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Challenges Of AI In Education: A Systematic Review

Nguyen Thi Huyen[1], Nguyen Phuong Lien[1], Pham Thu Thuy[1]
Thai Nguyen University Of Education – Thai Nguyen University, Vietnam

Abstract:
The profound impact of artificial intelligence on education is undeniable. Beyond its positive contributions, however, AI introduces numerous challenges to the education sector. To understand the latest developments in AI research, particularly concerning the challenges it presents for education, a review was conducted on 477 relevant works published between 2015 and 2025. The results demonstrate a widespread international interest in AI research in education, with studies consistently identifying various challenges for teachers and learners when AI is introduced into educational settings.

Keyword: *Artificial Intelligence, education, teaching, challenge*

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I. Introduction

Artificial Intelligence (AI) is revolutionizing education by enabling personalized learning experiences tailored to individual students' needs and abilities (Grace et al., 2023). AI-powered systems can analyze learner data to create customized content, provide targeted feedback, and adapt to each student's pace (Harry, 2023). Applications of AI in education include intelligent tutoring systems, automated grading, and immersive virtual reality environments (Grace et al., 2023; Sadiku et al., 2021). These technologies have the potential to improve student engagement, learning outcomes, and educational efficiency (Harry, 2023; Ayeni et al., n.d.). Additionally, AI in education offers significant opportunities for personalized learning, administrative efficiency, and improved accessibility (Widyasari et al., 2024). AI-powered systems can adapt to individual learner needs, provide real-time feedback, and create immersive learning environments (Grace et al., 2023; (Sytnyk & Podlinyayeva, 2024). However, challenges such as privacy concerns, data security, algorithmic bias, and ethical considerations must be addressed (Harry, 2023; Grace et al., 2023). Successful implementation of AI in education requires collaboration among educators, administrators, developers, and policymakers to ensure responsible and equitable use of these technologies (Grace et al., 2023; (Ayeni et al., 2024). Besides, the integration of AI in education faces challenges such as inequitable access, potential algorithmic bias, and ethical concerns regarding data privacy and security (Widyasari et al., 2024; (Eden et al., 2024). Implementing AI in education requires collaboration among educators, administrators, developers, and policymakers to ensure ethical and responsible use (Grace et al., 2023). To maximize benefits and address challenges, there is a need for transparent practices, conscientious oversight, and efforts to bridge the digital divide ((Eden et al., 2024). By carefully navigating these issues, AI can be harnessed to create more effective, equitable, and inclusive educational environments (Sytnyk & Podlinyayeva, 2024; (Eden et al., 2024).

It can be seen that AI brings many positive aspects to education, but there are also many challenges that those working in the education sector need to solve to bring equity in education for all students in the context of AI's increasingly profound impact on the education sector.

To find out what research has been written about the challenges of using AI in education, the study uses data from Scopus. The Scopus database stores research publications on various scientific topics related to AI in education. By analyzing the bibliographic records in the Scopus database, it is possible to extract valuable information regarding the collaboration networks and research interests of scholars in the fields of AI and education around the world. This analysis also allows for the construction of concepts, definitions, and a better understanding of the challenges that AI poses in learners' education. This study aims to provide a bibliographic review of scientific publications on the challenges posed by AI in education from 2015 to April 2025 in the Scopus database. This study focuses on clarifying the following issues:

RQ1. How many research-related publications were there in each year, from 2015 to April 2025?
RQ2. What are the prominent keywords?
RQ3. What are the most important countries concerning the production of research papers in challenge of AI in education?
RQ4. What the papers are the highest citation about challenge of AI in education?
RQ5. What are the main challenges identified in the research literature about challenges of AI in education ?

