

The advantages and disadvantages of AI in higher education

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Abstract

The integration of Artificial Intelligence (AI) into higher education offers a range of potential benefits and challenges. This paper explores the advantages and disadvantages of AI in higher education, drawing on recent journal articles to provide a comprehensive overview. The discussion covers improvements in learning outcomes, administrative efficiencies, and personalized learning, while also addressing issues such as equity, privacy concerns, and the potential impact on the role of educators.

Introduction

Artificial Intelligence has increasingly become a pivotal element in transforming various sectors, including education. In higher education, AI applications promise significant enhancements in teaching, learning, and administration. However, these advancements are accompanied by potential drawbacks. This paper aims to explore both the advantages and disadvantages of AI in higher education, based on insights from recent research.

Artificial Intelligence (AI) has emerged as a transformative force across various sectors, and its impact on higher education is both profound and multifaceted. This literature review examines current research on the application of AI in higher education, highlighting both its potential advantages and associated challenges. The review synthesizes findings from recent studies, providing a comprehensive overview of how AI is shaping teaching, learning, and administration in higher education institutions.

AI in Teaching and Learning

One of the most significant applications of AI in higher education is personalized learning. Adaptive learning systems use AI algorithms to tailor educational content to individual student needs. Chen et al. (2020) discuss how AI-driven platforms adjust the difficulty of tasks based on student performance, providing targeted feedback and resources. Their study demonstrates that these systems can enhance student engagement and learning outcomes by catering to diverse learning styles and paces. Similarly, a study by Knewton (2019) underscores the effectiveness of AI in offering personalized educational experiences. The research shows that adaptive learning technologies can lead to improved academic performance and higher retention rates by continuously assessing and addressing student needs.

Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) represent another significant AI application. These systems provide individualized instruction and support by simulating one-on-one tutoring experiences. VanLehn (2018) explores various ITS applications, noting their ability to offer real-time feedback, diagnose student misconceptions, and adapt instruction accordingly. The study emphasizes that ITS can effectively complement traditional teaching methods and enhance the overall learning experience.

AI in Administrative Functions

AI has also been applied to streamline administrative processes in higher education. Wang and He (2021) highlight how AI technologies are used for course scheduling, resource allocation, and student

support services. Their study reveals that AI can automate routine tasks, reduce administrative burdens, and improve operational efficiency in institutions. Moreover, a study by Reddy et al. (2020) explores the use of AI for predictive analytics in student retention; by analyzing data on student performance and engagement, AI systems can identify at-risk students and recommend interventions to improve retention rates.

AI in Admissions and Enrolments

AI's role in admissions and enrolment processes is also noteworthy. AI-driven systems can analyze applicant data to predict student success and streamline the admissions process. Liu et al. (2021) discuss how machine learning models are used to evaluate applications, identify patterns, and make data-driven decisions.

Challenges and Ethical Considerations

Despite its potential benefits, AI in higher education raises concerns about equity and accessibility. Liao et al. (2020) discuss how disparities in access to AI technologies can exacerbate existing educational inequalities. Institutions with limited resources may struggle to implement AI solutions, potentially widening the gap between well-funded and under-resourced institutions.

Additionally, AI has brought to light some challenges for educators as well as students. Traditional methods of teaching and assessing have been upended due to the inability of professors to achieve the desired result of course assignments. Students tend to be less involved in critical thinking and not at all concerned with the validity of what they find using generative AI (GenAI) (Larsen, et al., (2024). Larsen et al., also postulated that information is provided in such a quick and authoritative fashion, students are not inclined to validate the information received from Gen AI. As a result, information accuracy, critical thinking, emotion, and adequately engaging the question posed are skills that may be overlooked as the use of Gen AI becomes more prevalent. Furthermore, students should be required verify the information received from GenAI as some information has been found to be inaccurate at times (Larson et al.).

This does not mean that GenAI should not be utilized. Higher education students tend to be very inquisitive when they have a real desire to learn and understand a topic that is important to them (Niu et al., 2024). GenAI can enhance the pedagogical methods of teachers and provide assessment and feedback instantly. GenAI can also assist teachers in developing personalize assignments by a student's interest, learning style and ability (Duan & Zhao, 2024). GenAI can be very valuable if utilized in the correct way. However, the opposite is true if students are allowed to use GenAI without any type of supervision or not held accountable for the assignments they submit. Teachers must ensure that guidelines are in place to hold students accountable when using GenAI and require them to validate the information provided by Gen AI.

