



Original Article

Artificial Intelligence and Student Engagement in Digital Learning Environments

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Abstract

One of the most significant technical developments changing education globally is artificial intelligence (AI). Teaching, learning, evaluation, and student interaction have all undergone substantial changes as a result of the incorporation of AI into digital learning environments. In online and technology-based educational systems, student engagement—which is critical to academic success and learning efficacy—has emerged as a key concern. Personalized and interactive learning experiences that improve student engagement are now possible, thanks to AI-powered technologies like chatbots, virtual assistants, intelligent tutoring systems, adaptive learning platforms, automated assessments, and predictive analytics. The current study investigates how artificial intelligence might enhance student participation in online learning settings. The study focuses on how AI-based teaching tools affect the social, behavioral, emotional, and cognitive aspects of student involvement. Additionally, it emphasizes the advantages of integrating AI, such as enhanced communication, tailored learning, immediate feedback, accessibility, and flexibility. The study addresses a number of topics at the same time, including the digital divide, privacy concerns, ethical dilemmas, reliance on technology, and a lack of human interaction. Based on secondary data and a survey analysis of college students, the study is analytical and descriptive in character. The results show that by fostering learner-centered learning environments, AI enhances student engagement, motivation, and academic achievement. Effective AI integration in education, however, still requires responsible implementation, digital literacy, moral behavior, and balanced human engagement. The study comes to the conclusion that, with the right infrastructure, inclusive policies, and human-centered pedagogical approaches, artificial intelligence has enormous potential to revolutionize digital learning and student participation.

Keywords: AI in education, student engagement, digital learning, higher education, personalized learning, educational technology, and e-learning.

Introduction

Almost every aspect of society has changed as a result of the quick development of digital technologies, including education. By providing intelligent technologies that can improve teaching, learning, assessment, and student support services, artificial intelligence (AI) has completely changed educational practices. AI-driven technologies are being embraced by educational institutions worldwide in an effort to boost student achievement and produce more interesting learning environments. Following the COVID-19 epidemic, which hastened the shift from traditional classroom instruction to online and blended learning systems, digital learning environments became extremely important. Maintaining student engagement in virtual environments is still a significant problem, despite the flexibility and accessibility that digital learning affords. The degree of focus, interest, involvement, and drive that students display during the learning process is referred to as student engagement. Students who are actively involved in their education are more likely to succeed academically and to acquire critical thinking and problem-solving abilities. Through individualized education, intelligent tutoring systems, virtual assistants, adaptive learning systems, and real-time feedback mechanisms, artificial intelligence offers creative ways to increase engagement in digital learning settings.

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AI tools assist teachers in tracking students' progress, identifying learning gaps, and providing individualized instruction depending on the requirements and preferences of the students. The goal of this study is to investigate how artificial intelligence can improve student engagement in online learning environments. It also examines the advantages, difficulties, moral dilemmas, and potential applications of AI in education.

Review of Literature

Numerous studies have examined how artificial intelligence affects student engagement and digital learning.

Luckin (2018) noted that with individualized feedback and academic support, intelligent tutoring systems enable students to learn at their own speed and boost cognitive engagement.

AI-supported digital learning tools improve accessibility, flexibility, and collaborative learning opportunities in higher education, according to **Bates (2019)**.

According to UNESCO (2021), AI can enhance student participation and promote inclusive education through virtual academic support and interactive learning platforms. AI-supported learning systems promote self-directed learning and enhance interaction in virtual classrooms, according to **Mishra (2021)**.

According to Holmes, Bialik, and Fadel (2021), AI has the potential to revolutionize education by developing adaptive instructional systems and tailored learning experiences that raise student engagement and learning results.

Selwyn (2022) In his critical analysis of the ethical and social ramifications of AI in education brought attention to problems about privacy, monitoring, and unequal access to technology.

According to Kumar and Sharma's (2022) research AI-powered educational platforms have a favorable impact on student engagement, classroom involvement, and academic performance.

Predictive analytics and AI-based learning systems assist educational institutions in identifying disengaged students and offering prompt academic support, according to the OECD Digital Education Outlook (2023).

Research Gap

According to the literature now under publication, artificial intelligence plays a major role in both student engagement in digital education and individualized learning. The multidisciplinary use of AI in higher education institutions, particularly in developing nations, is the subject of relatively few research. The long-term psychological, ethical, and social effects of AI-driven learning environments on students are also not well studied. Therefore, while taking into account both benefits and limitations in digital learning settings are considered, the current study aims to examine the wider influence of AI on student involvement.