II. Materials And Methods

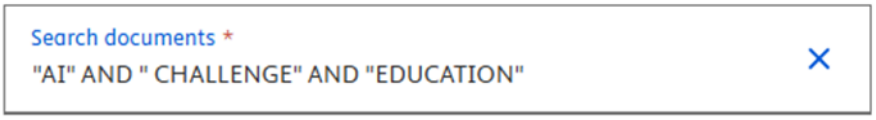
Data source and procedure

Bibliometric co-citation analysis, a meta-analytical technique, illustrates the relationships between research articles and topics (Cote et al., 1991; Kim & McMillan, 2008). This method allows researchers and authors to develop a clear understanding of a field's structure (Bibliometric Methods in Management and Organization – Ivan Zupic, Tomaž Čater, 2015, n.d.). The initial step in a bibliometric review involves identifying relevant databases for the study (Albort-Morant & Ribeiro-Soriano, 2016). For this research, the Scopus database was chosen to extract the necessary data. Building upon prior research regarding the potential of digital libraries, Scopus was selected for its ability to connect and analyze content (Klapka & Slaby, 2018). Furthermore, Scopus, developed over two years in collaboration with 21 research institutions and over 300 researchers and librarians (Burnham, 2006), stands as a highly comprehensive database of peer-reviewed journals, offering excellent scientific academic information.

All searches were conducted on the Scopus database in April 2025, and the data required for the bibliometric analysis were subsequently obtained. A diverse range of document types available in the database was included, such as articles, books, book chapters, rubrics, and related articles. The search strategy involved identifying all documents containing the terms “AI” AND “Challenge” AND "education". To ensure comprehensive journal information, the search timeframe was unrestricted; however, the earliest data collected dates back to 2015. Additionally, the search parameters were limited to the English language and open-access data to ensure the broad applicability of the research content.

Analytical methods and software

The study conducted a bibliometric analysis on one major database is Scopus. The data about challenges of AI in education was search and retrieved from the database in April 2025 with the following command:



The bibliometric analysis included five steps as follows:

Step 1. Raw data collection: The data retrieved from Scopus database using the command above included 6369 publications (books, chapters, journal articles, conference presentations) published on the journals from 2015 until April 2025.

Step 2. Data pre-processing and refinement: To refine the collection of 6369 identified documents, it is necessary to exclude the irrelevant documents included in the search results by limiting the year from 2015 to 2025, where the subject areas are Social Sciences, the Document type is Article, the Publication stage is final, and the keywords are limited to "Artificial Intelligence, ChatGPT, Generative AI, AI, Artificial Intelligence In Education, Artificial Intelligence Technologies, AI In Education, Artificial Intelligence Tools, Challenges, Artificial Intelligence Learning", and where the Language is English, open-access data. The result was 477 documents that met the requirements.

Step 3. Data extraction: Following the data refinement stage, the collection of 477 research works challenge of AI in education was finalised with relevant information including authors’ names, title of the research works, publishing houses (or publishing journals), publishing countries, citation indexes, etc.

Step 4. Data visualization: This study uses VOSViewer software (free access on the website: www.vosviewer.com) and Wordcloud (free access on the website: www.freewordcloudgenerator.com) to visualise the collected data through bibliometric analyses and visual representations of the publications based on a range of bibliometric indexes such as reference linkages, co-occurrences and co-citations.

Step 5. Result justification: Interpreting and analysing the findings through tables and diagrams created with VOSviewer and Wordcloud softwares.

III. Results

Summary Statistics

The sample included 477 publications written by 163 different authors. While two or more authors wrote most of the publications, 61 authors wrote only one publication. The publications were published by 164 different institutions in 212 different journals. 2832 keywords were used to describe the publications in our sample, and the total sample was cited 14,841 times, with an average of 30 citations per publication. The publication with the highest number of citations (2055) was Sharma M. et al (Sharma et al., 2022). In total, 86 countries contributed to the research on the challenge of AI in education, which means that this topic has received considerable attention worldwide.

How many research-related publications were there in each year, from 2015 to April 2025?

