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The potential impact of generative AI on the future of higher education: a game-changer or a danger to academic integrity

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ABSTRACT

Artificial intelligence (AI) has the potential to improve education by substantially modifying knowledge acquisition. While the research on AI's incorporation into higher education is growing, significant gaps exist in understanding its responsibilities, potential, implications for ethics, and privacy problems in educational settings. This study investigates AI's transformative impact on higher education using a total of four essential objectives: the ever-growing capabilities of AI within customized instruction, the prospective use of smart tutoring platforms, AI-driven review and input procedures in learning evaluation, and the ethical and privacy issues inherent in these technologies. A systematic review of the literature (SLR) was carried out to answer research questions established utilizing population, intervention, comparison, outcome, and context (PICOC) criteria, resulting in a structured analysis of pertinent articles. To conduct a thorough literature search, the Publish or Perish (version 8) application and an API key were used to systematically access the Scopus database. Initial keyword searches yielded 567 articles, which were reduced to 29 following predetermined relevant screening, restricted access sorting, repetition removal, and content validation. The findings show that AI technologies are increasing personalized education by adapting instructional content to individual needs while also improving decision-making, resources deployment, and administrative duties. However, the integration of AI raises issues such as data privacy, potential redundancies of human educators, and ethical obstacles. These findings highlight AI's immense potential for higher education, underlining the importance of tackling these problems regarding responsible and inclusive integration, furthering future research, and developing processes for responsible AI use in educational environment.

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1. INTRODUCTION

Artificial intelligence (AI) is a major factor in innovation in many different industries, one of which is higher education [1]. New opportunities to improve the efficacy, accessibility, and quality of teaching in higher education are emerging as a result of the fast advancements with use of intelligent tutoring systems (ITS), individualized learning solutions, predictive analytics, and automated administrative procedures, AI is revolutionizing the management and provision of education [2]. In the classroom, these AI-driven solutions promote individualization and put the focus on the students. Sajja *et al*. [3] affirmed that adaptive learning

systems have the ability to swiftly evaluate student progress, tailoring lessons and resources to suit unique requirements. More efficient and accurate evaluations of student performance are made possible by assessment tools powered by AI, while ITS offer personalized feedback and assistance. Institutions can run more smoothly, and employees can remnants at ease because AI is automating administrative tasks like scheduling, student support, and admissions [4]. Also, AI can foretell how well children will do in class and how likely they are to stay enrolled, so teachers may intervene with at-risk pupils when they need it most.

Tubella *et al*. [5] also stipulated that AI could transform higher education research in addition to its pedagogical and administrative benefits. Researchers can swiftly evaluate massive datasets with the use of AI's machine-learning algorithms and sophisticated data analysis, leading to the discovery of new patterns and insights [6]. Concerns about the ethical use of AI technology in the classroom, the future of teacher jobs, and the effects on student privacy are growing as more and more universities deploy AI to improve efficiency and encourage innovation [7]. This research delves into the ways AI is changing the face of higher education and how it might revolutionize pedagogy, student success, and institutional leadership. While AI offers great promise, it must be carefully managed to guarantee fair access, safeguard privacy, and preserve the vital human component of education. According to Singh *et al*. [8], online and hybrid learning approaches have been more popular since the COVID-19 epidemic. In this shift, AI is crucial because it improves student engagement, streamlines administrative processes, and provides more tailored educational experiences. In order to shape future approaches in higher education, it is vital to understand how AI can continue to support these growing educational models. Furthermore, AI has revolutionized the field of education as well as the job market [9], institutions of higher learning need to adjust to the changing workforce landscape brought about by AI-driven automation by preparing students for jobs in areas relevant to AI and schools can adapt to the needs of a dynamic labor market can be better understood by looking at AI in the classroom [10].