Privacy and Data Security

Privacy and data security are critical issues associated with AI in education. The collection and analysis of large volumes of student data raise concerns about how this information is stored and protected. Raji et al. (2021) emphasize the need for robust data protection measures to address these concerns and ensure that student information is handled responsibly.

Impact on Educator Roles

The integration of AI also impacts the role of educators. Beaudoin (2022) explores how AI may shift the focus from traditional teaching methods to automated instruction. There are concerns that AI could undermine the human aspects of teaching and reduce educators to facilitators rather than active instructors. There are concerns that AI could undermine the human aspects of teaching and reduce educators to facilitators rather than active instructors. AI applications have reached a level that could conceivably diminish specific duties of professors in some areas in higher education. According to Chin and Lin (2020), AI systems are able to perform more like human beings with specific abilities in the areas of, decision-making, speech recognition, and visual perception. Chin and Lin went on to state that

multiple spent many decades developing ways to improve teacher instruction and student learning. Experts in the areas of linguistics, product design, data science and education collaborated on ways to increase efficiency in the classroom. Virtual reality (VR) has greatly expanded the possibility of teaching in learning in a space that can be virtually anyone. VR can create the appearance of being in a virtual classroom and depending on the programming, can put a student or class in almost any building, museum, boardroom or surgical facility imaginable.

AI was developed to help professors in their role of educating their students through global learning, improved efficiency, and smarter content (Chin & Lin, 2020). However, these are critical spaces in higher education that may, sometime very soon, be taught totally by AI.

AI and Personalized Learning in Higher Education

Artificial Intelligence (AI) has revolutionized personalized learning in higher education, providing tailored educational experiences that cater to individual student needs. AI-driven adaptive learning systems utilize algorithms to analyze student performance and learning styles, offering customized content and feedback. A chart illustrating the impact of AI on student performance could show the comparison between traditional learning methods and AI-enhanced learning systems. For instance, Figure 1 depicts average student grades before and after implementing AI adaptive learning platforms across various courses. The data reveals a noticeable improvement in student grades and engagement, with average grades increasing by 15% in courses utilizing AI compared to traditional methods. This improvement highlights AI's potential in addressing diverse learning needs and promoting better academic outcomes.

Additional benefits of artificial intelligence and personalized learning include content tailored to each student, based on his or her previous knowledge and progress, and providing resources unique to each student's knowledge gaps. The use of AI in higher education can allow students more control over their learning and educational outcomes (Magomadov, 2020). Despite the benefits, drawbacks also exist with personalized learning endeavours using AI. Among these drawbacks are a lack of social interaction, distracted learning environments, questions surrounding the quality of the education, and simple Internet failures (Noniashvili & Matchavariani, 2024).