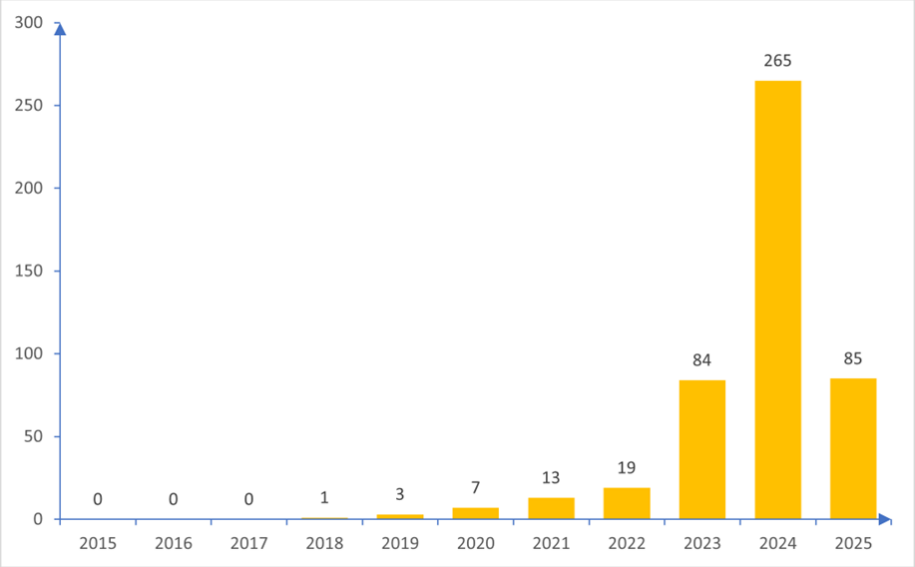


Figure 1. Total of studies by year

Figure 1 illustrates two distinct phases. The initial phase, spanning from 2015 to 2017, shows no recorded research concerning the challenges posed by AI in education. The subsequent phase, from 2018 to 2025, demonstrates a significant increase in research addressing this topic. In 2018, only a single study was documented. This number tripled the following year, and by 2024, there was a substantial surge in research output, reaching 265 works – a 265-fold increase compared to 2018, the year when research on the challenges of AI within the education sector commenced. By the conclusion of the data collection period, 85 research papers focused on this issue had been published.

What are the prominent keywords?

The keywords most frequently associated with AI and education are evident. Using Wordcloud software, the most frequent terms are 'intelligence,' 'artificial,' 'education,' and 'learning.' These keywords are centrally located and displayed with the largest font size. Less frequent keywords appear in smaller font sizes and are located further from the center. The visual representation of the keyword co-occurrence network in publications on the challenges of AI in education highlights topics of high and low interest. This suggests avenues for further research into under-explored areas such as the sustainable use of AI in education or gender equality in its application.

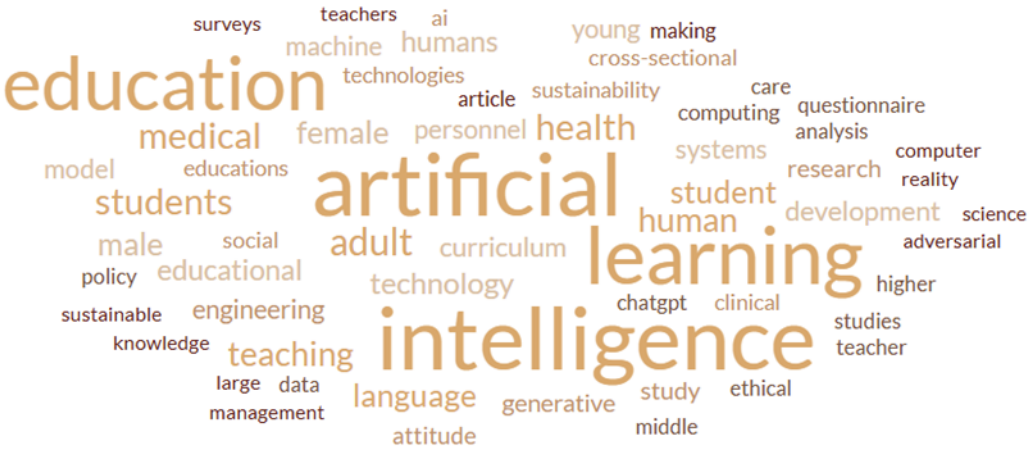


Figure 2. Visual representation of the Co-occurrence network of keywords in publications related to the challenge of AI in education. Source: Analysis results obtained with Wordcloud software.

