AIED Integration in Higher Education: Navigating Impacts on Student Behavior: A scoping review

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Abstract. The implementation of artificial intelligence in education (AIED) in higher education has had an impact on a variety of student behavior patterns. This article aims to provide a more in-depth review of future research opportunities for studying the relationship between AIED and student conduct. This study searched for scientific papers in many databases, including Semantic Scholar, Google Scholar, and the Garuda SINTA Portal. The search produced results from 355 publish or perish and 259 Google Scholar. The scoping study found that AIED has a considerable influence on students' cognitive, emotional, and social capacities, as well as their learning techniques and ethics. The scoping study found that AIED has a considerable influence on students' cognitive, emotional, and social capacities, as well as their learning techniques and ethics. The outcomes of this article evaluation showed many recommendations for higher education institutions intending to embrace or improve the integration of AIED, particularly in student behavior development. Given these limitations, the findings and suggestions offered in this study should be considered cautiously. More in-depth and thorough research is required to overcome these limitations and offer a more complete picture of the influence of AIED on student behavior in higher education

Keywords: Artificial Intelligence in Education, Academic Writing, Learning Technologies, Challenges, Opportunities.

1   Introduction

Artificial intelligence is now widely acknowledged as important in education across the world. Artificial intelligence (AI) is increasingly being used in education, and it has gotten a lot of attention in recent years. AI and adaptive learning technologies are frequently mentioned as significant advancements in education technology [1]. Experts expect that AI in education will rise by 43% between 2018 and 2022, with the Horizon Report 2019 Higher Education Edition [2] estimating that AI applications connected to teaching and learning will develop even faster.

In the context of the introduction of AI-based tools and services in higher education, Hinojo-Lucena et al. [3] stated that AI technologies have been introduced in higher education environments, but many educators are unaware of the scope of their application and, more importantly, what they actually offer. AI in education (AIED) has a significant role to play in enhancing the quality of education since its application may help instructors and students undertake learning activities [4]. The bigger the impact of AI on people, the more we need to comprehend it. AI has the ability to teach, train, and improve human performance, making individuals more effective at their jobs and activities [5]. The application of AI in education is not an option but a necessity. As educational technology develops as a new standard, all stakeholders involved in education must apply AI to achieve the basic goals of education, which must be individualized, effective, transformative, output-based, and integrative.

However, integrating AIED into higher education settings presents substantial hurdles and has an influence on student behavior patterns. Student conduct refers to the activities, attitudes, and interactions that students display both within and outside of the classroom [6]. Punctuality, active participation in class discussions, respect for time constraints, ethical behavior, and proper communication with classmates and instructors are all examples of good behavior. However, with these technological breakthroughs comes a significant consideration: student conduct and the usage of these artificial intelligence technologies. Artificial intelligence apps provide students with quick access to knowledge and individualized learning experiences, allowing them to select control over their learning process based on their own needs [7].

AIED applications not only facilitate the learning process but also have the potential to influence student behavior in the academic environment. The effectiveness of AIED integration in reducing the negative impact on student behavior largely depends on how these technologies are implemented and used. Higher education institutions need to ensure that the use of AIEDs not only focuses on control and prevention but also on developing positive behaviors and supporting effective learning.

Students in higher education are already utilizing the use of AI in the completion of academic writing tasks, as many AIEd-based applications are already in use in higher education[8], [9]. In January 2023, a survey of over a thousand college students found that more than half of them used ChatGPT for academic writing assignments; of the students surveyed, 75% considered ChatGPT to be cheating, but they did it anyway [10].

Fundamentally, the use of AI is not a threat to academic integrity. However, its use to produce articles that are claimed to be original work needs to be revised. A breach of academic integrity is considered when students use them to develop an entire piece of writing [11]. Ensuring academic integrity can be done through the use of AI responsibly with clear guidelines and protocols [12]. Students should be encouraged to reflect on their coursework and ensure that they meet academic standards by conducting self-evaluations. Students should be encouraged to think critically and independently and use AI-generated texts to assist rather than replace their own thinking [13], [14].