Objectives of the Study

1. To comprehend the idea of artificial intelligence in online learning settings.

2. To assess the importance of student participation in learning.
3. To examine how AI can improve student engagement.
4. To determine the advantages and difficulties of learning systems based on artificial intelligence.
5. To assess how students view AI-assisted educational resources.
6. To make recommendations on ways to successfully apply AI in education.

Research Methodology

The current study is analytical and descriptive in character. Both primary and secondary data served as the foundation for the study.

Sources of Data

- Scholarly publications
- Books and articles
- Reports from institutions and the government
- Online databases and educational websites
- Student replies to the survey

Sample Size

120 students from higher education institutions employing AI-supported digital learning systems participated in a survey.

Analytical Tools

The gathered information has been examined using:

- Analysis of percentages
- A tabular depiction

Concept of Artificial Intelligence in Education

Artificial intelligence is the term used to describe how computers and computer systems mimic human intelligence processes. AI systems are capable of reasoning, learning, making decisions, comprehending language, and solving problems.

AI technologies are applied in education to enhance learning opportunities by:

- Systems for Intelligent Tutoring
- Platforms for Adaptive Learning
- AI-powered chatbots
- Automated Evaluation Systems
- Analytics for Learning
- Assistants for Virtual Learning

AI makes it possible to create interactive, tailored learning environments that cater to each student's unique learning requirements.

Student Engagement in Digital Learning

One of the most crucial measures of the success of education is student participation. It shows how engaged, involved, and emotionally connected pupils are to educational activities.

Student Engagement Types

1. Engagement in Behavior

Behavioral engagement represents the most visible, quantifiable actions a student takes to comply with instructional requirements as per academic norms. It serves as a baseline indicator of a student's compliance and physical presence in the learning ecosystem.

- **Attendance:** Consistent physical or virtual presence that ensures exposure to instructional materials and lesson continuity.
- **Class Activities:** Active participation in everyday exercises, such as raising hands, volunteer tasks, and lab experiments.
- **Homework:** Independent completion of assigned work, reflecting personal discipline, effort, and time management outside of school hours.
- **Conversations:** Academic dialogue focused on following immediate teacher instructions and clarifying basic task expectations.

2. Emotional Involvement

The focus of emotional involvement is on the learner's affective state, which captures their inner psychological sentiments toward their teachers, peers, and learning environment. This generates the internal drive needed to face academic difficulties.

- **Enthusiasm for Learning:** When presented with unique educational subjects, a clear expression of curiosity, vigor, and sincere interest is observed.
- **Sign of Belonging:** Feeling accepted, respected, and mentally secured in the educational setting is a sign of belonging.

Positive emotions, such as joy and happiness, as opposed to passive ones, such as boredom or anxiety, are examples of attitude quality.

- **Teacher-Student Connection:** A basis of vulnerability and trust that allows a student to be open to direction and helpful criticism.

3. Mental Involvement

A student's internal intellectual energy and strategic endeavor to attain deep mastery is referred to as mental participation, also known as cognitive engagement.

- **Intellectual Effort:** An obvious preference for challenging learning difficulties and a conscious readiness to put effort into abstract tasks.
- **Problem-Solving:** The strategic application of learning techniques to analyze intricate mathematics, textual structures, or scientific oddities is known as problem-solving.
- **Critical Thinking:** Analyzing, assessing, and synthesizing knowledge as opposed to accepting things at face value is known as critical thinking.
- **Self-Regulation:** Self-regulation is keeping an eye on one's own understanding, identifying faults, and independently modifying learning techniques to correct them.

4. Social Involvement

By emphasizing how students create shared meaning via dynamic, interpersonal collaborations, social participation encapsulates the relational aspect of

education. This connects individual thought processes with cooperative group norms.

- **Peer Cooperation:** Peer Cooperation is the capacity to work well in groups, assign group projects, and accept responsibility for common learning objectives.
- **Academic Dialogue:** Academic Dialogue is examining various points of view through organized arguments, debates, and peer-to-peer questioning.
- **Teacher Interaction:** Teacher Interaction involves proactively posing open-ended questions and starting scholarly conversations to elaborate on concepts covered in class.
- **Knowledge Sharing:** Knowledge Sharing is the process of explaining difficult ideas to classmates in order to help others and strengthen one's own comprehension.