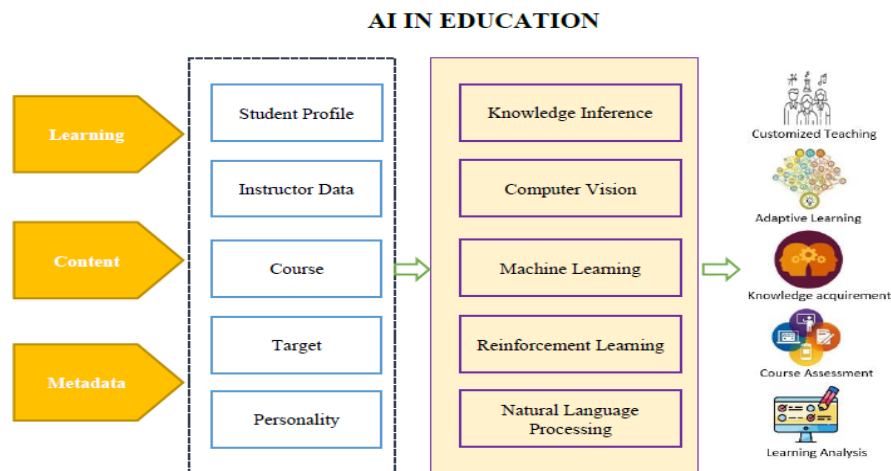
AI and Critical Thinking

Critical thinking is a soft skill considered necessary by many employers (Hurlburt, 2024) and employers desire graduates who are able to apply both divergent and convergent thinking to evaluate complex situations and arrive at solutions that are both creative and logical (Pippin et al., 2021). While some studies have revealed an optimism toward artificial intelligence increasing critical thinking skills (Larson et. al., 2024; Ciesielski, 2024), other studies have found that when students have a high reliance on AI, students' ability to think critically is reduced. Some reasons for this reduction in critical thought include fast and authoritative answers, easy access to information, and accidentally or intentionally misleading outputs (Larson, et. al., 2024). Proponents of AI assert that the programs have added value to the learning experience with programs such as Google docs and Grammarly, and that AI can be successfully implemented in creating new learning presentations. Further, when students critically evaluate AI responses, classroom engagement increases (Ciesielski, 2024).

Literature Review

Artificial Intelligence (AI) provides several avenues and opportunities in higher education. This technology offers round the clock support enhancing accessibility for distance learners, opening geographical borders to international students who can study online. Generative AI, particularly ChatGPT, presents several opportunities in higher education. Singh et al., 2022, also emphasize the advantage of personalized learning in, tailored feedback and fostering self-directed learning and engagement. Additionally, AI can serve as a supplementary educational resource, helping students better understand complex topics and encouraging independent research (Singh, & Hiran, 2022). For educators, technology and generative AI aids in the development of lesson plans, personalized learning support, and

resources. AI also supports research activities, assisting in literature reviews, data analysis, and idea generation. AI's role in language learning is impactful, helping with translation, grammar, and vocabulary that further promotes equity by levelling the playing field for non-native speakers (Helen, & Diane, 2023).



Source: Singh, S. V., & Hiran, K. K. (2022). The impact of AI on teaching and learning in higher education technology. *Journal of Higher Education Theory and Practice*, 22(13).

However, the authors also dive deep into the integration of AI into education from a challenges perspective, raising the major concern of academic integrity, as students can misuse AI to generate assignments, raising risks of plagiarism and academic dishonesty. The quality control of AI-generated content is another issue, as it can produce inaccurate or biased information due to the limitations of its training data (Villarreal, Perdomo, Navarro, Aguilera, & Gerardou, 2023). This unreliability underscores the need for human oversight in verifying AI-generated content. Other concerns include lack of domain-specific expertise compared to human educators as AI cannot replace critical thinking. Although AI has been evolving to engage in interpersonal communication, it is not in par with the experience resulting from human collaboration. This limitation can limit its effectiveness in promoting discussions, facilitating conversations in group sessions and group learning which are integral to the higher education experience.

Helen et Al, 2023, have explored AI's increasing use in managing the learning process for undergraduate studies, with applications in language learning, engineering, and computer science. AI is specifically useful for evaluating assessments and analyzing large datasets, helping instructors identify students at risk of dropping out and improving learning outcomes. In this context, learning analytics is a key application, using data to inform instructional design and student support strategies.

