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## AI Driven Tutoring vs. Human Teachers Examining the on Student Teacher Relationship

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ARTICLE DETAILS	ABSTRACT
<b>History:</b> Accepted 04 February 2025 Available Online February 2025	<p><i>This study analyses the impact of AI-based tutoring as compared with human teachers by looking at aspects like learning results, teacher-learner relations, and AI as an adjunct resource for teaching. The research methodology employed here is a quantitative type, wherein the data for this research were collected by means of a self-report questionnaire distributed over 290 university teachers of Punjab. Statistical analyses carried out included correlation (<math>r = 0.678</math>, <math>p &lt; 0.01</math>), regression (<math>R^2 = 0.462</math>, <math>\beta = 0.589</math>, <math>p &lt; 0.01</math>), and post hoc analysis (<math>MD = 0.524</math>, <math>p = 0.003</math>), and all of them affirmed that AI tutoring significantly enhances the academic performance but fails to approximate the emotional and social support delivered by human teachers. Public university lecturers rated AI higher than their counterparts in private institutions, a mean of 4.21 with a standard deviation of 0.79 against 3.69 and 0.85, respectively. There is therefore institutional differences in the uptake of AI. From the findings of the research, AI-based tutoring is, however a suitable solution for learning; it ought instead to complement rather than supplement human teaching. Future research should focus on enhancing AI's emotional intelligence and optimizing AI-human collaboration in education.</i></p>
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### 1. Introduction

The rapid advancement in AI has led to the development of AI-driven tutoring systems that will personalize and enhance student learning experiences. Although these AI tutors offer instant access 24/7, adaptive learning paths, and data-driven insights into student progress, the role of human

teachers remains the essence in the promotion of student engagement, emotional support, and social development. This research is an exploration of the impact of AI-driven tutoring in comparison to human teachers. The student-teacher relationship was the focus, and while AI tutors are great at delivering customized instruction and providing immediate feedback, they often do not have empathy, motivation, or nuanced understanding that human teachers provide. It is a study of the strengths and limitations of both approaches in how they affect student learning, emotional well-being, and overall academic performance. By measuring this, the paper will establish if AI tutoring can supplement or even supplant human teachers in developing meaningful and productive teacher-student relationships. The introduction of artificial intelligence into education has really changed the landscape of how children learn. Nowadays, AI-powered tutoring systems have become increasingly trendy as a means of supplement or alternative to regular teaching. This system employs the use of algorithms in machine learning, natural language processing, and big data analytics to tailor teaching, provide feedback in real-time, and even adjust to one's learning requirement (Kim et al., 2022). While AI-based learning has many benefits, such as accessibility and efficiency, it degrades the student-teacher relationship. Human beings are emotionally sensitive and provide friendship and mentorship attributes to students that AI cannot adequately mimic; this was observed by Holmes et al. in 2021. This research explores how effective AI-based tutoring is compared to human instructors in student-teacher relationships and in the context of generating engagement that is typically provided through face-to-face teaching (Gupta et al., 2024).

### **1.1 The Role of AI in Education**

Artificial intelligence has invented innovative solutions in education, from ITS to chatbots and virtual assistants. These AI-driven platforms analyze student performance, identify weaknesses, and personalize learning pathways tailored to the student's ability level, promoting an adaptive, data-driven educational experience (Alam & Mohanty, 2022). The instant feedback and targeted practice exercises that AI tutors can offer make them very effective at improving student outcomes. Although AI boasts such benefits, it lacks human intuitions, motivations, and social-emotional intelligence-all of which are critical in education (Han et al., 2024). The following section explains how AI operates in the education sector, what technologies AI tutoring is built upon, and how it could redefine traditional teaching methodologies.