To make educated decisions on the adoption and deployment of AI in higher education, policymakers, educators, and institutional leaders need facts that are credible and based on evidence. The strengths, weaknesses, opportunities, and best practices of AI integration can be better understood with the help of a systematic review, which provides an exhaustive evaluation of the current literature. With AI's increasing clout, rules regulating its usage that are good for students, teachers, and schools must be put in place. To ensure the ethical and effective implementation of AI, a comprehensive study can lay the groundwork for future educational policy development. Research into the many facets of AI deployment in higher education is continuing, making it a new and exciting area of study. Future research can be reorganized by a systematic review's identification of knowledge gaps in areas like AI's scalability, broader social ramifications, and its long-term effects. The literature on AI in higher education is growing, but there is an absence of in-depth research on the new possibilities, challenges, roles, ethics, and privacy issues that arise when using AI in the classroom. While many studies have looked at certain aspects of AI, but how it can help with ITS and personalized learning, very few have taken the time to compile all of the findings into one comprehensive study of how AI will change the way we teach and evaluate students. Also, there is not enough data to draw conclusions about the privacy concerns and ethical dilemmas that come with using AI in universities. This knowledge gap highlights the need for comprehensive literature studies that explore the many uses of AI and evaluate the privacy and ethics needed for their responsible adoption. This protects the interests of both teachers and students while making sure that AI is used to its fullest potential too.

This study systematically reviewed the literature on the use of AI in higher education's new personalized learning approaches. It examined AI-powered technologies utilized in evaluations and feedback, with a focus on ITS, and determined how well they tracked student development and learning results. Furthermore, the study also examined possible privacy and ethical problems with AI technology adoption in higher education. An important first step in identifying a study and extracting relevant data is to formulate research questions. It was critical to formulate research questions in order to examine the existing literature on AI in higher education and direct the results toward specified goals. A popular tool for getting researchers to think about the parts of their research questions, the population, intervention, comparison, outcome, and context (PICOC) criteria shown in Table 1 served as the basis for these questions [11], [12]. The goals of the systematic literature review (SLR) can be simplified into searchable keywords using the PICOC framework, which stands for PICOC. This framework then helps in the design of appropriate research questions. With the help of PICOC framework, the appropriate research questions are:

i) What is the emerging role of AI in personalized learning methodologies in higher education identified in existing literature?
ii) What are the opportunities identified in existing literature regarding ITS in higher education?
iii) What kinds of AI-powered technology have been used in assessments and feedback for continuous monitoring of student progress and track learning outcomes?
iv) What are the key ethical considerations and privacy in education for adoption of AI technology in higher education?

Table 1. PICOC component and description

PICOC component	Description
Population (P)	Higher education (students, educators, and academic institutions)
Intervention (I)	Adoption of AI technology
Comparison (C)	focusing on emerging AI roles for personalized learning, tutoring, assessment and key ethical considerations
Outcome (O)	Identification of emerging roles and contributions of AI in personalizing learning
Context (C)	Higher education environment

2. LITERATURE REVIEW

AI is swiftly altering the framework of teaching and learning in higher education. As AI technologies advance, they present unparalleled prospects to better educational processes, facilitate individualized learning, improve evaluation systems, and optimize administrative activities. This literature review examines the diverse emergent uses of AI in higher education, emphasizing its incorporation into educational methods and learning strategies. The subsequent sections will emphasize main themes in current research, encompassing adaptive learning systems, intelligent tutoring, AI-driven assessments, and the evolving role of educators in AI-enhanced settings.

2.1. Emerging roles of AI increasingly integrates into personalized learning methodologies in higher education

An important benefit of AI in higher education is its capacity to provide tailored learning experiences. Study by Castro *et al.* [13] established that AI-driven adaptive learning systems can customize instructional content and learning trajectories to accommodate the distinct requirements of individual students. These systems evaluate data regarding student performance, learning behaviors, and engagement levels to adapt content delivery dynamically. Educators utilize machine learning algorithms to tailor courses and activities for individual learners, enabling students to advance at their own speed. This method has demonstrated efficacy in enhancing learning results, especially for individuals needing supplementary assistance or more demanding content [14]. AI-enabled personalized learning promotes a student-centric educational framework, transitioning from a uniform methodology to tailored learning experiences. Furthermore, personalized learning systems can also diminish dropout rates by detecting students at risk of underachievement and delivering prompt interventions, thus enhancing retention and completion rates [15].

2.2. Intelligent tutoring systems in higher education

AI-driven intelligent teaching methods signify a substantial progression in higher education [16], these ITS are engineered to provide customized teaching by replicating the roles of a human educator. They can assist students in navigating complex problem-solving procedures, provide feedback, and facilitate opportunities for concentrated practice. Various researches [17]–[19] stipulated that ITS significantly enhance learning results, especially in fields such as computer science, mathematics, and engineering that necessitate procedural knowledge. Students utilizing intelligent tutoring technologies in higher education often surpass their counterparts in conventional classroom environments [20]. These systems incorporate efficient feedback mechanisms that provide tailored, instantaneous feedback, allowing students to comprehend and correct their mistakes in real time. Furthermore, by automating repetitive instructional tasks, these technologies improve student performance while reducing the cognitive burden on educators.