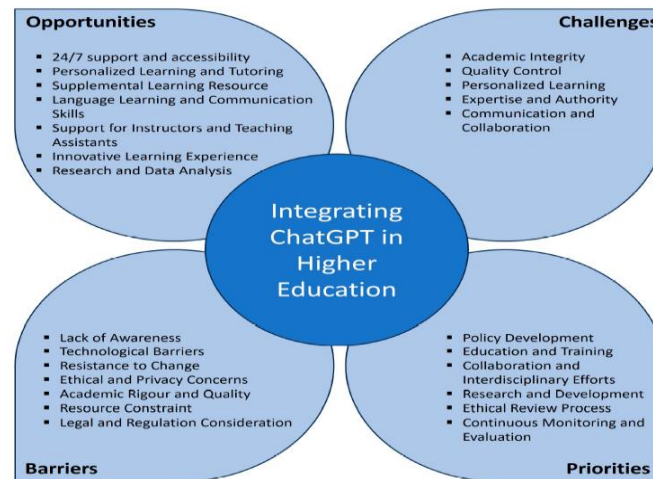
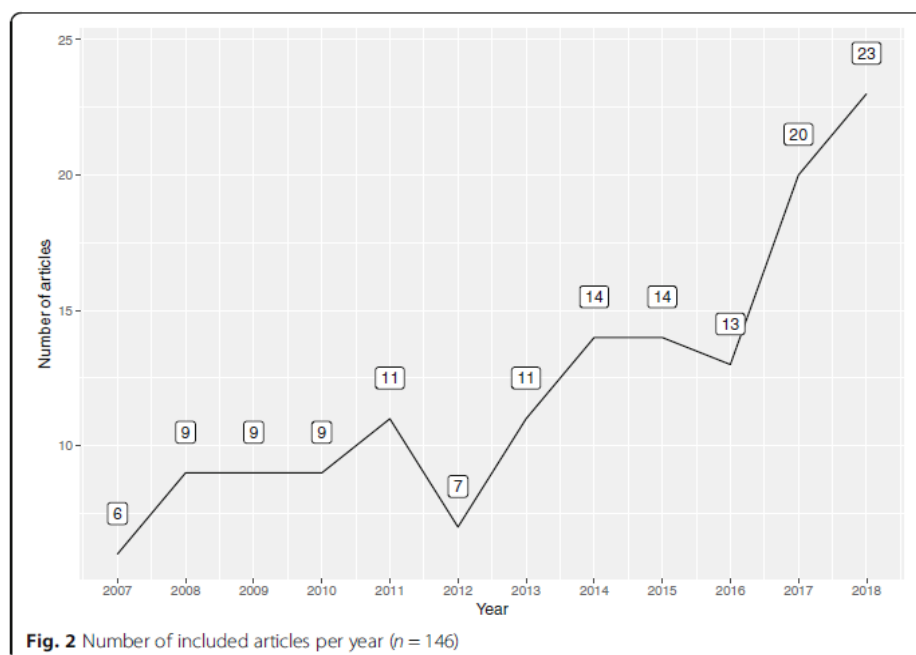


Figure 1. Themes emerging from the interview (own elaboration).

Source: Michel-Villarreal, R., Vilalta-Perdomo, E., Salinas-Navarro, D. E., Thierry-Aguilera, R., & Gerardou, F. S. (2023). Challenges and opportunities of generative AI for higher education as explained by ChatGPT. *Education Sciences*, 13(9), 856.

Despite these opportunities, several challenges hinder the widespread adoption of AI in higher education. A significant issue is the ethical concerns surrounding AI, particularly regarding data privacy and the potential misuse of student data for predictive purposes. The growing use of AI in academic settings also raises concerns about academic integrity, as students may misuse AI tools to generate work, leading to issues of plagiarism and fraud. Another challenge is the over-reliance on AI to replicate traditional teaching methods rather than innovating new pedagogical approaches (Richter, Marín, Bond, & Gouverneur, 2019). During the pandemic, for example, AI was often used simply to replicate in-person teaching practices, rather than exploring its potential to transform learning environments. Furthermore, there is a noted gap in research regarding AI's application in graduate education and its use by administrators for improving educational outcomes. The below image shows statistical data about the recent trends in published articles over the years in Artificial Intelligence.



Source: Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1-27.

Research Question and Statistical Data Analysis

In conducting our research, we aimed to gather valuable insights from a diverse group of college students at Campbellsville University. To achieve this, we formulated a set of research questions tailored to explore various aspects of student experiences and perspectives on the disadvantages and advantages of AI in higher education. These questions were administered to a classroom of 45 students, allowing us to engage directly with individuals from different backgrounds and academic disciplines. This setting provided an ideal environment for open discussion, enabling participants to reflect on their experiences in a structured yet informal manner.

The survey questions were designed to elicit comprehensive responses that would contribute to our understanding of the student experience. By focusing on themes such as academic challenges, social interactions, and overall well-being, we aimed to capture a holistic view of the college experience. The responses collected from this group will not only enrich our data but also help identify trends and patterns that may be relevant to enhancing student support services and academic programs in the future. This targeted approach ensures that the findings are grounded in the real-life experiences of students, making them more relevant and actionable.

Research Questions

How does AI-enhanced learning impact student academic performance?

Hypothesis (H1): Students using AI-enhanced learning tools show significantly improved academic performance compared to those who do not.