To more clearly represent the relationship between prominent keywords on the research topic, VOSviewer software was used for analysis. The keyword study examines the distribution of the most frequently

used keywords, employing a keyword co-occurrence analysis. This approach aimed to visualize the current state and emerging trends of key research topics within the domain of rubrics in self-assessment. Specifically, the study focused on the author-provided keywords listed below the abstract. Based on this data, Figure 3 illustrates the primary keywords, with the size of each node indicating the frequency with which the keyword appeared across the papers (larger keywords and nodes signify higher occurrence). The connecting lines represent the frequent co-occurrence of keywords within various papers. Furthermore, a shorter distance between nodes suggests a relatively stronger relationship between those keywords in terms of co-occurrence compared to their association with other keywords (Garrigos-Simon et al., 2019). The terms associated with the keyword "challenge of AI in education" include: Artificial intelligence, chatGPT, generative AI, AI, sustainability, students, educational technology,… appeared with great frequency.

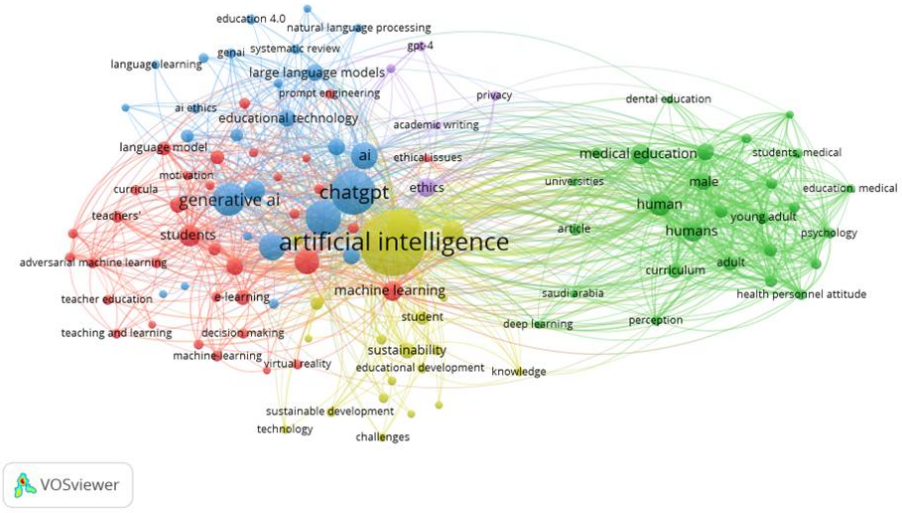


Figure 3. Visual representation of the Co-occurrence network of keywords in publications related to the challenge of AI in education. Source: Analysis results obtained with VOSviewer software.

What are the most important countries concerning the production of research papers in challenge of AI in education?