2.3. The use of AI-powered assessments and feedback for continuous monitoring of student progress and track learning outcomes

AI is crucial in automating evaluations and enhancing feedback mechanisms in higher education. Conventional assessment techniques, including examinations and written assignments, tend to be laborious and frequently yield delayed responses. Conversely, AI-driven assessment tools, such as automated essay grading systems like project essay grade (PEG) and Turnitin's revision assistant, provide instantaneous feedback to students [21]. These systems employ natural language processing (NLP) algorithms to evaluate written content, offering detailed comments on grammar, structure, and logic. AI-driven formative evaluations enable ongoing review of student progress, allowing teachers to track learning outcomes with greater efficacy. Platforms such as EdTech's Gradescope automate the assessment of assignments and quizzes, enabling instructors to concentrate on more intricate responsibilities, such curriculum building and tailored instruction [22]. Furthermore, AI-assisted evaluations can augment student motivation by delivering prompt, constructive feedback that fosters learning enhancement [23].

2.4. Ethical considerations and challenges in adoption of AI technology in higher education

Although AI has various advantages for education, it also presents considerable ethical dilemmas, especially around data privacy, bias, and fairness in algorithmic decision-making. Concerns are increasing

around the storage, distribution, and use of the extensive student data amassed by AI systems for individualized learning. Moreover, the potential for algorithmic bias persists, since AI systems may perpetuate existing disparities by delivering biased feedback or suggestions derived from erroneous datasets [24]. In addition to that, the necessity of transparency and responsibility in AI based learning environments is very important [25]. Educational institutions must guarantee that AI technologies are developed and executed in manners that are equitable, transparent, and considerate of student autonomy. Moreover, there is an immediate necessity for legislative frameworks that consider the ethical ramifications of AI in education.

3. METHOD

3.1. Research approach

The SLR technique is used in this study to ascertain, comprehend, and consider research in an organized approach in order to find responses regarding research queries formulated [26]. Additionally, in order for a systematic review to be of good quality, it must take steps to effectively reduce the likelihood of bias and errors [27]. Furthermore, a well-defined protocol is used to steer the systematic review process [28], [29]. This protocol lays out the goals, concepts, and processes in advance to synthesize previous research and derive trustworthy findings. There are four main steps for doing a review: deciding what to include and what to banish, deciding where to look for information, evaluating the quality of the results, and finally, extracting and presenting the information [30], [31]. The following subsections go into depth about each of these stages. Figure 1 shows the main processes that this study followed to conduct the SLR according to the SLR technique.

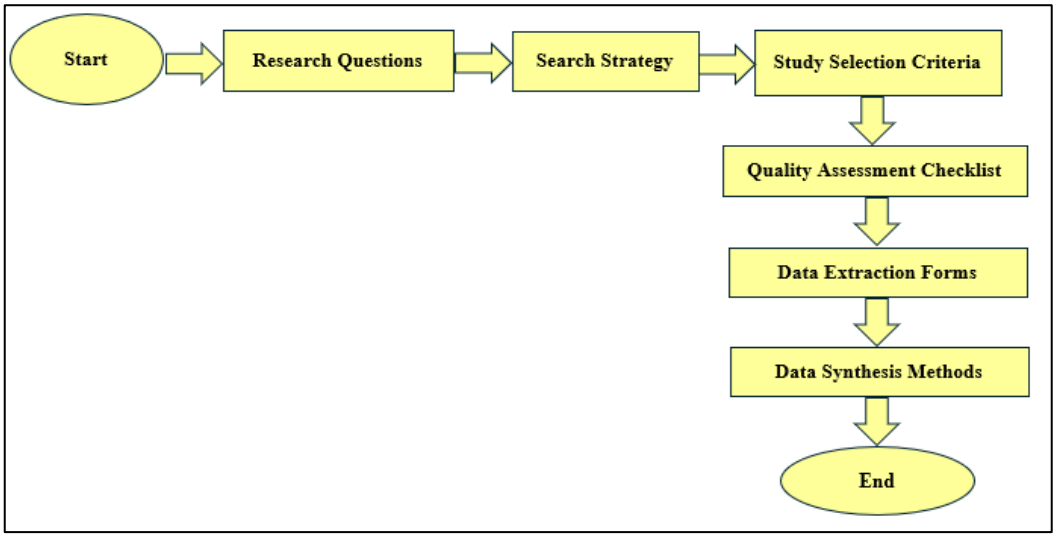

Figure 1. Protocol review stages [31]