Over-reliance on the use of AI can have a negative impact on academics, especially for college students. There is a risk of reduced social interaction and decreased self-regulation skills in such an environment. Furthermore, this can also result in decreased

higher-order cognitive abilities such as problem solving, reasoning, creativity, and critical thinking for college students [15]. This is due to the fact that the use of ChatGPT can make the process of getting answers or information easier. As a result, students' motivation to conduct independent research and generate their own solutions or conclusions may decrease [16]. Marzuki et al. [17] stated in their article that the use of AI can also hinder the growth of critical thinking and problem-solving skills in students. In higher education, this challenge cannot be ignored. This is in line with Yang et al. (2021), who highlighted that the diagnosis of student engagement, learning patterns, and behavior in AI learning requires more attention.

The preceding arguments demonstrate that AIEDs have significant potential to increase learning effectiveness and facilitate individual learning. However, the incorporation of these technologies may have an impact on how students interact with their learning environment, such as how they accomplish assignments, communicate, and engage in academic activities. As a result, understanding the elements that impact students' behavior patterns is critical for incorporating AIEDs into higher education settings.

As a result, this article seeks to give a more thorough overview of future research prospects for understanding the link between AIED and student behavior. The main questions raised are how AIED integration affects student behavior patterns in higher education settings, what variables are used to examine student behavior patterns when integrating AIED in HEIs, and what practical recommendations are available for higher education institutions that want to adopt or improve AIED integration, with a focus on behavioral development. Higher education institutions can overcome these challenges by understanding the impact and variables that influence students' behavior patterns when integrating AIED, as well as implementing appropriate practical recommendations. This research is expected to make a significant contribution to the development of higher education that is adaptable and sensitive to technological advancements and student requirements.

2. Method

Design of Reviews. This scoping review was performed according to the 5-stage framework by Arksey and O'Malley. The scoping review methodology includes six framework stages: 1) identifying the research question, 2) identifying relevant studies, 3) selecting studies, 4) charting the data, 5) collecting, summarizing, and reporting the results 6) consultation exercise [18]. The scoping review analysis in this article follows the rules written in the PRISMA Extension for Scoping Reviews (PRISMA -ScR): Checklist and explanation [19] to ensure quality in reporting

Scoping review research question

R1: How does the integration of AIED (Artificial Intelligence in Education) affect student behavior patterns in a higher education environment?

R2: What are the practical recommendations for higher education institutions that want to adopt or improve AIED integration, with a focus on behavioral development?

Identifying relevant studies. Researchers conducted database searches and studied the scoping review approach. This research conducted a search for scientific articles through several databases, including Semantic Scholar, Google Scholar, and the Garuda SINTA Portal. The search was conducted using relevant keywords such as "artificial intelligence in education," "AIED integration in higher education," and "impact of AI on student behavior." In addition, the reference lists of the included studies were also searched to find more relevant article. The reference studies consisted of published articles from 2017 to 2024.

Study selection criteria: inclusion and exclusion. The initial search began in January 2024 and ran until March 2024. The overall search yielded 614 items from worldwide and national journal papers. After reviewing multiple papers, 54 research were identified as meeting the criteria and included in this article review. The search for scientific literature yielded results from 355 Publish or Perish and 259 Google Scholar manuscripts.