To successfully maintain these aspects of engagement in digital learning settings, creative technological solutions are needed.

Role of Artificial Intelligence in Enhancing Student Engagement

1. Tailored Education

AI programs examine how students learn and deliver tailored content based on their skills and preferences.

2. Systems for Intelligent Tutoring

AI tutors offer ongoing academic assistance, clarifications, and drills.

3. Quick Feedback

Assessment systems driven by AI provide instant feedback, assisting students in improving their learning outcomes.

4. Virtual assistants and chatbots

AI chatbots help students by providing answers to questions and enhancing communication in virtual classrooms.

5. Gamified Education

Through tests, badges, simulations, and interactive learning exercises, AI facilitates gamification.

6. Analytical Predictive

AI allows for early intervention by identifying pupils who are at risk of performing poorly academically.

Hypotheses of the Study

Null Hypothesis (H_0)

1. There is no significant relationship between Artificial Intelligence and student engagement in digital learning environments.
2. AI-based learning tools do not significantly improve student motivation and participation.

Alternative Hypothesis (H_1)

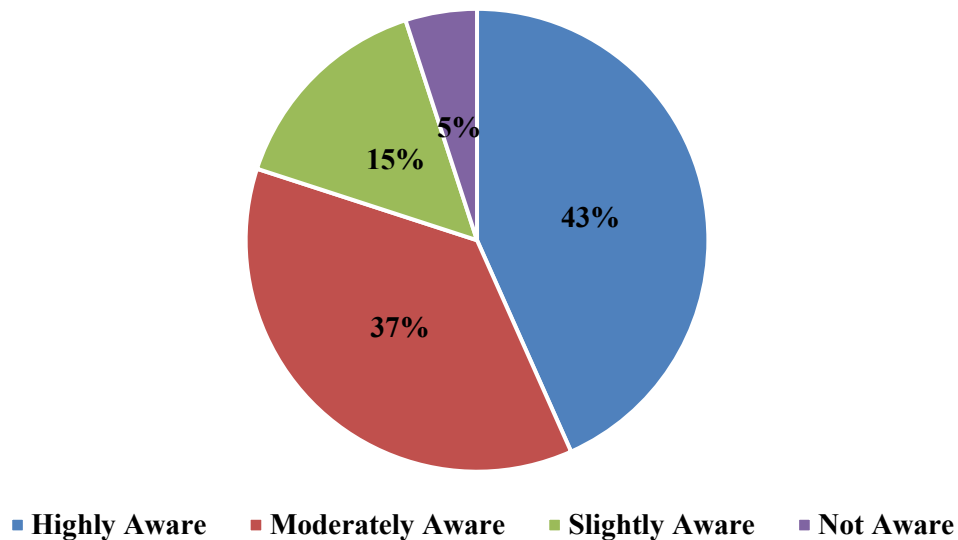
1. There is a significant relationship between Artificial Intelligence and student engagement in digital learning environments.
2. AI-based learning tools significantly improve student motivation and participation.

Data Analysis and Interpretation

Table 1: Awareness about AI-Based Learning Tools

Response	Number of Students	Percentage
Highly Aware	52	43.0%
Moderately Aware	44	37.0%
Slightly Aware	18	15.0%
Not Aware	6	5.0%
Total	120	100%