3.2. Search strategy

An essential component of resource selection is using search engines to find pertinent, high-quality materials for systematic research [30]. The Scopus database was the intended focus of this keyword-based search approach, because of its extensive collection of journal articles from diverse sources, the Scopus database was selected for this investigation. The search keywords formed the basis of the search phrases were utilized to find relevant publications. The Boolean search utilized in this research were “AI in higher education”, “Artificial intelligence in higher education”, “Artificial intelligence in personalized learning”, “AI in personalized learning”, “AI in personalized learning”, “Artificial intelligence in personalized learning”, “personalized learning in higher education”, “AI in intelligent tutoring”, “Artificial intelligence in intelligent tutoring”, “Artificial intelligence assessment”, “AI assessment”, “Artificial intelligence feedback”, “AI feedback”, “Artificial intelligence ethics in education”, “AI ethics in higher education”, “AI ethics in education”, “Artificial intelligence privacy” and AI privacy. The search strategy was constructed and implemented to obtain research that have correlate and limited to be with the research goals, according to the SLR topic targeted in this research.

3.3. Inclusion/exclusion criteria

A thorough screening procedure was put in place throughout the inclusion and exclusion phase to guarantee the selection of correct and pertinent articles that were in line with the study topics. Journal articles only addressing the effects of AI on the trajectory of higher education were chosen for the SLR based on strict relevance, quality, and data integrity standards. For systematic and efficient retrieval procedure, Publish or Perish version 8 application was used to ease literature searches within the Scopus database using an API key. Academic rigor required that only articles published in peer-reviewed scientific journals be considered; other forms of literature, conference proceedings, book chapters, dissertations, and theses, notes, review articles, editorial were excluded. Unless the abstract or summary offered sufficient information for inclusion, studies without full-text availability were also not considered. In order to avoid duplication, we also eliminated records that were already in existence and studies that had data sets that overlapped. In order to keep the study focused, we also omitted research that did not directly look at AI's function in higher education or related fields. The publications that were chosen were all published in English, and they were all limited to research that were published between 2020 and 2024.

3.4. Data sources and databases searched

Recognized as the biggest curated and reviewed abstract and indexing database, Scopus is an invaluable resource for academic, governmental, and business institutions [32]. Scopus indexes also include the majority of the journals, which are also listed in Web of Science (WoS), and its inclusivity is more than 60% higher than WoS. Because of this similarity, bibliometric analyses that take into account both databases may produce redundant results [33]. Therefore, one of the most credible databases for searching pertinent literature is Scopus, which is why it was selected for this study. Scopus was chosen for data collecting because of its vast scope, comprehensive search filters, and data analysis grids, which greatly improve data management skills. To make sure each article fit the inclusion requirements and was relevant, we looked over its title, abstract, and primary content very carefully. Following this comprehensive assessment, the papers that were ultimately chosen were screened in preparation for the next steps of the review.

The Publish or Perish version 8 application was utilized for literature search within the Scopus database using an API key. The initial search using the specified keywords yielded a total of 567 articles. Following an initial relevance screening, this number was reduced to 157 articles directly pertinent to the study's subject. Duplicates and records flagged as ineligible by automated screening tools were subsequently excluded, resulting in 134 articles remaining. Due to access limitations, some articles could not be retrieved, further refining the selection. A comprehensive review of abstracts and full texts led to the exclusion of an additional 16 articles that did not align with the thematic focus of the study. Ultimately, 29 research articles met the predetermined inclusion and exclusion criteria and were included in the final consideration, as shown in Figure 2.