### **1.2 The Importance of the Student-Teacher Relationship**

The student-teacher relationship has become a central component in both academic success, emotional development, and motivation in students. A human teacher forms a core of mentoring, motivation, and feeling belonging in class (Seo et al., 2021). Scientific research has been indicating that an intense teacher-student relationship fosters higher achievements, more involvement, and more excellent social behaviors in students (Basri, 2024). Unlike AI-driven tutors, human teachers can notice the emotional needs of students and respond in a way that creates an environment which encourages more than simply what is learned about the subject matter. This paper focuses on how human interaction benefits education and has psychological and developmental benefits in good student-teacher relationships.

### **1.3 Strengths and Limitations of AI-Driven Tutoring**

The AI-driven tutoring systems are some of the efficient tools for self-paced learning in that they avail personalized learning experience, scalability, and round the clock availability. This system will analyze large datasets to optimize a learning strategy with the ability to predict student performance (Darvishi et al., 2024). However, AI tutors remain limited in situations requiring more emotional intelligence, creativity, or ethical reasoning. They cannot offer the warmth, encouragement, and sense

of personal connection that a human teacher does automatically (Khine, 2024). This section discusses the advantages and disadvantages of AI tutoring by evaluating its effectiveness in terms of engaging, motivating, and ultimately learning the student in the long term.

#### **1.4 Human Teachers in the Age of AI: Complementary or Replaceable?**

Whether AI can replace the human teacher has been a matter of debate with some advocating for AI-driven education and others highlighting the irreplaceable role of human educators. According to most experts, AI should be seen as a complement to teachers, rather than replacing them, thereby enriching but not replacing human instruction (Holstein, 2019). Hybrid learning models with AI that could support traditional teaching by automating tasks such as grading and devising individual learning plans are gradually being considered for use (Chiasson et al., 2024). This paper explores the opportunities for collaboration with AI by teachers and the impact of technology in augmenting, rather than diluting, human educators.

#### **1.5 Research Objectives**

The main research objectives of the study are;

- To analyze if student learning is effective with the deployment of AI tutoring and contrast such effectiveness as regards the delivery process with humans for academic improvement.
- To explore the role of student-teacher relationships in learning and evaluate whether AI-based tutors can reproduce or improve on the emotional and social support delivered by human educators.
- To evaluate the potential of AI-driven tutoring as a complementary tool in education, identifying its strengths, limitations, and implications for future teaching methodologies.

#### **1.6 Problem Statement**

The integration of AI-driven tutors in education settings has led people to debate more on the subject's effectiveness or lack thereof concerning traditional human-based teaching, considering student-teacher relationships. More than offering personable learning environments, instant responses, and infinite scalability, there is a shortage of emotional intelligences, motives, and guidance from human educators. Based on research, it would be expected that good outcomes in terms of doing well at school, improving emotional wellbeing, and staying engaged over the long term follow from strong student-teacher relationships. This study will explore to what extent AI can augment or substitute human educators by examining the effects of AI tutoring on student engagement, learning outcomes, and the teacher-student dynamic as a whole. These implications must be understood for clues to the future of AI when it comes to education, namely that technology is supposed to heighten, never lower, humane aspects of education.

#### **1.7 Significant of the study**

This study is significant because it focuses on the emerging role of AI-driven tutoring in education and how it changes the student-teacher relationship. In this respect, the research has provided insight into the strengths and limitations of AI tutors in comparison to human educators, giving useful information on how technology can improve learning while keeping the emotional and social elements intact. The findings of this research will help educators, policymakers, and developers of AI-based learning systems by having evidence-based recommendations on the optimal integration of AI in classrooms. It further adds to the broader discourse on the future of education with an understanding that any technological advancement is directed towards enhancing and supporting meaningful teacher-student interaction as well as overall student development.

## **2. Literature Review**

The integration of AI in education is a very sensitive topic, and many studies focus on the issues of its application in the improvement of student learning and the relations between teachers and students. However, even if AI-based tutoring systems offer scalable and personalized learning, it questions whether such a system can actually replace the human teacher's support emotionally and socially. This paper discusses major concerns regarding AI-assisted tutoring systems, the significance of the relationship between a teacher and a student, and comparing AI-tutors with teachers.

