Impact of AI on Student's Academic Achievement

Lucky Joy Tutika [a] , Jyothsna Kondavalasa [b] , Dr. Sudhir Kumar Patnaik [c]

[a] Department of Computer Science and Engineering, GMR Institute of Technology, Rajam, Andhra Pradesh, 532120, India Email: 22341A05I1@gmrit.edu.in
[b] Department of Computer Science and Engineering, GMR Institute of Technology, Rajam, Andhra Pradesh, 532120, India, Email: 22341A0590@gmrit.edu.in
[c] Department of Basic Sciences & Humanities, GMR Institute of Technology, Rajam, Andhra Pradesh, 532120, India, Email: sudhirkumar.p@gmrit.edu.in

ABSTRACT:

Artificial intelligence (AI) has emerged as a transformative tool in education, promising to revolutionize learning experiences and outcomes. This study investigates the impact of AI on student academic achievement in educational settings. A mixed-methods approach was employed, utilizing surveys administered to students from diverse educational backgrounds. The findings revealed widespread adoption of AI tools among students, with a generally positive outlook on their potential to enhance academic performance. However, the study also identified a nuanced picture, with observations of both positive outcomes (e.g., improved grades) and negative consequences (e.g., facilitated cheating) since the integration of AI technologies. The study emphasizes the importance of strategic AI integration to optimize learning and student success. It underscores the need for careful consideration of ethical implications and the implementation of monitoring mechanisms to mitigate potential risks associated with AI use. Recommendations for future research include employing rigorous methodologies to assess the long-term effects of AI integration and exploring interventions to maximize benefits while minimizing risks. By providing valuable insights into the role of AI in shaping student academic achievement, this research informs decision-making and practice in educational settings, paving the way for informed and effective utilization of AI technologies in education.

Keywords: Artificial intelligence (AI), Student academic achievement, Educational technology, Personalized learning, Ethical considerations, Learning engagement, AI-facilitated cheating

Introduction

In recent years, artificial intelligence (AI) has gained significant popularity in the field of education (Castro et al., 2015; Mega et al., 2014). AI refers to the development of computer systems capable of activities typically requiring human intelligence, such as speech recognition, visual perception, decision-making, and language translation (Himanen et al., 2019). In education, AI applications include personalization of learning experiences, automation of administrative tasks, and provision of insights into student performance (Xu et al., 2017).

Existing Evidence

Previous research has identified various factors influencing student academic achievement. Mega et al. (2014) highlighted the importance of emotions, self-regulated learning, and motivation. Additionally, Castro et al. (2015) found a significant correlation between parental involvement and improved academic performance. Furthermore, Lei et al. (2018) reported a positive association between student engagement and academic success. However, limitations were noted in the existing literature, including the lack of standardized measurement tools and inconsistent definitions of student engagement (Lei et al., 2018).

Research Gap

While prior studies have explored factors influencing academic achievement, a comprehensive understanding of the impact of AI on student performance remains lacking. While Hong et al. (2015) demonstrated the potential for AI and machine learning techniques to assess and improve student achievement in animal behavior studies, there is limited research on direct applications in educational settings.

Objective

This research aims to address the gap in existing literature by investigating the impact of AI on student academic achievement. Specifically, the study explores how AI technologies, such as machine learning algorithms and predictive analytics, can be used to track, analyze, and enhance student performance in educational settings.

Constraints

Challenges faced during this research included the limited availability of studies directly focusing on the impact of AI on student academic achievement in educational settings. Additionally, the rapidly evolving nature of AI technologies presented a challenge in synthesizing current knowledge in the field.

Materials and Methods

Participants

The study involved a total of 300 participants from two distinct groups:
- 200 students from GMR Institute of Technology, Rajam, Andhra Pradesh, who participated in an offline survey.
- 100 students from various educational institutions and fields of study who participated in an online survey distributed through Google Forms.

Survey Type

A mixed-methods approach was employed, utilizing both offline and online surveys to collect data on student perceptions of AI in education. This methodology enabled a comprehensive examination of students' experiences and perspectives regarding AI integration in educational settings.

Questionnaire Design

The meticulously designed questionnaire gathered information on:
- Demographics
- Prior experiences with AI educational tools
- Perceptions of AI's impact on student academic achievement
- Perceived benefits and challenges of AI
- Observations of changes in academic achievement due to AI implementation
- Beliefs regarding AI's role in education
- Ethical concerns related to AI use in educational settings

Questionnaire Administration

- **Offline Survey:** Trained researchers administered the offline survey in person at GMR Institute of Technology, ensuring consistency and accuracy in data collection. Participants were approached randomly and invited to participate voluntarily.
- **Online Survey:** The online survey, administered via Google Forms, allowed for broader participation by inviting students from various educational institutions to respond voluntarily. Participants received guarantees about the privacy and anonymity of their answers.

Questionnaire Testing

Before deployment, the questionnaire underwent rigorous testing to ensure the clarity, comprehensibility, and relevance of the questions. Pilot testing was conducted with a small sample of participants to identify and address any ambiguities or issues with the questionnaire. Feedback from pilot participants was used to refine and finalize the questionnaire for wider distribution.

Statistical Analysis

Quantitative data from the surveys were subjected to descriptive statistical analysis to summarize participants' responses to closed-ended questions. Mean scores, frequencies, and percentages were calculated to quantify participants' perceptions and experiences regarding AI in education. Qualitative data from open-ended questions were analyzed using thematic analysis to identify recurring patterns and themes in participants'

responses, providing deeper insights into their perspectives and experiences. This comprehensive methodology facilitated a robust examination of the impact of AI on student academic achievement, encompassing both quantitative and qualitative aspects to provide a nuanced understanding of the topic.