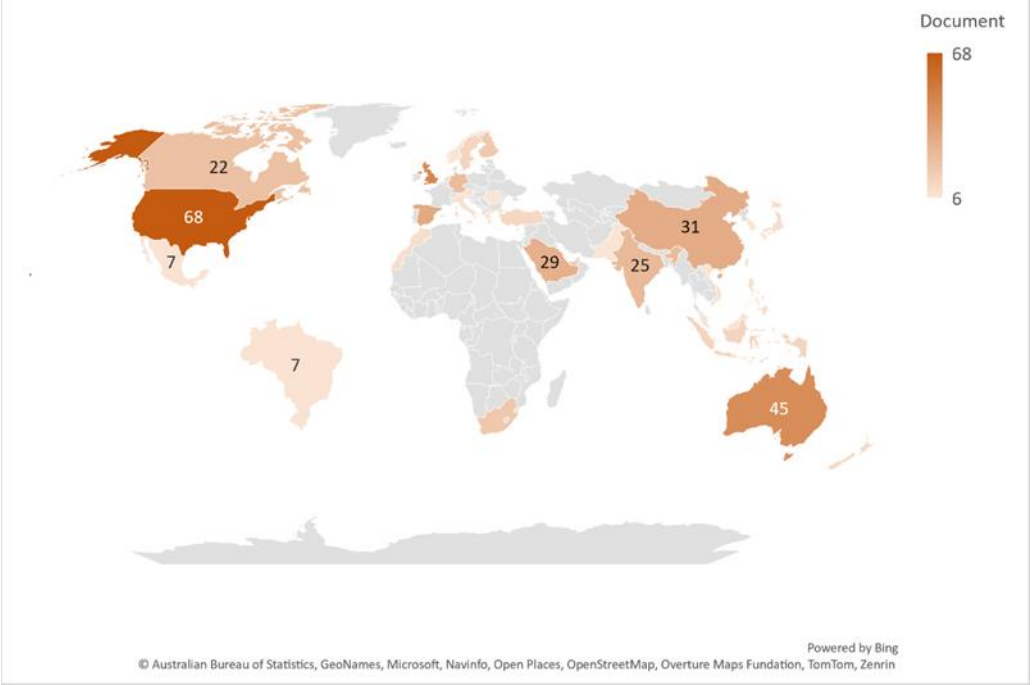


Figure 4. The countries concerning the production of research papers in challenge of AI in education

From Figure 4, it is not difficult to see that the United States is the country with the largest number of research projects on the challenges of AI in education with 68 documents, followed by the United Kingdom with

48 research projects, 1.4 times less than the United States. With 45 research projects belonging to Australia, followed by Spain with 32 research projects. Following are a series of other countries with fewer projects. Through the data table below, it can be seen that the issue of "challenges of AI in education" is a topic of interest to many countries from the Americas, Europe, Asia, Africa and Oceania. The statistical table only focuses on countries with 6 or more projects, in addition, there are a number of other countries that also research this issue but with fewer studies.

Country	United States	United Kingdom	Australia	Spain	China	Saudi Arabia	India	Germany	Hong Kong
Document	68	48	45	32	31	29	25	24	23
Country	Canada	South Africa	United Arab Emirates	Finland	Indonesia	Sweden	Turkey	New Zealand	Netherlands
Document	22	19	18	18	13	13	12	11	9
Country	Philippines	Japan	Morocco	Italy	Austria	Singapore	Viet Nam	Taiwan	Philippines
Document	9	9	9	8	8	8	7	7	9
Country	Qatar	Malaysia	Brazil	Mexico	Norway	Pakistan	Romania	Greece	South Korea
Document	7	7	7	7	6	6	6	6	6

Visualization tools are a powerful component of scientific progress in many fields. In many cases, data summarized in the form of charts or graphs can help clearly express ideas (Chu et al., 2013). Using VOSviewer software allows to clearly see the research collaboration between countries. Seeing research collaborations across countries shows the importance and impact of the research problem.