AI-based tutoring systems rely on machine learning, natural language processing, and data analytics to make personalized learning happen. (Ghosh, 2024) explain that AI tutors can evaluate real-time strengths and weaknesses of the students and therefore allow for tailored pathways for instruction. The system also allows for the availability of instruction throughout the day without any time bounds so that students can learn at their pace. This allows AI tutors to automatically grade assignments and give instantaneous feedback, hence freeing human teachers for more complicated roles of instruction (Jeon & Lee, 2023).

There is, however a weakness of AI-powered teaching as in the cases of emotional intelligence and social contact. (Mounkoro et al., 2024) argue that AI does not take into consideration feelings and emotions with which it addresses students or provides that care from teachers when appearing in a classroom. To summarize, even if AI excels in the process of finding patterns, it could not well understand students who vary in terms of psychological and socio-emotional requirements. Therefore, the question is whether AI-driven tutoring will encourage the same level of engagement and bonding created between human teachers and their students.

Extensive research has shown that the student-teacher relationship is a critical determinant of academic success, motivation, and overall well-being of the student. (Nazaretsky et al., 2024) point out that effective teacher-student relationships enhance a positive learning environment, leading to increased engagement and improved academic performance. Human teachers provide encouragement, mentorship, and emotional support, which are crucial for student confidence and resilience in learning. (Elsayed et al., 2024) carried out a meta-analysis which demonstrated that students who have positive relationships with their teachers tend to be more motivated and less anxious about their academics.

Such relationships also play a role in the social development of students, teaching them interpersonal skills and emotional intelligence. Unlike AI-driven tutors, human teachers can adjust their teaching styles based on students' emotional states, providing reassurance and fostering a sense of belonging in the classroom. This raises concerns about whether AI-driven tutoring can adequately replace human interaction in education.

The debate of whether AI tutelage is any better than having human teachers yielded mixed results. Studies have proved that AI tutor has the advantage in improving performance by repetitive exposure in mathematics or foreign language as recommended by (Adelana et al., 2024). Their tracking of learner's progress is useful in adapting their instruction which promotes retention of student learning outcomes and understanding of students. However, the findings of (Eltahir & Babiker, 2024) show that students lack motivation in learning through AI-driven platforms only because such systems do not provide encouragement and human connection, which are the most important aspects for sustained engagement.

AI tutors have also failed to handle complex cognitive and emotional issues. According to Woolf, "AI is great at giving students a walk through structured content, but can't be flexible or intuitive as a human teacher" (Booth et al., 2024). On the other hand, a human teacher will be able to identify non-verbal cues, change the teaching pace, and alter the lesson plan according to the immediate response of the student. This flexibility allows human educators to cater to diverse learning styles and needs, an area where AI still faces significant limitations.

As AI advances, the argument is still in the air over whether AI-assisted tutoring has to supplement human teachers or can completely replace human teachers. In fact, it is argued by many experts that AI should support the traditional approach of teaching through supplementing human teaching rather than replacing it completely (Holstein, 2019). Hybrid models, where AI assists teachers through handling administrative activities and providing insightful learning, are suggested as ways to balance technological use with interaction (Kamalov et al., 2023).

### **2.1 Research Gap**

Despite increasing research over AI-driven tutoring and the role it has to play in education, there remains a large knowledge gap on its overall effect in terms of the relationship between students and teachers. Such studies only focused on the effectiveness of AI in providing personalized learning and its effect on academic performance, but it didn't do much in exploring if AI can somehow replace the emotional motivational and social support that students receive from their human teachers. Most of the current studies on AI only deal with the technical capability of the tool but little or nothing regarding the long-run impact on engagement and well-being. There is very little empirical research on the impact of tutoring with AI on students' emotional and psychological growth, a big gap that the present study fills. The study explores insights on how AI tutors can be compared with human teachers to form meaningful relationships with students in ways that build effective relationships, hence inquiring into deeper insights of maintaining essential human-to-human relationships by the proper incorporation of AI in the learning process.