Inclusion criteria
1. Studies that address the integration of artificial intelligence (AIED) in higher education.
2. Studies that explore the impact of AIED integration on student behavior.
3. Studies that contain information about the variables used to look at student behavior patterns related to AIED integration.
4. Articles that provide practical recommendations for higher education institutions in adopting or improving AIED integration.
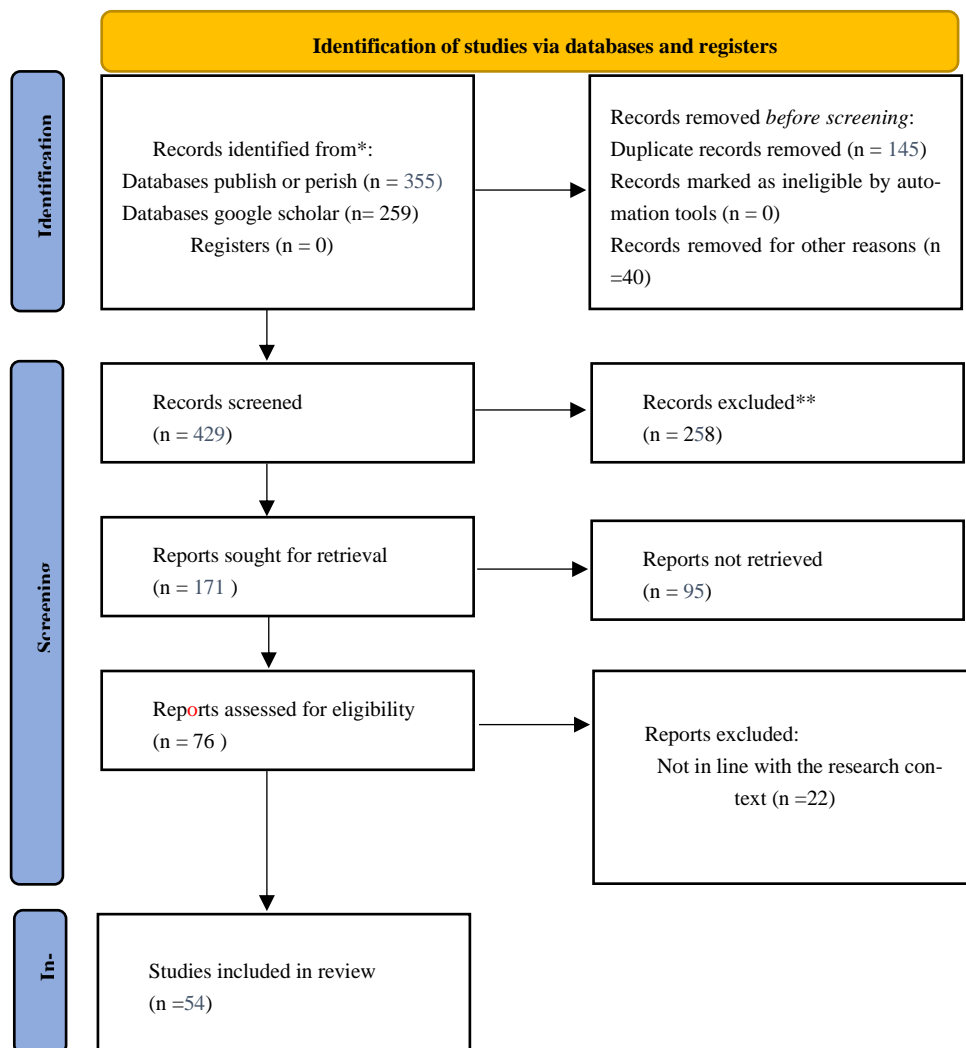
Exclusion criteria. Exclusion criteria were factors that prevented the article from being used for review. The criteria included:
1. Articles that are not relevant to the topic of AIED integration in higher education.
2. Studies that did not have enough information about the impact of AIED integration on student behavior.
3. Publications that are not primary research or have low methodological quality.
4. Studies that did not meet the established age, subject type, or context criteria.

By applying strict inclusion and exclusion criteria, it is hoped that this study can present a comprehensive and accurate review of AIED integration in higher education and its impact on student behavior.

Selection Process. The first search produced 429 relevant abstracts and citations, which were processed using https://www.rayyan.ai/. Continuous filtering revealed 145 identical articles. There were 258 exclusions. The entire texts of 76 papers were found to fit the inclusion requirements, but 22 did not match the research findings. Overall, 54 studies fulfilled the inclusion criteria.

Data collection process. This research was conducted through consultation and charting, assisted by several people. Consultation was carried out after analyzing the data and reporting the results to an artificial intelligence expert (SM), a literature review expert (NS), and a behavior expert (UK) from the psychology faculty of Maulana Malik Ibrahim State Islamic University Malang, thus providing valuable insights beyond what has been captured through literature searches. Input consultation results: using the Rayyan.AI application, using the Prisma 2020 chart list and flowchart, and identifying inclusion and exclusion criteria.

Identification of studies via databases and registers

Identification

Records identified from*:
Databases publish or perish (n = 355)
Databases google scholar (n= 259)
Registers (n = 0)

Records removed *before screening*:
Duplicate records removed (n = 145)
Records marked as ineligible by automation tools (n = 0)
Records removed for other reasons (n =40)

Screening

Records screened
(n = 429)

Records excluded**
(n = 258)

Reports sought for retrieval
(n = 171)

Reports not retrieved
(n = 95)

Reports assessed for eligibility
(n = 76)

Reports excluded:
Not in line with the research context (n =22)

In-

Studies included in review
(n =54)

Pic 1. PRISMA 2020 Flow Diagram for new systematic review which included searches of databases and registers only from rayyan.ai

Data Items. Data analysis is carried out in accordance with the data extraction that has previously been carried out by the researcher. Data will be displayed through tables, diagrams, or images so that analysis can be done easily and comparisons of all the criteria that have been identified can be made. Further analysis will be reported both descriptively and narratively. The researcher will discuss the implications of the findings for future research, practice, and policy. The researcher used the PRISMA-ScR checklist as a reporting guideline that will be used later.