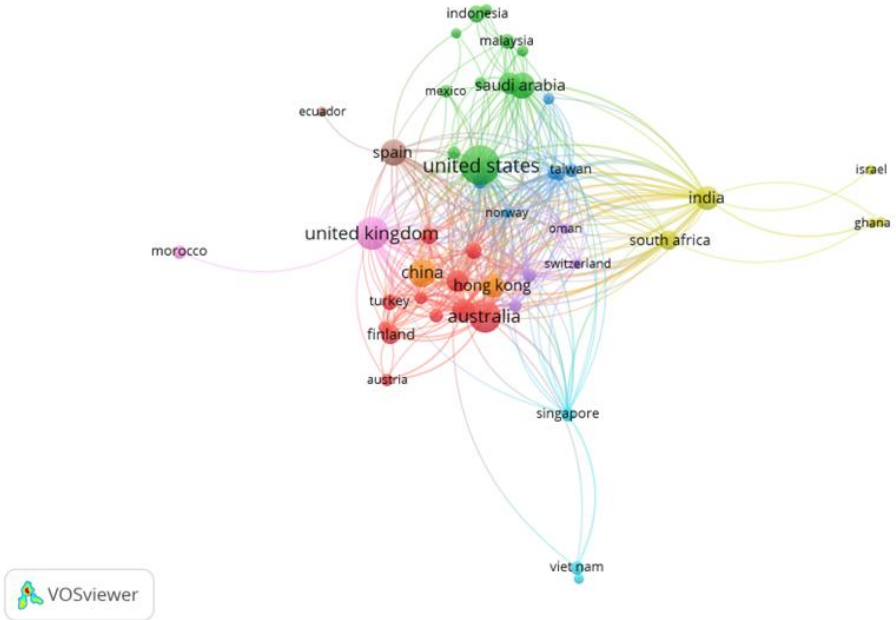


Figure 5. Network Visualization of Country Research

Based on the visualization of the graph structure in Figure 5, it is possible to analyze the collaboration between researchers in different countries around the world. Notably, the United States, with the largest circle node, appears to be the country with the most collaboration with other countries such as Saudi Arabia, Malaysia, Indonesia, Mexico, etc. With the second largest level, Australia and the United Kingdom also demonstrate research collaboration with many other countries, but it is not as extensive as that of the United States. The smaller the nodes, the weaker the collaboration and combination between countries. There are countries that have many joint research projects with different countries around the world, but there are also countries that only collaborate with a single country, such as Morocco, which only collaborates with the United Kingdom, or Ecuador, which only collaborates with Spain in this research field.

What papers are the highest citation about challenge of AI in education ?

An examination of the number of citations reveals the quality of a document, and also its popularity and influence within a research field (Blanco-Mesa et al., 2017). Table 1 presents the top 20 papers with the most citations and their characteristics. Interestingly, of these 20 most cited papers, 19 were published in 2025, with only one from 2024. This highlights the huge and rapid impact that research related to the challenges of AI in education is having on the scientific community. The fact that new works published in 2025 quickly gained a large number of citations indicates that this field of research is developing at a very fast pace. New knowledge and discoveries are constantly being built upon and acknowledged, leading to older studies potentially becoming less cited than new discoveries.

Table 1 shows that the most cited article is by Ahmed A.-B. et al., with 2055 citations. Ranked second is the article titled 'Integrating Artificial Intelligence into High-School Computer Science Curriculum: A Perspective Study in Morocco,' which has 1987 citations, 1.03 times fewer than the most cited article. Following this is work published in the journal 'Nurse Education in Practice' with 551 citations, which is 1504 and 1436 citations less than the first and second positions, respectively. From the 4th position downwards, the total number of citations in the articles does not exceed 550.

Table 1. Top 20 papers with the highest citations about challenge of AI in education