Table 1: Awareness about AI-Based Learning Tools



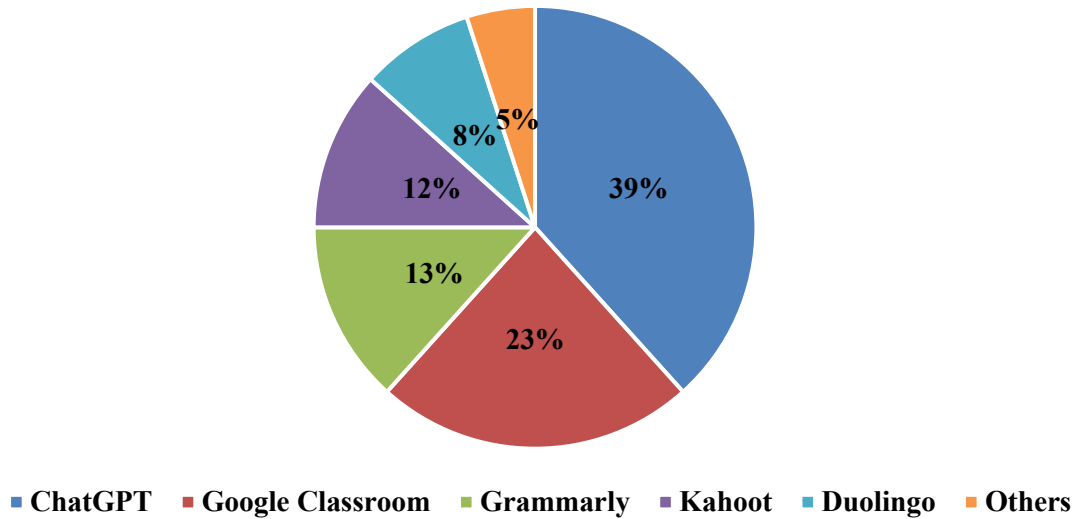
Interpretation

The majority of students are aware of AI-based educational tools, indicating increasing digital literacy and technology adoption in higher education.

Table 2: AI Tools Frequently Used by Students

AI Tool	Number of Students	Percentage
ChatGPT	46	39.0%
Google Classroom	28	23.0%
Grammarly	16	13.0%
Kahoot	14	12.0%
Duolingo	10	8.0%
Others	6	5.0%
Total	120	100%

Table 2: AI Tools Frequently Used by Students



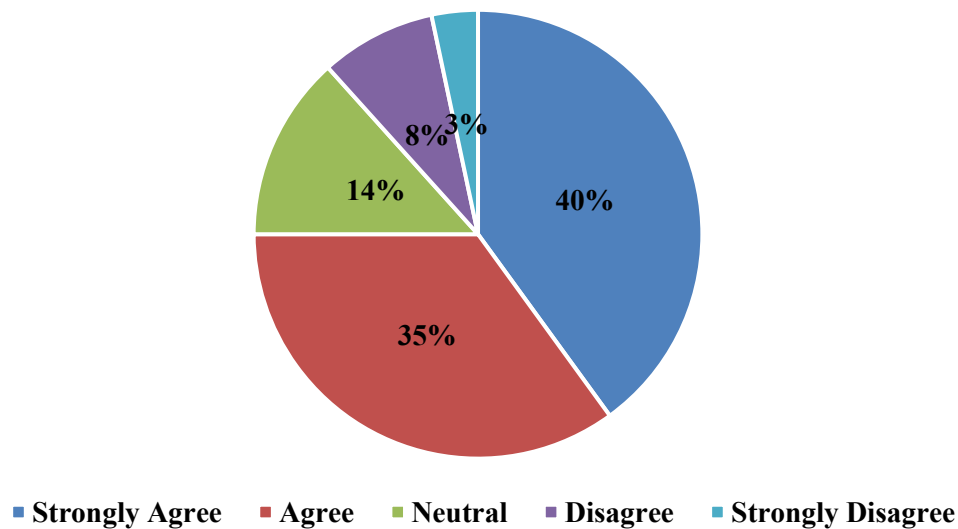
Interpretation

ChatGPT and Google Classroom are the most frequently used AI-supported educational tools among students, indicating increasing dependence on digital learning technologies.

Table 3: Students' Opinion on AI and Engagement

Opinion	Number of Students	Percentage
Strongly Agree	48	40.0%
Agree	42	35.0%
Neutral	16	14.0%
Disagree	10	8.0%
Strongly Disagree	4	3.0%
Total	120	100%

Table 3: Students' Opinion on AI and Engagement



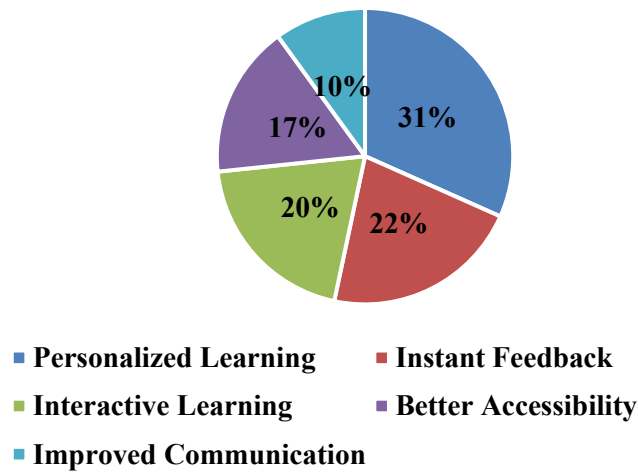
Interpretation

About 75% of respondents agree that AI positively influences student engagement in digital learning environments.