3. Results

R1: How does the integration of AIED (Artificial Intelligence in Education) affect student behavior patterns in a higher education environment?

The integration of artificial intelligence in education (AIED) in higher education has affected various aspects of student behavior patterns. Based on the scoping review conducted, it was found that AIED has a significant impact on students' cognitive, emotional, and social abilities, as well as on learning strategies and ethics. This exposure suggests that AIED has great potential to improve various aspects of student behavior and learning, although it also poses some challenges that need to be addressed.

Various studies have found that AIED can encourage creativity, critical thinking, and problem solving. Research by [20] showed that students exposed to AIEDs showed improvements in computational thinking, which is essential for facing challenges in the digital age. In addition, students' adaptability also improved along with changes in curriculum and learning content facilitated by AIEDs, as revealed by [21].

The ethical use of AI in education is an important concern. Kassymova et al. emphasize that students need to be guided to use AI in an ethical way to avoid potential misuse of technology. On the other hand, research by Athanasios Polyportis identified changes in students' trust and behavioral control due to the integration of AIEDs, which may also lead to emotional fear. Research by Joksimovic et al. [25] explored how AIED supports complex problem solving in cognitive, social, and emotional aspects. However, Kozlova et al. [26] emphasize that the final decision in the learning process should remain with humans, although AI can provide significant support in the decision-making process.

Social anxiety is also a factor influenced by AIED. Zhu and Deng [22], found that college students with high levels of social anxiety tend to prefer robot-based training partners over humans. This suggests that AIEDs may provide an alternative for students who have difficulty with social interaction.Students' behavioral patterns in using AI resources also have a significant effect on their cognitive achievement, as revealed by Jaboob et al. [27] and supported by the findings of McClelland [28] and Volzhenin et al. [29]. Meanwhile, Namli & Aybek [30] found that AIED can improve students' computational thinking skills, programming self-efficacy, and motivation.

Students' self-regulation strategies and behavior patterns can also be improved through the integration of an open learner model with AI-based visualization, as shown by the research of Sun et al. [32]. In addition, AI applications can also encourage and

foster academic honesty and integrity, although there is a risk of potential misuse of technology that needs to be monitored. Other research shows that AIED can enhance creative problem solving, effective time management, and interpersonal communication. Prinsloo [35] highlighted that AIED can improve the efficiency of strategic planning, while Al-Ansi and Fatmawati [36] emphasized the creation of interactive educational content that stimulates critical thinking and collaboration.

Overall, the integration of AIED in the higher education environment provides many benefits for improving student behavior and learning patterns. However, its implementation must be done carefully and consider ethical aspects to ensure that this technology is used optimally without compromising fundamental values in education. The following data charting table summarizes the key findings from various studies on student behavior patterns influenced by AIED integration in higher education environments based on various studies.

Table 1. *Data Charting of AIED Integration Influencing Student Behavior Patterns in Higher Education Environments*

How does the integration of AIED (Artificial Intelligence in Education) affect student behaviour patterns in higher education?

Author	Pattern Behaviour
[20]	Creativity, Critical Thinking, Problem Solving, and Computational Thinking
[21]	Adaptability, Learning Curriculum, and Learning Content
[23]	Ethics in using AI in educational settings
[24]	Changes in trust, emotional fear, and behavioral control
[25]	Complex problem solving: metacognitive (unexplored), Cognitive (pattern recognition, knowledge consumption, knowledge representation, statistical reasoning, knowledge structuring, control over task execution, decision making), Social (collaboration and cooperation), Emotional (social anxiety, pleasure, emotional states, attitudes, beliefs, faith, morals)
[26]	Decision-making: judgment must still be made exclusively by human activity.
[22]	Social Anxiety: Students with higher social anxiety are more likely to choose robot training partners over human training partners.
[27]	Students' behavior patterns in the use of AI resources affect students' cognitive achievement.
[28], [29]	Students' cognitive achievement
[30]	AI affects students' computational thinking skills, programming self-efficacy, and motivation.
[31]	Cognitive skills required in the learning process through AI applications include attention, long- and short-term memory, logic and reasoning, auditorial and visual processing, and processing speed.
[32]	Use of self-regulation strategies and behavioral patterns through the integration of an open learner model with AI-based visualization
[33]	Encouraging and fostering honesty and integrity
[34]	Creative problem solving, effective time management, and interpersonal communication.
[35]	Strategic planning efficiency
[36]	Creation of interactive and immersive educational content that stimulates critical thinking, problem-solving skills, creativity, and collaboration
[37]	Helping students become more independent.