3.5. Selecting quality article

The first step, called title and abstract screening, involved checking the titles and abstracts of all the papers that were obtained to see if they fulfill the inclusion requirements. Research that blatantly does not meet these criteria was disregarded at this point. After that, in the comprehensive review step, all the studies that made it through the initial screening were checked for relevance and quality by reading their entire texts. To guarantee that all criteria for inclusion and exclusion are met, this evaluation followed a predetermined format. After this first screening, all included studies underwent a comprehensive quality review that targets particular criteria pertaining to study methodology, approach, and relevance. The validity and trustworthiness of measures, as well as the study's methodology and sampling strategy, was carefully considered in quantitative investigations. Quality of research questions, techniques of data collecting, and analysis depth are the determining factors for qualitative investigations. This methodical procedure guarantees that the final presentation of results is based on only high-quality research.

3.6. Data extraction and analysis

To guarantee a thorough assessment of the found publications, a methodical approach was used during the data extraction and analysis phase of this systematic review. Ultimately, 29 research articles met the predetermined inclusion and exclusion criteria and were included in the final consideration. Records that did not conform to the research's questions were omitted using stringent exclusion criteria to ensure the validity and usefulness of the review. This method involved a number of phases aimed at excluding certain things. To start with, we excluded papers that were not written in English to make sure all of the included studies used consistent and coherent language. Additionally, a temporal filter was used to exclude publications that were published prior to 2020 in order to concentrate on the most current advancements. So that we could focus entirely on primary research, we also methodically removed reviews, books, and conference proceedings. During the full-text review phase, additional enhancing took place. With an eye

toward the possibilities offered by ITS and an exploration of AI-powered technologies utilized in evaluations and feedback, this systematic review sought to thoroughly investigate the developing roles of AI in customized learning approaches within higher education.

The review also found possible privacy and ethical problems with using AI in universities, and it evaluated how well these systems tracked students' development. To address the research aim, the systematic review sought to answer the research questions: i) What is the emerging role of AI in personalized learning methodologies in higher education identified in existing literature?; ii) What are the opportunities identified in existing literature regarding ITS in higher education?; iii) What kinds of AI-powered technology have been used in assessments and feedback for continuous monitoring of student progress and track learning outcomes?; and iv) What are the key ethical considerations and privacy in education for adoption of AI technology in higher education? All selected articles were interpretively analyzed in accordance with these research questions, and the findings were critically presented in the subsequent section.

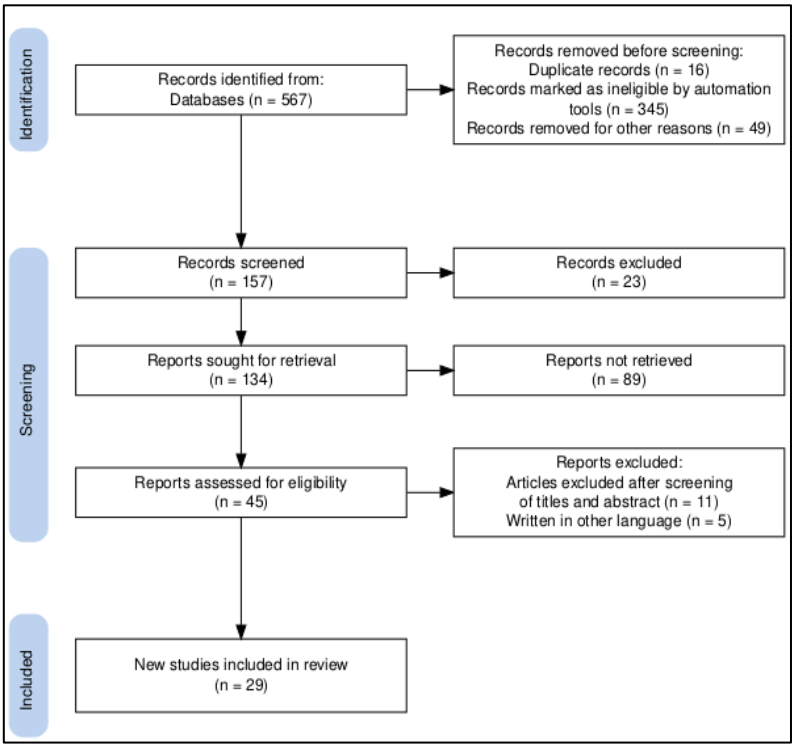

Figure 2. Flow diagram of systematic review process

4. RESULTS

This section concentrates on assessing and analyzing the collected data to emphasize results pertinent to the four primary subjects for research previously identified. The areas encompass individualized learning methodologies, ITS, AI-enhanced technology utilized in assessments and feedback, as well as ethical considerations and privacy issues in education. This part offers a thorough review of the study's results by examining the fundamental elements, revealing the complex interplay between the changing roles of AI and higher education.