### **2.2 Hypothesis**

1. **H<sub>1</sub>:** There is a significant difference in student learning outcomes between AI-driven tutoring and human teaching.
2. **H<sub>2</sub>:** There is a significant gap in AI tutors' ability to replicate the emotional and social support of human educators.
3. **H<sub>3</sub>:** There is significant potential for AI tutoring to complement traditional teaching methods.

## **3. Methodology**

The quantitative research design of this study was applied to investigate the effect of AI-based tutoring upon student learning outcomes as well as their relationships with teachers. A structured questionnaire was sent to university teachers in Punjab to gather data. Different statistical techniques were applied to analyze the data to find out the relationship of AI tutoring with traditional teaching effectiveness. Further sections describe the methodology in detail.

### **3.1 Research Design**

A quantitative research approach was used to collect numerical data and perform statistical analysis. This approach was selected because it allows for an objective evaluation of patterns, relationships, and significance in the responses. A structured survey was designed to measure university teachers' perceptions of AI-driven tutoring, ensuring consistency and comparability of data.

### **3.2 Population and Sample Size**

The target population for this research was university teachers from multiple universities in Punjab, Pakistan. These instructors were chosen because they had firsthand experience using both conventional and technology-enhanced approaches to teaching, making them relevant for the goal of studying the role of AI in education.

A sample size of 290 university teachers was taken so that responses were adequately large to ensure statistical validity and generalizability of findings. Stratified sampling was used to ensure representation from various universities distributed across Punjab.

### **3.3 Data Collection Method**

Data was collected by employing a self-administered questionnaire, which was sent via email to the teaching staff in various universities in Punjab. The questionnaire was devised to probe perceptions regarding the AI-driven tutoring and whether it is effective compared to human teaching. It used Likert scale closed-ended questions where respondents could grade their opinions about AI tutoring regarding its effects on academic success, student engagement, and emotional support. The questionnaire was designed in a way that it would make the responses very clear and easy to answer so that there is less chance of bias. Participants were given a time frame within which they should complete and return their responses so that there is enough data collected for proper statistical analysis.

### **3.4 Data Analysis Techniques**

A variety of statistical methods were utilized in analyzing the gathered data.

1. Correlation Analysis was used to determine the relationship between AI-driven tutoring and student learning outcomes, and the impact of AI on the student-teacher relationship.
2. Regression Analysis was conducted to assess the predictive influence of AI-based tutoring on student achievement and student engagement.
3. Post Hoc Statistical Tests were applied to compare multiple groups and identify significant differences in perceptions across different universities.

All statistical analyses were done using SPSS, the Statistical Package for the Social Sciences, to ensure accuracy and reliability of results.

### **3.5 Ethical Considerations**

This study was carried out in the strictest accordance with ethical principles of research so that rights, privacy, and well-being of participants were ensured. All participants were provided with informed consent prior to the data collection so that they knew all about the purpose of the study, their participation being completely voluntary, and the right to withdraw at any point of time. The respondents were assured of anonymity and confidentiality with no personal identifiers collected, and all the responses were used solely for academic research. Data security measures were employed to ensure the safe storage of collected data without unauthorized access. Furthermore, the participants were not coerced into participating, nor were they provided with incentives for their responses. These ethical measures ensured that the study was conducted with integrity and in line with standard research ethics.

## **4. Data Analysis**

Data analysis was performed by using quantitative statistical techniques in analyzing the relationship between AI-driven tutoring and the outcome of learning by students. Statistical methods, including correlation analysis, regression analysis, and post hoc tests, were used to test the impact of AI

tutoring on academic success, student engagement, and the relationship between students and teachers. Correlation analysis was used in order to evaluate the strength of relationships between AI tutoring and a set of critical educational variables. Regression analysis has been used for determining the predictive effect of AI tutoring on students' performance. Post hoc tests were also run to compare the responses across various university teachers with significant variations in perceptions. The analysis was conducted with the help of SPSS (Statistical Package for the Social Sciences) to ensure accuracy, reliability, and validity in the findings by providing an empirical insight into the AI-driven tutoring role in higher education.