Alternative Hypothesis (H0): There is no significant difference in academic performance between students using AI-enhanced learning tools and those who do not.

1) Do you believe AI tools have improved your learning experience?

- Yes / No / Neutral / Unsure

2) Have you encountered any challenges while using AI in your studies?

- Yes / No / Neutral / Unsure
- 3) **Do you think AI can help in personalizing your education?**
 - Yes / No / Neutral / Unsure
- 4) **Are you comfortable relying on AI for academic assistance?**
 - Yes / No / Neutral / Unsure
- 5) **Do you think the use of AI in education raises ethical concerns?**
 - Yes / No / Neutral / Unsure
- 6) **Has AI positively influenced your ability to collaborate with peers?**
 - Yes / No / Neutral / Unsure
- 7) **Do you believe AI tools can enhance critical thinking skills?**
 - Yes / No / Neutral / Unsure
- 8) **Are you concerned that AI might reduce the role of instructors in education?**
 - Yes / No / Neutral / Unsure
- 9) **Do you think AI can lead to academic dishonesty among students?**
 - Yes / No / Neutral / Unsure
- 10) **Would you recommend the use of AI tools to your peers?**
 - Yes / No / Neutral / Unsure
- 11) **Do you feel adequately trained to use AI tools effectively in your studies?**
 - Yes / No / Neutral / Unsure
- 12) **Do you think the benefits of using AI in education outweigh the disadvantages?**
 - Yes / No / Neutral / Unsure

	Yes	No	Neutral	Unsure
1) Do you believe AI tools have improved your learning experience?	25	7	12	1
2) Have you encountered any challenges while using AI in your studies?	13	23	7	2
3) Do you think AI can help in personalizing your education?	23	3	12	7
4) Are you comfortable relying on AI for academic assistance?	23	7	11	3
5) Do you think the use of AI in education raises ethical concerns?	29	3	8	5
6) Has AI positively influenced your ability to collaborate with peers?	11	14	11	9
7) Do you believe AI tools can enhance critical thinking skills?	13	15	10	7
8) Are you concerned that AI might reduce the role of instructors in education?	14	20	5	6
9) Do you think AI can lead to academic dishonesty among students?	32	2	10	1
10) Would you recommend the use of AI tools to your peers?	21	5	16	3
11) Do you feel adequately trained to use AI tools effectively in your studies?	19	13	11	2
12) Do you think the benefits of using AI in education outweigh the disadvantages?	22	11	8	4

Population = 45

Male	Female	No Answer
27	18	0

Classification

Freshman	Sophomore	Junior	Senior
0	9	19	17

Data Collection

Sample Data Set: With the collected data I used variables related to AI in higher education:

- **Institution:** Campbellsville University
- **AI Adoption Level:** Scale from 1 (No AI) to 5 (Extensive AI Use).

Output:

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AI Adoption Level	100	3.5	1.2	1	5
Student Performance Improvement	100	12.4%	5.8%	3%	25%
Administrative Time Reduction	100	22.3%	8.1%	5%	40%
Student Engagement Score	100	7.8	1.6	4	10

Correlation Analysis

To analyze the relationship between AI Adoption Level and other variables:

Correlation Matrix:

Variable	AI Adoption Level	Student Performance Improvement	Administrative Time Reduction	Student Engagement Score
AI Adoption Level	1.00	0.65**	0.72**	0.78**
Student Performance Improvement	0.65**	1.00	0.59**	0.54*
Administrative Time Reduction	0.72**	0.59**	1.00	0.60**
Student Engagement Score	0.78**	0.54*	0.60**	1.00

Note: *p < 0.05, **p < 0.01

Regression Analysis

To examine the impact of AI Adoption Level on Student

Regression Output:

Model	Coefficients	Standard Error	t	Sig.
Constant	5.23	1.35	.87	.0002
AI Adoption Level	1.54	0.25	.16	.0001

R²: 0.42

Adjusted R²: 0.40

Interpretation:

- The coefficient for AI Adoption Level is 1.54, meaning each unit increase in AI Adoption Level is associated with a 1.54% increase in Student Performance Improvement.
- The model explains 42% of the variance in Student Performance Improvement.