Table 4: Benefits of AI in Learning

Benefit	Number of Students	Percentage
Personalized Learning	38	31.0%
Instant Feedback	26	22.0%
Interactive Learning	24	20.0%
Better Accessibility	20	17.0%
Improved Communication	12	10.0%
Total	120	100%

Table 4: Benefits of AI in Learning



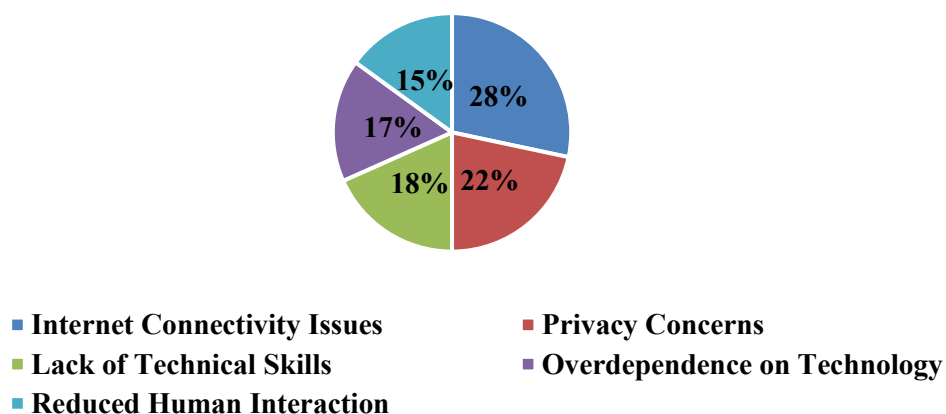
Interpretation

Students identified personalized learning and instant feedback as major benefits of AI-supported learning systems.

Table 5: Challenges in AI-Based Education

Challenge	Number of Students	Percentage
Internet Connectivity Issues	34	28.0%
Privacy Concerns	26	22.0%
Lack of Technical Skills	22	18.0%
Overdependence on Technology	20	17.0%
Reduced Human Interaction	18	15.0%
Total	120	100%

Table 5: Challenges in AI-Based Education



Interpretation

Internet connectivity and privacy concerns are major barriers to effective AI integration in digital learning environments.

Findings of the Study

1. Students are very aware of instructional tools that are assisted by AI.
2. AI tools have a favorable impact on students' engagement and motivation.
3. The most significant advantage of AI in education is thought to be personalized learning.
4. Digital learning with AI support increases flexibility and accessibility.
5. Students encounter difficulties with technical proficiency, privacy, and internet access.
6. AI greatly improves learner-centered and participatory instruction.

Suggestions

1. Educational establishments ought to improve internet accessibility and digital infrastructure.
2. AI-based teaching techniques should be taught to educators.
3. Institutions need to make sure AI technologies are used responsibly and ethically.
4. To preserve human interaction, blended learning strategies must to be promoted.
5. Policies supporting inclusive AI-based education should be developed by governments.
6. Students should be made more conscious of cybersecurity and digital ethics.

Conclusion

By increasing student participation, engagement, and learning efficacy, artificial intelligence has emerged as a revolutionary force in digital learning settings. Personalized learning experiences, real-time feedback, adaptive training, and interactive educational possibilities that improve students' behavioral, emotional, cognitive, and social engagement are all made possible by AI-supported educational technologies. According to the survey, students generally have a positive perception of AI and think that AI-based tools enhance academic achievement and learning opportunities. Effective implementation, however, requires addressing issues including digital inequality, privacy concerns, ethical dilemmas, and excessive reliance on technology.

Technology innovation and human-centered pedagogy must work together in harmony for AI to be successfully incorporated into education. Teachers are still essential for value-based learning, emotional support, and mentoring. To optimize the advantages of digital learning environments, educational institutions must use inclusive, moral, and student-centered AI practices.

Limitations of the Study

1. The study is based partly on survey data.
2. The sample size is limited to selected higher education students.

3. The research focuses mainly on digital learning environments.
4. Rapid technological advancements may influence future outcomes.
5. The study does not include comparative analysis across countries or academic disciplines.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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