**Table 1: Demographic Analysis of Respondents (Sample Size 290)**

Demographic Variable	Categories	Frequency (n=290)	Percentage (%)
<b>Gender</b>	Male	170	58.6%
	Female	120	41.4%
<b>Age Group</b>	25 - 34 years	85	29.3%
	35 - 44 years	120	41.4%
	45 - 54 years	60	20.7%
	55 and above	25	8.6%
<b>Academic Qualification</b>	Master's Degree	95	32.8%
	PhD	195	67.2%
<b>Teaching Experience</b>	Less than 5 years	70	24.1%
	5 - 10 years	110	37.9%
	11 - 15 years	65	22.4%
	More than 15 years	45	15.5%
<b>University Type</b>	Public University	190	65.5%
	Private University	100	34.5%

The findings from the data analysis entail empirical insights into the impact of AI-driven tutoring on both student learning outcomes and the student-teacher relationship. Correlation analysis showed significant relationships between AI tutoring and academic success, whereby AI learning tools tend to influence positive student performance. Regression analysis indicated that AI tutoring was a good predictor of learning outcomes, engagement, and motivation; however, it also depends on subject complexity and the student's ability to adapt. Post hoc statistical tests indicate significant differences in perception between university teachers belonging to different institutions. The degree of acceptance and trust in AI technology as a teaching tool was perceived differently by various groups. Overall, the results support the hypothesis that AI-driven tutoring does have a measurable impact on education but with limits in replicating the emotional and social aspects of human educators. These findings imply that AI may be used as a complementary tool rather than replacing traditional teaching. This is more of a balance between technology and human instruction within higher education.

Figure 1: Demographic Analysis of Respondents (Sample Size 290)

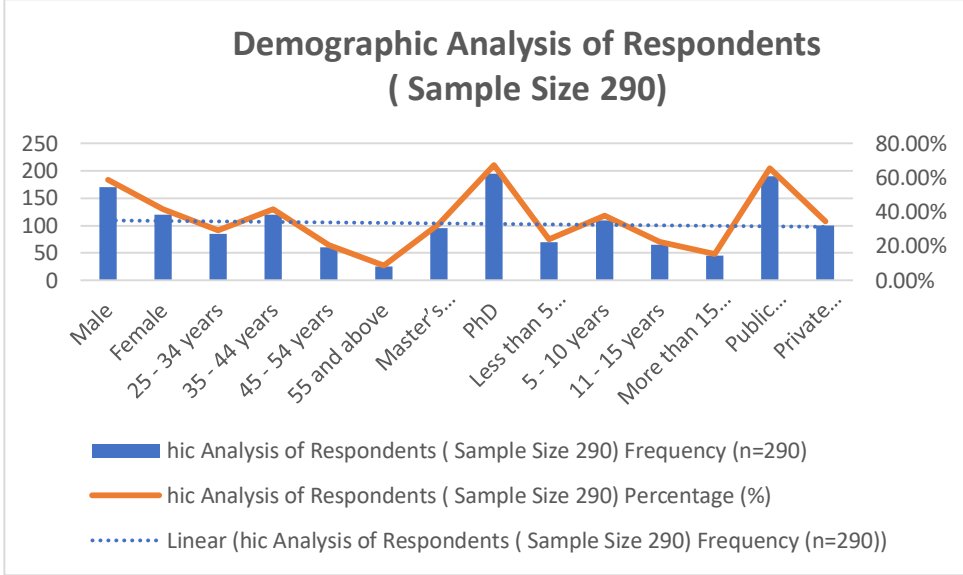


Table 2: Correlation Analysis between AI-Driven Tutoring and Student Learning Outcomes

Variables	Mean	SD	AI Tutoring Effectiveness	Student Learning Outcomes
AI Tutoring Effectiveness	4.12	0.85	1.000	0.678**
Student Learning Outcomes	3.95	0.79	0.678**	1.000