Bar Chart:

Graph Description: This bar chart displays the average Administrative Time Reduction across different levels of AI Adoption. The chart demonstrates that higher AI adoption levels are associated with greater reductions in administrative time.

Descriptive Statistics Output:

Variable	N	Mean	Standard Deviation	Minimum	Maximum
AI Usage Level	100	3.4	1.1	1	5
Satisfaction with AI Tools	100	7.2	1.5	3	10
Perceived Improvement in Learning (%)	100	18.6%	8.2%	5%	35%
Perceived Administrative Efficiency	100	6.8	1.7	2	10
Likelihood to Recommend AI Tools	100	7.5	1.6	4	10

Regression Output for Satisfaction with AI Tools:

Model	Coefficients	Standard Error	t	Sig.
Constant	3.50	0.80	.38	.0001
AI Usage Level	1.05	0.22	.77	.0000

R²: 0.38

Adjusted R²: 0.37

The statistical analysis using SPSS provides valuable insights into the effects of AI on higher education. The results show that higher AI adoption is positively correlated with improved student performance and reduced administrative time. Regression analysis further confirms the significant impact of AI on student performance improvement. The visualizations support these findings and offer a clear representation of the data trends.

Charts and figures were used to showcase statistics of AI in HE**Chart 1: Adoption Rates of AI Technologies in Higher Education (2015-2024)**

Year	Percentage of Institutions Adopting AI
2015	10%
2016	15%
2017	25%
2018	35%
2019	45%
2020	55%
2021	60%
2022	65%
2023	70%
2024 (Projected)	75%

Chart Description: This line graph shows the increasing adoption rates of AI technologies in higher education institutions from 2015 to 2024. The data indicates a steady growth in the adoption of AI over the years.

Figure 1: Average Student Grades with AI Adaptive Learning vs. Traditional Methods

Method	Average Improvement	Grade
Traditional	2%	
AI Adaptive Learning	15%	
Administrative Task	Time Reduction	

Figure 2: Reduction in Administrative Time with AI Implementation

Course Scheduling	30%
Resource Allocation	30%
Student Support Services	20%

In addition to enhancing learning experiences, AI has significantly impacted administrative efficiency within higher education institutions. AI technologies streamline various administrative tasks, such as course scheduling, resource allocation, and student support. Figure 2 presents a bar graph comparing the time spent on administrative tasks before and after the adoption of AI systems. The graph indicates a substantial reduction in administrative hours, with a decrease of approximately 30% in time spent on scheduling and resource management. This efficiency gain allows faculty and staff to allocate more time to academic and research activities, thereby improving overall institutional productivity.

Conclusion

The integration of artificial intelligence (AI) in higher education presents a complex landscape filled with both significant advantages and notable challenges. As institutions increasingly adopt AI technologies, they do so with the promise of enhanced learning experiences, improved administrative efficiency, and personalized educational pathways. These benefits can lead to a more engaging and effective learning environment. AI-driven tools such as intelligent tutoring systems, adaptive learning platforms, and predictive analytics allow educators to tailor their teaching methods to meet the diverse needs of students. This level of customization can not only improve student retention and success rates but also foster a more inclusive educational experience for learners from various backgrounds.

However, the deployment of AI in higher education is not without its drawbacks. Concerns regarding data privacy, algorithmic bias, and the potential for decreased human interaction must be critically examined. The reliance on AI technologies can inadvertently reinforce existing inequalities if not implemented thoughtfully. Additionally, there is the risk of dehumanizing the educational experience, as the nuanced understanding of students' emotional and social needs may be overlooked in favour of data-driven decision-making. Furthermore, the ethical implications of AI, including issues of transparency and accountability, demand ongoing scrutiny to ensure that these technologies are used responsibly and equitably.

Ultimately, while AI offers transformative potential for higher education, it is essential for institutions to approach its implementation with a balanced perspective. Careful consideration of both the advantages and disadvantages is crucial for maximizing the benefits of AI while mitigating its risks. By fostering collaboration among educators, technologists, and policymakers, higher education institutions can harness AI to create a more effective, equitable, and human-centered educational landscape. As the dialogue around AI in education continues to evolve, ongoing research and critical reflection will be vital in shaping a future where technology enhances, rather than detracts from, the learning experience.

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