4.1. What are the emerging roles of AI in personalized learning methodologies in higher education identified in existing literature?

The main research objectives centered on examining the trends and advancing functionalities of AI specifically in adaptive learning facilitation, ITS, predictive analytics, personalized learning, evaluation and feedback automation, and collaborative learning enhancement. Although several research investigated various AI functions, only those pertaining to individualized learning methodologies in higher education were emphasized. The results are categorized into six primary groups. The position of the adaptive learning facilitator focuses on AI-driven adaptive learning systems that tailor instructional content to meet each student's individual needs, learning speed, and prior knowledge. These systems incessantly modify the

difficulty and format of materials according to data, so generating a tailored learning experience. This transition from conventional to adaptive personalized learning was analyzed in four research. ITS have emerged as the primary contributors to the role of AI in higher education research, as evidenced by six studies. Predictive analytics tools were significant in four studies. Six research examined personalized learning facilitated by AI-powered virtual assistants or chatbots. These virtual assistants serve as constant companions for students, providing personalized study recommendations, addressing inquiries, and managing schedules, thus improving the educational experience outside conventional classroom hours. Furthermore, five research examined evaluation and feedback automation, whereas four papers addressed collaborative learning.

4.2. What are the opportunities identified in existing literature regarding ITS in higher education?

ITS provide individualized educational programs designed to address each student's specific needs, learning speed, and knowledge deficiencies, enabling personalized education that is challenging to attain in conventional big classroom environments. An analysis of 29 articles reveals that the opportunities afforded by ITS can be categorized into six principal areas: student engagement and motivation, scalability of high-quality education, support for at-risk students, self-paced learning, data-driven insights for instructors, and accommodation of diverse learning styles. Among them, student involvement and motivation (n=4) and the scalability of quality education (n=6) emerge as the most frequently recognized advantages. ITS also provides assistance in three distinct areas: helping at-risk students (n=3), facilitating self-paced learning (n=5), and delivering data-driven insights for instructors (n=5). Moreover, ITS facilitates the accommodation of various learning styles (n=6), enhancing the personalization of the learning experience. Haridas *et al*. [34] emphasized that ITS can facilitate the early identification of at-risk pupils by monitoring their progress and forecasting prospective difficulties using performance data. This facilitates prompt interventions, providing further assistance to students prior to the escalation of their difficulties. Likewise, ITS enable students to advance through information at their own speed, assisting individuals who require additional time to comprehend concepts or those who can swiftly navigate familiar topics.

4.3. Intelligent kinds of AI-powered technology have been used in assessments and feedback for continuous monitoring of student progress and track learning outcomes?

Upon integrating the research, diverse AI-driven technologies are utilized for assessments and feedback, facilitating ongoing monitoring of student progress and the tracking of learning outcomes. These technologies are classified into six categories: automated essay scoring systems, learning management systems (LMS), peer assessment and feedback systems, automated quiz and test grading systems, speech and writing feedback systems, and gamified learning and assessment. Automated essay scoring systems (n=3), LMS (n=6), peer assessment and feedback systems (n=6), automated quiz and test grading systems (n=3), speech and writing feedback systems (n=4), and gamified learning and assessment (n=5) are all integral components of contemporary education. Automated essay scoring systems employ NLP and machine learning to assess student writings, examining elements such as grammar, coherence, logic, and relevance to deliver overall scores and specific feedback [35], AI-powered LMS solutions consistently evaluate student advancement by scrutinizing engagement metrics, including quiz scores, involvement levels, and time allocated to continuous assessment activities these systems produce instantaneous insights on learning outcomes and recommend material modifications or interventions based on the performance of individual students [36].