How does the integration of AIED (Artificial Intelligence in Education) affect student behaviour patterns in higher education?	
Author	**Pattern Behaviour**
[38]	AI can support student engagement and motivation.
[21]	AI can facilitate decision-making, resilience, intelligent processes, and identifying at-risk students.
[39]	AI encourages emotional awareness for efficient learning.
[40]	Use of AI applications (chatbots) to address mental health issues such as ADHD
[41]	An AI chatbot identifies suicidal tendencies through interaction with users.
[42]	AI chatbots detect anxiety and depression symptoms in college students through interaction with users.
[43]	Dependence on AI can affect students' mindsets and creativity.
[44]	The combination of AI and VR is effective in increasing undergraduate student engagement.
[45]–[47]	Generative AI applications show great potential for improving student behavior.
[48]	Student behavior as a mediator in the relationship between AI techniques and applications and student cognitive achievement.

R2: What are the practical recommendations for higher education institutions that want to adopt or improve AIED integration, with a focus on behavioral development?

The findings of the scoping review revealed various recommendations for higher education institutions looking to adopt or enhance the integration of artificial intelligence in education (AIED), especially in student behavior development. Firstly, the modification and use of AI technology in learning Lawan et al. [50] suggested the modification of flipped learning to reduce the negative impact of generative artificial intelligence on education, which can help students develop better learning behaviors. as well as the integration of AI models and algorithms, such as combining AI with the SEPT model [52]. Using the SEPT framework to analyze the student journey and determine the interdependencies between steps helps to understand the determinants of student behavior. Furthermore, the K-Means Clustering and Support Vector Machine approach [53] involves utilizing AI algorithms to identify student behavior patterns and improve prediction of learning outcomes, as well as detecting at-risk students.

Second, there is the need for evaluation and feedback, such as. Hooda et al. [49] found that the I-FCN assessment and feedback technique was superior to other techniques such as ANN, XG Boost, and SVM in improving student learning outcomes. Third, ethical policies and practice [56,[62] recommends developing policies, guidelines, and best practices for the ethical and effective use of AI technologies. Academic integrity policies should be updated regularly. whereas Perkins & Roe [61] found the need to socialize policies and include the implementation of practices such as having students sign agreements and providing reminders about the severity and impact of ac-

ademic dishonesty. Fourthly, Topali et al. [51] emphasized the importance of stakeholder involvement in all stages of designing AIED solutions, noting that currently their involvement is often lacking at the ideation and prototyping stages.

Fifth, monitor and evaluate the implementation of AI. Monitoring student behavior can use Smart University [52] by managing student behavior and activities with sensors and intelligent monitoring systems, and Emotion Detection [70] through AI technology to analyze students' facial expressions, voices, and body language to understand their needs and emotional responses to course material. Sixth, AI readiness in higher education [68], [71] the need to prepare learners to understand and adopt AI, including AI literacy and understanding of changing academic norms and ethics. Seventh, use of AI for academic and administrative support Zawacki-Richter et al. [65] identified four areas of AIED application: profiling and prediction, assessment and evaluation, adaptive and personalized systems, and intelligent tutoring systems, but highlighted the lack of critical reflection on the challenges and risks of AIED and the weak connection to theoretical pedagogical perspectives.

The eighth is related to language limitations and ethics. Eysenbach [63] noted the need for the development of AI technology that can understand language according to specialized fields of study. Furthermore, universities need to develop ethical guidelines for trustworthy AIED implementation. Nguyen et al. [66] recommended the creation of ethical guidelines for ethical and trustworthy AIED implementation. Higher education institutions need to adopt a holistic approach to AIED integration with a focus on developing student behavior. Practical recommendations include modification of learning methods, stakeholder engagement, use of AI analysis techniques, and development of ethical policies. Effective implementation of AIED can improve learning outcomes and help in better understanding and directing student behavior.