Rank	Journal	Articles	Authors	Year	TC
1	Journal of Engineering Education Transformations	Half a Decade of Artificial Intelligence in Education in Africa: Trends, Opportunities, Challenges and Future Directions	Ahmed A.-B.; King B.D.; Hiran K.K.; Dadhich M.; Malcalm E. (Ahmed et al., 2025)	2025	2055
2	Journal of Curriculum Studies Research	Integrating Artificial Intelligence into High-School Computer Science Curriculum: A Perspective Study in Morocco	El Khayati M.; Courr A.; Kich I.; Hibbi F.-Z. (El Khayati et al., 2025)	2025	1987
3	Nurse Education in Practice	Redefining pedagogy with artificial intelligence: How nursing students are shaping the future of learning	Ghimire A.; Qiu Y. (Ghimire & Qiu, 2025)	2025	551
4	Learning and Individual Differences	Chatbots in education: Hype or help? A meta-analysis	Laun M.; Wolff F. (Laun & Wolff, 2025)	2025	503
5	International Journal of Artificial Intelligence in Education	Embracing AI Assistants: Unraveling Young Researchers' Journey with ChatGPT in Science Education Thesis Writing	Anik M.H.; Raaz S.N.C.; Khan N. (Anik et al., 2025)	2025	354
6	European Journal of Dental Education	Attitudes and Perceptions of Australian Dentists and Dental Students Towards Applications of Artificial Intelligence in Dentistry: A Survey	Hegde S.; Nanayakkara S.; Jordan A.; Jeha O.; Patel U.; Luu V.; Gao J. (Hegde et al., 2025)	2025	316
7	Education and Information Technologies	Exploring students' perspectives on Generative AI-assisted academic writing	Kim J.; Yu S.; Detrick R.; Li N. (J. Kim et al., 2025)	2025	289
8	Educational Process: International Journal	Challenging Conventions: ChatGPT's Controversial Impacts on Educational and English Language Teaching Practices	Adipat S. (Adipat, 2025)	2025	287
9	Medical Teacher	Creating virtual patients using large language models: scalable, global, and low cost	Cook D.A. (Cook, 2025)	2025	286
10	Studies in English Language and Education	AI-Powered Language Learning: A Blessing or a Curse for English Language Education?	Liando N.V.F.; Tatipang D.P.; Rorimpandey R.; Kumayas T.; Saudah K.; Iskandar I. (Liando et al., 2025)	2025	274
11	Journal of Computer Information Systems	The Potential of Generative Artificial Intelligence Across Disciplines: Perspectives and Future Directions	Ooi K.-B.; Tan G.W.-H.; Al-Emran M.; Al-Sharafi M.A.; Capatina A.; Chakraborty A.; Dwivedi Y.K.; Huang T.-L.; Kar A.K.; Lee V.-H.; Loh (Ooi et al., 2025)	2025	272
12	Education Sciences	Exploring ChatGPT's Role in Higher Education: Perspectives from Pakistani University Students on Academic Integrity and Ethical Challenges	Alghazo R.; Fatima G.; Malik M.; Abdelhamid S.E.; Jahanzaib M.; Nayab D.E.; Raza A. (Alghazo et al., 2025)	2025	269
13	Journal of Information Technology Education: Research	Perceptions, strategies, and challenges of teachers in the integration of artificial intelligence in	Arranz-García O.; García M.D.C.R.; Alonso-Secades V. (Garcia et al., 2025)	2025	252

14	European Journal of Dental Education	Integrating Generative AI in Dental Education: A Scoping Review of Current Practices and Recommendations	Uribe S.E.; Maldupa I.; Schwendicke F. (Uribe et al., 2025)	2025	244
15	Journal of Educators Online	AI shishya: enhancing vedic pedagogy with artificial intelligence in education 4.0.	Dash S.A.; Bharathi S.V. (Dash & Bharathi, 2025)	2025	218
16	Perceptions, strategies, and challenges of teachers in the integration of artificial intelligence in	Reflective thinking meets artificial intelligence: Synthesizing sustainability transition knowledge in left-behind mountain regions	Ficko A.; Sarkki S.; Gultekin Y.S.; Egli A.; Hiedanpää J. (Ficko et al., 2025)	2025	218
17	Contemporary Issues in Early Childhood	Artificial intelligence applied to early childhood education: A focus for educational research?	Latorre-Medina M.J.; Abdelmaula-Mesaud S. (Latorre-Medina & Abdelmaula-Mesaud, 2025)	2025	210
18	Education Sciences	Subject-Specialized Chatbot in Higher Education as a Tutor for Autonomous Exam Preparation: Analysis of the Impact on Academic Performance and Students' Perception of Its Usefulness	Sánchez-Vera F. (Sánchez-Vera, 2024)	2025	189
19	Societies	Perception and Ethical Challenges for the Future of AI as Encountered by Surveyed New Engineers	Khogali H.O.; Mekid S. (Khogali & Mekid, 2024)	2024	174
20	System	Integrating human expertise with GenAI: Insights into a collaborative feedback approach in translation education	Xu X.; Sun F.; Hu W. (Xu et al., 2025)	2025	155