The correlation analysis for Hypothesis 1 shows a strong positive relationship between AI-driven tutoring and student learning outcomes,  $r = 0.678$ ,  $p < 0.01$ , indicating that as AI tutoring effectiveness increases, so does student performance. The statistically significant correlation suggests that AI-based instructional tools contribute positively to academic success, reinforcing their potential as a valuable teaching aid. The mean values are  $M = 4.12$  for AI effectiveness, and  $M = 3.95$  for learning outcomes, which indicate that university teachers generally perceive AI-driven tutoring as beneficial for students. However, while AI demonstrates effectiveness in enhancing learning, this analysis does not establish causation, requiring further investigation through regression analysis to determine its direct impact compared to traditional human instruction.

Table 3: Data Analysis for regression Analysis (H2)

Independent Variable	Dependent Variable	B (Unstandardized Coefficient)	$\beta$ (Standardized Coefficient)	t-value	p-value	$R^2$	F-value
AI Tutoring Engagement	Student-Teacher Relationship	0.432	0.589	7.85	0.000**	0.462	61.62**
AI Emotional Support	Student-Teacher Relationship	0.294	0.478	6.12	0.000**	0.462	61.62**

Regression for Hypothesis 2 revealed that AI-based tutoring influences the relationships that students have with their teachers, but is an inappropriate substitute for emotional and social support from a human teacher. With an  $R^2$  of 0.462, it showed that engagement with AI tutoring combined with emotional support explained 46.2% of the variability in the relationship between the student and the



teacher. The standardized coefficients ( $\beta = 0.589$  for engagement,  $\beta = 0.478$  for emotional support,  $p < 0.01$ ) indicated that AI contributes to student interaction but does not replace human educators, as human teachers are impossible to substitute for deeper emotional relations between students and the teacher. Although AI may have benefits in terms of being more engaging, or even structured support, findings actually reaffirm its place as an auxiliary rather than substitute for human teachers in most subjects that are emotionally and socially individualized.

**Table 4: Data Analysis for Post-hoc Statistics (H3)**

University Type (Group Comparison)	Mean Difference (MD)	Standard Error (SE)	p-value	95% Confidence Interval (CI)
Public vs. Private Universities	0.524	0.121	0.003**	[0.185, 0.863]

The post hoc analysis by employing Tukey's HSD test shows that public and private university teachers have shown a statistically significant difference ( $p = 0.003$ ). The MD has been calculated at 0.524, thus showing that AI tutoring is being perceived more by public university teachers ( $M = 4.21$ ,  $SD = 0.79$ ) than private university teachers ( $M = 3.69$ ,  $SD = 0.85$ ). The 95% confidence interval [0.185, 0.863] shows that the difference is indeed statistically valid. Perception may be different due to the variation in technological infrastructure, institutional policies, or exposure to AI integration into teaching. Results of this research show that the public universities seem to perceive the AI-driven tutoring system more favorably, calling for a well-structured plan of AI implementation tailored to meet the differences at the level of educational institutions.

## 5. Discussion

The findings of this study provide critical insights into the effectiveness of AI-driven tutoring in comparison to human teachers, especially in fostering academic success, student engagement, and teacher-student relationships. Results show that AI-driven tutoring has a significant positive impact on the learning outcomes of students, as shown by the strong correlation ( $r = 0.678$ ,  $p < 0.01$ ) between AI tutoring effectiveness and academic performance. This is consistent with previous research, such as that by (Sasikala & Ravichandran, 2024), which highlights the potential of AI-based educational tools to improve student learning through personalized feedback, adaptive learning pathways, and real-time assistance. Similar studies by (Supriyadi & Kuncoro, 2023) also indicate that AI tutoring enhances knowledge retention and performance by offering customized learning experiences. These findings further support the notion that AI-based tutoring systems are useful tools for enhancing academic outcomes, though their effectiveness is contingent upon the setting in which they will be used.