4.4. What are the key ethical considerations and privacy in education for adoption of AI technology in higher education?

Upon examining the research findings, numerous significant ethical and privacy concerns emerge about the deployment of AI technology in higher education. These problems can be classified into four primary domains, they are data privacy and security, bias and fairness in AI algorithms, transparency and accountability, and ethical AI design and utilization. Resolving these challenges necessitates a comprehensive examination of prior research to discern prevalent themes and areas of concern. This methodology entails analyzing pertinent papers, integrating their findings, and deriving conclusions regarding the principal ethical and privacy concerns associated with AI in higher education. Five studies (n=5) underscore the significance of upholding transparency in the acquisition and utilization of student data, especially when AI systems evaluate sensitive personal information such as learning behaviors and cognitive performance [37]–[40]. The concern of bias and fairness in AI algorithms is emphasized in three research (n=3), with the necessity for periodic assessments of AI systems to identify and mitigate bias [41]. Four research (n=4) recommend that AI systems in higher education incorporate transparent characteristics, allowing students and instructors to evaluate AI-generated results [42]. Six research (n=6) emphasize the importance of ethical design techniques that incorporate diverse stakeholders, including students and educators from varied backgrounds, to guarantee

justice and inclusivity in AI systems. Proposed ethical AI frameworks underscore the ideals of fairness, transparency, and inclusivity in the creation of educational AI systems [43].

5. DISCUSSION

AI-driven tailored learning platforms tailor material and pacing to students' learning styles and performance preferences, these solutions promote student engagement and success by providing personalized learning experiences [43], [44]. AI can analyses student data and provide real-time feedback, enabling personalized course routes [45]. AI-driven tutoring solutions provide individualized support outside of the classroom. Lee *et al*. [46] stated that ITS give students quick feedback and advice, minimizing the need for human interaction and enabling scalable, on-demand support. AI is increasingly employed to streamline administrative processes including evaluations, enrollments, and student support [47]. Data analysis with AI can inform institutional growth and resource allocation. AI analyzes massive student data to uncover trends and inform course offerings, retention strategies, and operational improvements. Early intervention is possible with predictive analytics, which may predict enrollment trends and identify at-risk students [48]. By automating time, space, and staff assignments, AI technologies help institutions maximize resource allocation. Research demonstrates AI systems can improve institutional efficiency by reducing administrative burdens and operating costs, also can automate grading and attendance tracking for educators [49]. AI frees educators to focus on content and student mentoring by reducing administrative tasks. AI analytics let educators track student progress, discover learning gaps, and alter teaching methods.

The possibility for instructors and AI systems to collaborate on tailored courses by AI can assist educators make data-driven teaching decisions using student learning data [50]. AI can improve teacher development by providing tailored training and assistance and AI systems can evaluate educators' performance and offer areas for improvement, making professional development more personalized and effective [51]. Moreover, Escotet [52] stated that AI-driven systems may quickly assess student performance data and change course difficulty, pace, and material to fit individual learning demands. By identifying student weaknesses and providing targeted support, these technologies personalize learning. They provide personalized comments, explanations, and direction throughout the learning process, like one-on-one tutoring. AI-driven assessment systems examine student work, problem-solving, and critical thinking skills. AI-detected student submission patterns, providing greater insights into student performance [53]. Grading, attendance, and assignment evaluation are automated by AI, reducing educators' administrative workload. This allows time for lesson planning, classroom interaction, and customized student support. AI-powered virtual classrooms allow tailored engagement with AI avatars as teaching assistants. Avatars can answer questions, explain complex topics, and provide emotional support, improving learning [54]. AI systems can also suggest movies, articles, and interactive simulations for each learner. These suggestions enhance education by providing different curriculum-aligned resources. AI can also tailor learning routes for kids with learning difficulties by adjusting content and teaching methods. These technologies provide tailored support for students who need it, creating a more inclusive learning environment [55]. AI-generated content ownership is still unclear, with debates concerning whether the artist, user, or AI system should own rights. Legal issues hamper AI-generated material, especially in art, music, literature, and software development. Generative AI systems are trained on enormous datasets with inherent biases, which might result in biased language, visuals, or choices that damage particular populations. AI-generated material might reinforce detrimental stereotypes and biases, resulting in discrimination [48].

Another issue with generative AI is accountability. When AI-generated content causes reputational or societal damage, as deepfake videos, it might be hard to hold creators or users accountable. AI usage laws are harder to enforce without explicit credit. Using generative AI, cybercriminals may develop complex phishing emails, malware, and other dangers. AI-generated content might trick people into clicking on hazardous links or create polymorphic malware that modifies its code to avoid cybersecurity [49]. Academic integrity difficulties arise when students use generative AI models like generative pre-trained transformers to write essays, research papers, and code. Allowing plagiarism and devaluing authentic student work could harm education. Generative AI can develop compelling fake information. AI can create fake news, social media posts, and realistic audio/video deepfakes. Public trust is at jeopardy due to these technologies influencing ideas, propagating misinformation, and defaming persons and organizations [53]–[55].