Table 2. *Charting Data of Recommended Practices in Adopting AI in Higher Education*

Practical recommendations for higher education institutions looking to adopt or enhance AIED integration, with a focus on behavioural development	
Author	Recommendation
[50]	Modify flipped learning to reduce the negative impact of generative artificial intelligence.
[51]	Involving stakeholders in all stages of AIED solution design
[52]	Use the SEPT framework to analyze and understand the determinants of student behavior.
[53]	Apply K-Means clustering and SVM to identify student behavior patterns and improve the prediction of learning outcomes.
[54]	Using AI to analyze assessment variables and improve educational interventions.
[49]	Applying I-FCN assessment and feedback techniques to improve student learning outcomes.
[55]	Using paper cards to consider accountability and transparency in the application of AI technologies.
[56]	Develop policies, guidelines, and best practices for the ethical and effective use of AI technologies.

Practical recommendations for higher education institutions looking to adopt or enhance AIED integration, with a focus on behavioural development	
Author	**Recommendation**
[57]	Using the Generative AI Chatbots Acceptance Model (GAICAM) Framework to look at the attitude (readiness [optimism, innovativeness, discomfort, and insecurity], personal factors, perceptions, and basic infrastructure]) of actual AI usage.
[58]	Using AI-centered smart university sensors and intelligent monitoring systems to manage student behavior and activities.
[59]	Update academic policies to address AI-related academic integrity issues.
[60]:	Periodic revision of academic integrity policy with clear guidelines.
[61]	Socialization of the policy and inclusion of practices such as having students sign the honor pledge and providing reminders about the severity and impact of academic dishonesty
[62]	Policy makers should establish strict policies and regulations and educate individuals on the importance of ethical behavior when using AI technologies.
[63]	Upgrade AI technologies to understand language according to specialized fields of study.
[64]	Critically evaluate AI resources and tailor them to specific teaching contexts.
[65]	Focus on profiling and prediction, assessment and evaluation, adaptive and personalized systems, and intelligent tutoring systems in AIED implementation.
[66]	Create ethical guidelines for ethical and trustworthy AIED implementation.
[67]	Educators can prepare for development in jobs that cannot be replaced by technology and machines, such as cognitive analysis.
[68]	Prepare learners for roles that cannot be replaced by technology and machines.
[69]	Exploring the potential classroom applications of AI, deep learning algorithms, NLP, and detection technologies for precision education.
[70]	Using AI-based emotion detection systems to understand and respond to students' emotional needs.
[71]	the provision of AI literacy understanding to the change of student academic norms and ethics. a comprehensive understanding of AI in the academic context.

4. Discussion

In an era where technology is constantly evolving, the integration of artificial intelligence in higher education is increasingly taking center stage. Through the use of this technology, higher education institutions can optimize students' learning experiences, including in terms of behavioral development and the response and impact of integrating AI. This is because behavioral aspects also play an important role in overall student performance [72].

Students' behavioral patterns in using AI in higher education refer to the various ways in which students interact, respond, and adapt AI technologies in their learning context. These patterns cover various aspects of students' learning experiences, including how they learn, communicate, and overcome academic challenges. These behavioral patterns show how the integration of AI in higher education not only changes the

way students learn and interact but also how they think about the technology and its impact. Several studies emphasize the role of AI applications and techniques in improving student behavior when integrating AI in education [73]–[75]

Another important aspect is to maintain human oversight. While AIEDs have advanced capabilities for enhancing the decision-making process, the final decision must remain under human control. This safeguard is necessary to manage the ethical complexities and potential errors that AIs may introduce. AI output may contain falsity or bias, and students' over-reliance on AIs risks creating superficial learning or no learning [76]–[78]. It also ensures that the educational experience remains human-centered, fostering a learning environment that values human judgment and interpersonal interactions. To support the statement, Fagin et al. [79] explained that students need to have important critical thinking skills in integrating AIED, namely: clarity (the ability to understand the information received), accuracy (the ability to investigate the distance between information and factual reality), and relevance (the ability to evaluate whether the information received is relevant).