Results and Discussion

The survey findings revealed a high level of usage of AI tools among students for academic purposes, with nearly all participants reporting utilization of various AI technologies. Popular tools included QuillBot, Grammarly, Gradescope, Owlfit, Tutor.ai, Copyscape, Otter.ai, Duolingo, Quizlet, Jenni.ai, and Knowt, each serving diverse functions from writing assistance to language learning and plagiarism detection.

Table 1 AI Usage and Perceptions in Education

Aspect	Finding
AI Tool Usage	**Widespread among students for academic purposes.**
Popular AI Tools	**QuillBot, Grammarly, Gradescope, Owlfit, Tutor.ai, Copyscape, Otter.ai, Duolingo, Quizlet, Jenni.ai, Knowt**
Perceptions of AI Impact	**- 60% view it positively (improved learning experiences, outcomes)** **- 20% neutral** **- 20% view it negatively (reliance on technology, cheating)**

Regarding perceptions of AI's impact on academic achievement, the majority of respondents (60%) viewed it positively, attributing benefits such as enhanced learning experiences and improved outcomes. However, 20% expressed neutrality, while the remaining 20% believed AI had a negative impact, citing concerns such as reliance on technology and the potential for cheating.

Participants reported observing changes in student academic achievement since the implementation of AI technologies in educational institutions. Positive changes included improved grades and increased engagement facilitated by AI-enabled learning tools. However, some negative aspects, such as instances of cheating facilitated by AI, were also noted, highlighting the need for ethical considerations and monitoring.

The survey revealed widespread belief among participants that AI technologies can improve student engagement in learning activities, indicating optimism about the potential of AI to enhance educational experiences.

Barriers to the effective implementation of AI in education were identified, including access disparities, lack of infrastructure, and resistance to change among educators. Ethical concerns regarding data privacy and algorithm bias were also raised, underscoring the importance of ethical guidelines and regulations in AI integration efforts.

Regarding the potential for AI to replace human teachers, responses varied, with some expressing certainty or possibility while others emphasized the irreplaceable role of human interaction in teaching ethics, discipline, and values.

In response to additional thoughts or suggestions, participants emphasized the importance of integrating AI with traditional teaching methods and raised concerns about overreliance on technology and its potential to diminish student motivation and engagement. Suggestions were made to restrict public access to AI and prioritize its use for specific purposes such as crime prevention and research.

Our study aimed to investigate the impact of artificial intelligence (AI) on student academic achievement in educational settings.

Employing a mixed-methods approach, we conducted surveys to gauge students' perceptions of AI in education. Our methodology involved administering questionnaires to students from diverse educational backgrounds, and analyzing their responses to gain insights into AI tool usage, perceptions, and observed effects on academic achievement.

Our findings revealed widespread AI tool usage among students for academic purposes, with optimism regarding its potential to positively impact academic achievement. Participants reported observing changes in student academic achievement since the implementation of AI technologies, both positively, such as improved grades and increased engagement, and negatively, with instances of facilitated cheating.

Our study builds upon existing literature by offering empirical insights into the specific role of AI in shaping student academic achievement, contributing to a deeper understanding of this emerging area.

Our study underscores the importance of strategic AI integration in education to optimize learning experiences and improve academic outcomes. However, it also highlights the need for ethical considerations and monitoring to mitigate potential risks associated with AI use, such as algorithmic bias and cheating.

Table-2 Observed Changes in Student Achievement due to AI

Change	Observation
Positive	Improved grades, increased engagement
Negative	Instances of AI-facilitated cheating

Acknowledging limitations, such as reliance on self-reported data and limited generalizability, underscores the need for cautious interpretation of findings and warrants future research to address these constraints.

Future research should focus on employing rigorous methodologies to assess the long-term effects of AI integration in education and exploring interventions to mitigate negative consequences, maximizing the benefits for diverse student populations.

In summary, our study provides valuable insights into the impact of AI on student academic achievement. While highlighting the potential benefits, it also underscores the importance of ethical considerations and monitoring to ensure responsible AI integration in education. By addressing these challenges and building upon our findings, we can harness the full potential of AI to empower students and educators in the digital age.

Future Research

Future research should focus on employing rigorous methodologies, such as longitudinal studies or experiments, to assess the long-term effects of AI integration on student achievement compared to traditional methods (Francescucci & Rohani, 2018). Additionally, research should explore interventions to maximize benefits while mitigating risks. This could involve investigating techniques for detecting and preventing AI-facilitated cheating, or exploring pedagogical approaches that leverage AI's strengths while complementing human teachers' irreplaceable role (Alyahyan & Düştegör, 2020).

Conclusion

Our research aimed to explore the impact of artificial intelligence (AI) on student academic achievement in educational settings. Through surveys, we found widespread AI tool usage among students, with optimism regarding its potential to positively impact academic achievement. Observations of changes in student academic achievement since AI implementation revealed both positive outcomes (e.g., improved grades) and negative consequences (e.g., facilitated cheating).

Our findings underscore the significance of strategic AI integration in education to optimize learning experiences and improve academic outcomes. Additionally, they highlight the need for ethical considerations and monitoring to mitigate potential risks associated with AI use (Dafouz & Camacho-Miñano, 2016).

The implications of our study extend to educational practitioners, policymakers, and researchers, emphasizing the importance of responsible AI integration and the development of interventions to address challenges such as cheating (Bal-Taştan et al., 2018).

In conclusion, our study provides valuable insights into the impact of AI on student academic achievement. By addressing challenges and building upon our findings, we can harness the full potential of AI to empower students and educators, ultimately enhancing learning experiences and outcomes in the digital age.

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