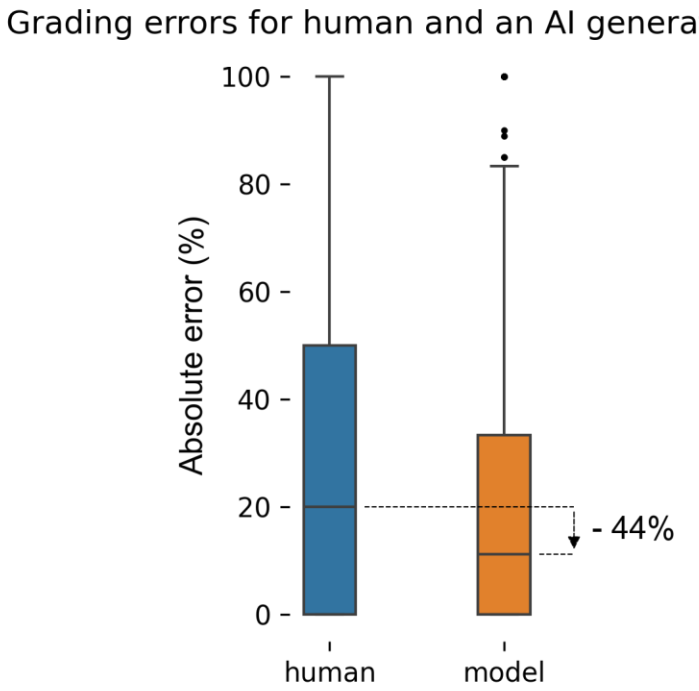
Effectiveness of AI Tutoring vs. Traditional Tutoring

The use of AI tutoring in educational systems has provided a new and improved way to teach students information. AI tutors can offer around the clock personalized learning methods to give students targeted learning help. The availability of AI also creates a better way for parents alike to build a learning schedule that works for them whereas with human tutors the cost and availability may create difficulties for both the tutor and students. The support AI provides allows for “every student [to get] access to individualized learning material” (Das, 2024). This gives equal opportunity for people of all backgrounds to receive valuable education regardless of location. AI has the tools to fill the gap between a student's strengths and weaknesses.

Although AI does provide many benefits for people around the globe there are a few invaluable things human tutoring provides that AI cannot. The main one is human interaction. The emotional connection between human tutors and their students cannot be provided or replicated by AI. Human tutors can provide emotional support and cater to an individual’s specific needs. This connection helps a student build a deeper understanding of difficult concepts and better their critical thinking. Traditional tutoring allows engagement from both parties that a computer program doesn’t prove for students. Being able to sit when a student is growing tired, frustrated, bored, etc. is vital for some people (Dr. Olga Abeysekera, 2021). The use of different tutoring options in the end is up to preference because AI’s targeted approach can be better suited for an individual’s needs to increase intelligence over human connection and vice versa.

AI grading and Feedback

AI grading systems allow for quick grading turnaround. Students can receive their scores and feedback in a short time span whereas with traditional grading they may have to wait days at a time. AI is also beneficial to the teachers because the AI feedback can help them "understand their mistakes, clarify misconceptions, and make necessary adjustments to enhance their learning outcomes" (TechFlow, 2022). This additional help provides educators with more instructional time and one on one time with students. Another benefit is the elimination of biases. AI allows for transparency and fairness because of its objective basis of grading and feedback, further providing a more equal education to all (TechFlow, 2022).



Picture from (Gobrecht & Tuma, 2024) shows that AI currently surpasses human correctness by 20%

Although AI grading and feedback is a strong and beneficial tool, it does have limitations. AI grading is strong and efficient in dealing with multiple choice and short answer

questions but can have trouble with subjective assignments. AI may have a difficult time grading material such as creative projects and essays due to its failure to replicate human thinking and processes. AI cannot replace human touch and deep understanding when “evaluating assignments that require understanding of complex ideas, creativity, and subjective judgement” (Paper, 2023). While AI can provide immediate grading and corrections it cannot give proper feedback that engages deeper thinking and fosters problem solving skill development needed to make students broadly “more intelligent.”

Tailored Learning and Cognitive Development

One of AI’s biggest strengths is its ability to deliver tailored/personalized learning experiences. This resource can work for student’s individual needs especially those that have trouble in large traditional settings where instructors must teach to the whole versus the few. “AI helps students learn at their own pace and enhances their understanding of the material” (aqua, 2023). Teachers responsible for large groups of children tend to not have time to focus on the individual needs of specific students whereas AI is able to assess and update to fit specified needs around the clock. Research shows that AI platforms have been shown to “increase student engagement and improve academic outcomes” (aqua, 2023).

Despite the many benefits AI tailored learning its use may not particularly be the best outcome for cognitive development. AI allows for fast and efficient learning, but it lacks the ability to teach students deeper skills. AI teaching is beneficial for a student's short-term development while long term development may be negatively impacted without the ability to solve issues that require a creative approach. Critics are concerned that “overreliance on AI tools may hinder students' creativity and critical thinking skills” (Restack, 2020). Which are necessary skills to navigate inside and outside the classroom. AI’s tailored learning can create efficient

students that understand basic surface level concepts but on the other hand this same tool can diminish necessary strong skills that are vital to creating smarter students.

Long Term Use of AI

The true depth of AI on long-term is still unknown to us. AI is a significant platform with multiple tools that can foster intellectual growth in a broad sense. AI enhances immediate learning but tends to fail in cultivating deeper learning and problem-solving skills. Utilization of AI can "effectively supplement classroom learning and make vast amounts of information readily accessible to students" (Yin, 2024). This shows that the use of AI can positively help students understand key concepts on deeper levels that cannot be fostered in a traditional setting alone. On the other hand, the heavy reliance on AI can be detrimental making it difficult for students to foster not only critical thinking and problem-solving skills but social skills as well. With AI we "risk that this could lead to a dehumanized educational experience" (Restack, 2020). Without human interaction and emotional support students can begin to lack motivation and make later stages of education difficult (Carpenter, 2023).

Conclusion

AI is a great resource when used properly. AI can offer tools such as tutoring, grading, and tailored learning. Each tool being effective in its own way. Together they provide efficient help in the classroom. These resources can allow a better understanding for students who have trouble in traditional areas. AI alone cannot foster smarter students. To create an environment that fosters all skill sets, the use of AI must be paired with the traditional methods to give well rounded education to students. Artificial intelligence should be used to boost human interaction and support where the deficit lies.

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