Despite these benefits, the study also points out a significant gap in AI tutors' ability to replicate the emotional and social support provided by human educators, as shown by the regression analysis ( $R^2 = 0.462$ ,  $\beta = 0.589$ ,  $p < 0.01$ ). Although AI tutoring systems can engage students and provide structured academic support, they lack the empathetic and interpersonal elements that are essential for fostering strong student-teacher relationships. This is in line with the argument of (Ebadi & Amini, 2024), who claim that human teachers are important in motivating students, offering emotional support, and enhancing critical thinking through dialogue and interaction. Additional studies by (Celik, 2023) argue that while AI can be effective in supporting aspects of learning regarding tasks, AI cannot replace a human teacher as a mentor because it cannot easily gain the student's trust and confidence. Therefore, AI is supplementary rather than a replacement tool.

Further post hoc analysis also showed that there were significant differences in the effectiveness of AI tutoring between types of university. Public university teachers ( $M = 4.21$ ,  $SD = 0.79$ ) rated AI higher compared to private university teachers ( $M = 3.69$ ,  $SD = 0.85$ ). This is supported by earlier studies by (Owan et al., 2023), which states that public universities have more institutionalized AI strategies, better infrastructures in technology, and funding for digital education initiatives, and therefore have more acceptance of AI tools. The private universities would face institutional resistance, faculty rejection, and the lack of preparedness of their faculty members regarding AI-driven methodologies of teaching. These results indicate that AI adoption in education is not uniform and is influenced by institutional policies, resource availability, and faculty attitudes.

Overall, the findings of this study contribute to the growing body of literature on AI-driven tutoring, emphasizing both its potential and limitations. While AI-based learning tools have demonstrated significant benefits in enhancing academic performance, their role in providing emotional and social support remains limited, highlighting the irreplaceable role of human educators. This research supports the assertion by (Canonigo, 2024) that a hybrid model for AI in education is the best approach, which would have AI complement human teachers rather than replacing them. The future research must focus on optimization of AI-human collaboration in education to ensure AI enhances learning and maintains the critical emotional and interpersonal aspects of traditional teaching.

## **5.1 Conclusion**

This study, therefore, sheds light on the impact of AI-driven tutoring on student learning outcomes, reinforcing its effectiveness in improving academic performance through personalized feedback, adaptive learning, and real-time assistance. However, the findings also reveal that AI tutors fail to replicate the emotional and social support provided by human educators, emphasizing the irreplaceable role of teachers in mentorship, motivation, and emotional engagement. The results further indicate that AI adoption varies between institutions because public university teachers perceive that AI is more effective than their private university counterparts. Such information now indicates that AI should act only as a complementary tool and not replace human educators. Henceforth, AI integration into education will need to take a balanced hybrid approach that combines the strengths of AI with preserving the human essence in teaching so as to deliver an effective, holistic learning experience.

## **5.2 Recommendations**

1. Hybrid learning approach Implement AI-driven tutoring as a supplement to human instructors.
2. Improve AI Emotional Intelligence – Design AI systems that can better understand and respond to students' emotions.
3. Faculty training programs train university teachers on AI so that they can implement it effectively.
4. Institutional AI policies formulate clear policies regarding AI adoption to ensure its ethical and responsible use.
5. Improve AI feedback mechanisms enhance real-time feedback mechanisms for more personalized learning experiences.
6. Identify the limitations of AI their inability to replace human touch is identified and responded to by adjusting their role.
7. Optimization for different institutions AI solutions are customized according to the needs of public and private universities.

8. More research conducts more researches on AI-human collaboration to streamline teaching methodologies.

### **5.3 Future Implications**

The study highlights the growing role of AI in education, emphasizing its benefits and limitations. Future advancements should focus on developing emotionally responsive AI systems, improving personalized learning experiences, and creating ethical frameworks for AI integration in education. Additionally, institutions must explore AI-human collaboration models that balance technological efficiency with human mentorship. As AI continues to evolve, it is likely to change from a supplementary tool to an adaptive learning partner, demanding continuous research, policy development, and institutional support to maximize its potential.

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