5.1. Implications for policy and practice

Educational institutions need defined AI ethics and should use ethical frameworks that promote inclusiveness and fairness to ensure that AI systems satisfy the different requirements of all pupils, especially those from underprivileged backgrounds [56]. To preserve AI-collected student data, data protection must be strengthened. Institutions should also establish frameworks for continual AI tool assessment and evaluation,

focused on student learning results, engagement, and satisfaction. AI tools must be built for educational environments through collaboration between higher education institutions and AI technology developers [57]. This alliance can create intuitive, effective, and dependable AI apps. Institutions can overcome AI adoption hurdles by setting high ethical standards, improving data protection, investing in infrastructure and training, and fostering stakeholder engagement [58]. These approaches will help AI alter education, improving equity, accessibility, and learning for all students. Open communication with students and stakeholders about AI data collection, storage, and use builds trust and responsibility. Governments and organizations should fund higher education AI technology development and implementation [59].

5.2. Directions for the future

Future study should focus on longitudinal studies to determine how AI technology affects student learning, retention, and education. Longitudinal assessments can help academics understand higher education AI efforts' longevity and efficacy. Multidisciplinary collaboration between educators, technologists, ethicists, and politicians is necessary to understand AI's complicated effects on education. Multidisciplinary approaches should be used to produce holistic solutions that consider technological and ethical factors in future investigations. Exploring how AI may improve higher education fairness and inclusion is crucial. This involves exploring ways to ensure that underprivileged and marginalized groups benefit equally from AI technologies and removing barriers to access. Comprehensive educator training programs that emphasize AI technology integration are needed now. Future research should determine the best professional development methods to help educators learn AI tools and adjust their teaching methods. As higher education adopts AI technology, clear standards and laws are needed. Future study should examine how governments may support responsible AI use while keeping educational institutions responsive to technology. Finally, inquiry-based learning, collaborative learning, and AI-enhanced personalized learning should be studied to see if they improve student engagement and learning

6. CONCLUSION

AI-enabled personalized education lets universities scale customized learning. AI systems can customize course content, resources, and pacing based on students' learning behaviors, performance, and preferences. Learning analytics from AI lets educators track student progress, identify issues, and act early when pupils are underperforming. Real-time feedback helps educators tailor their lessons to student requirements using data-driven methods. ITS are revolutionizing higher education by providing individualized, adaptive learning experiences that supplement standard teaching techniques. These platforms support students, improve academic achievements, and provide more adaptable and scalable educational solutions as they evolve. AI-powered examinations give pupils fast feedback, helping them understand their strengths and flaws. This timely feedback promotes a growth mentality, encouraging students to actively learn and adapt to their study habits. Continuous AI assessments encourage repetition, which improves retention and skill improvement. AI-driven evaluations boost educational outcomes by personalizing and adapting instruction, according to research. Tailoring learning experiences improves engagement and comprehension, improving academic performance and education satisfaction. AI-automated assessment processes allow educators to spend more on teaching and less on grading. This efficiency improves assessment and encourages more frequent and varied evaluations, which improves student development understanding. AI encourages teamwork, customizes learning pathways, and promotes critical thinking to boost student engagement with content and peers. AI's support of collaborative and inquiry-based learning advances flexible, engaging, and inclusive educational settings that prepare students for modern life. AI is improving teaching, personalizing training, and allowing instructors to become learning facilitators in higher education.

To truly benefit from AI in education, educators must focus on professional growth, teamwork, and ethics as they adapt. Educators can improve efficacy, student engagement, educational equity and innovation by integrating AI. AI has immense potential to improve education, but it poses complicated ethical considerations that must be considered. Ethical AI adoption in higher education requires prioritizing data protection, tackling algorithmic bias, ensuring fair access, and fostering openness and responsibility. Establishing a robust ethical framework for AI in education would allow institutions to leverage its transformative potential while promoting fairness, equity, and trusted modern world.

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C : **C**onceptualization
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D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest

DATA AVAILABILITY

No data was used for the research described in the article.

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