In its implementation, many universities prohibit their students from using AI in their academic assignments, hence the need for AI policies in education [80]. However, several studies have shown that the success of AI applications in education depends on students' self-regulated learning skills and how they utilize them [81], [82]. Research by Yan et al. [83] suggests that students who have strong self-regulated learning skills may be able to maintain a high level of dependability in interactions with AI.

Drawing on [84] model of self-regulated learning, the shift witnessed in pupils may be placed within the three stages of self-regulated learning: foresight, performance, and self-reflection. The students' original learning objectives and planning (forethought phase) were enhanced by their interactive experiences with Gen AI, resulting in more successful tactics and performance modifications (performance phase). The following reflection on these experiences and consequences (the self-reflection phase) most likely contributed to an iterative cycle of progress in both metacognitive knowledge and self-regulation abilities. AIEd has tremendous potential to alter higher education and student behavior. However, fulfilling this promise will need a collaborative effort by academics, educators, and policymakers to address the gaps and problems that present.

A review of the existing literature on artificial intelligence in education (AIED) reveals some critical gaps. First, there is a need for additional empirical research into the behavioral changes caused by AIED applications among university students. While some studies focus on academic achievements, the whole range of student behavior, such as motivation, engagement, and cooperation, has yet to be investigated. Furthermore, there is a lack of cross-cultural research that examines how AIED affects student behavior in a variety of educational settings. To address this gap, future research should prioritize longitudinal studies that track the long-term impact of AIEDs on student behavior in higher education. Such studies will provide valuable insights into how ongoing interactions with AI tools affect behavioral patterns, study habits, and social interactions over time. Comprehensive studies should also incorporate a mixed-methods approach, combining quantitative data with qualitative insights to capture the different ways in which AIEDs affect the student experience. These studies should involve a

diverse range of educational backgrounds and communities to guarantee that the findings are generally relevant and inclusive.

Study Limitations. While this paper presents a thorough analysis of the integration of AIEDs in higher education and its impact on students' behavioral patterns, several limitations should be acknowledged. Although we attempted to incorporate papers from several databases, it is conceivable that some relevant studies were excluded owing to restricted access or rigorous inclusion and exclusion criteria. Furthermore, AI technology is rapidly evolving, so conclusions from research completed some years ago may no longer be applicable to contemporary technologies and practices. Furthermore, the implementation of AI in higher education is continually expanding, necessitating ongoing updates to the study's findings and suggestions. Given these limitations, the findings and suggestions offered in this study should be considered cautiously. More in-depth and thorough research is required to overcome these limitations and offer a more complete picture of the influence of AIED on student behavior in higher education.

5. Conclusion

The scoping review emphasizes AIED's transformational potential in higher education, particularly in terms of personalized learning and increased student involvement. The key findings indicate that AIED has a considerable influence on students' cognitive, emotional, and social capacities, as well as learning techniques and ethics. According to research, AIED can promote creativity, critical thinking, and problem solving while also improving students' computational thinking abilities and flexibility to curricular changes. However, there are ethical concerns that must be addressed, such as possible technological misuse and alterations in students' behavioural control.

Research has also demonstrated that using AIEDs can help students enhance their computational thinking abilities, motivation, and programming self-efficacy. However, AIEDs can have an impact on students' social anxiety, with those who experience high levels of anxiety being less likely to prefer robot-based training partners. Furthermore, AI may be used to monitor students' self-regulation tactics and behavioral patterns, as well as to encourage academic honesty in the face of technological risks.

The findings' practical implications imply that higher education institutions should take a comprehensive approach to AIED integration, with an emphasis on student behavior development. Practical recommendations include modifying learning methods, engaging stakeholders, utilizing AI analytical tools, and developing ethical policies. Effective AIED deployment can improve learning outcomes and aid in better understanding and guiding student behavior. It is critical to recognize that educational technology is more than simply technology; we must consider the pedagogical, ethical, social, cultural, and economic components of AIEd. Policymakers should prioritize developing a supportive framework that fosters innovation while protecting student data.

AIEd has tremendous potential to alter higher education and student behavior. However, fulfilling this promise will need a collaborative effort by academics, educators, and policymakers to address the gaps and problems that present. By performing rigorous longitudinal research and emphasizing inclusion, the education community may

use AIED to develop more engaging, equitable, and successful learning environments. The future of higher education rests in the smart integration of AI technologies, which not only boost academic achievements but also promote students' overall growth.

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