TC: Total citations

What are the main challenges identified in the research literature about challenges of AI in education ?
There are some of the key challenges that the research team has compiled from a number of research projects:

Table 2. The main challenges identified in the research literature about challenges of AI in education

Documents	The key challenges identified
Integrating Artificial Intelligence into High-School Computer Science Curriculum: A Perspective Study in Morocco (El Khayati et al., 2025) Perceptions, strategies, and challenges of teachers in the integration of artificial intelligence in (Garcia et al., 2025)	Teacher attitudes and perception
	Teacher's training
	Lack of resources
	Lack of perspectives among education skateholders
Redefining pedagogy with artificial intelligence: How nursing students are shaping the future of learning (Ghimire & Qiu, 2025) Attitudes and Perceptions of Australian Dentists and Dental Students Towards Applications of Artificial Intelligence in Dentistry: A Survey (Hegde et al., 2025)	AI isn't objective; it's trained on data created by humans and humans have biases
	AI can also exacerbate existing inequalities
	The educators are not transparent about their own use of AI, it undermines student trust and sends a mixed message about the appropriate role of AI in education.
Embracing AI Assistants: Unraveling Young Researchers' Journey with ChatGPT in Science Education Thesis Writing (Anik et al., 2025)	The non-users of Chat GPT faced significant challenges in research methodology, tool development, and data interpretation.
Exploring students' perspectives on Generative AI-assisted academic writing (J. Kim et al., 2025)	GenAI's hallucination (a phenomenon when the system generates texts that are semantically or syntactically plausible but are in fact incorrect or nonsensical, was found to be the most prevalent challenge of GenAI-assisted academic writing)
	AI's lack of contextual understanding was another significant challenge to effective GenAI-assisted writing
	AI's lack of higher-order thinking as reflected by the top 3 levels of Bloom's taxonomy
	Lack of human awareness (in this study's case, the students), as many studies pointed out, posed another challenge; this included AI's inability to understand the student's context or environment, such as unique writing styles, tone, techniques, communication styles, learning environment, and so on
	Lack of understanding of the culture associated with the language was perceived as another challenge
	AI was its lack of relationship skills
	ChatGPT's lack of pedagogical skills was found to be an important challenge
	AI's inability to explain its knowledge: what it knows, how it knows it, and why it suggests certain information.

Challenging Conventions: ChatGPT's Controversial Impacts on Educational and English Language Teaching Practices (Adipat, 2025)	Trustworthiness and authenticity are two critical concerns when integrating ChatGPT into second language education as it calls into question the credibility of its content, with reliability and accuracy of the information remaining major concerns.
	Separating between unique student papers and content helped with generative AI that became a challenge for evaluation purposes and brought to the surface the question of the authenticity and fairness of grading assessments.
	Academic misconduct problems have become more of a concern
	Chat GPT can make a culture of academic dishonesty and a reduction of the value or purpose of academic pursuits
Perception and Ethical Challenges for the Future of AI as Encountered by Surveyed New Engineers (Khogali & Mekid, 2024)	AI technology has the potential to replace human labor, leading to job losses or decreased employment opportunities in several industries.
	Data security and privacy: People may be concerned that incorrect treatment, hostile actor access, or exploitation of their data might lead to identity theft or privacy issues
	Discrimination and bias: Users may worry that AI-powered algorithms might unintentionally discriminate against specific groups of people, upholding societal inequities or exacerbating already-existing prejudices in society.
	Excessive dependence on AI: Users who rely too much on AI systems run the danger of damage or dysfunction.
	The complexity and ambiguity of AI algorithms: Might make it difficult to understand the logic underlying their conclusions or recommendations.
	Ethical implications: Users may be concerned about the development and deployment of AI for potentially hazardous purposes including spying and public opinion manipulation.
	Losing the human touch: AI technology may reduce interpersonal relationships and remove the human factor in several situations.

As shown in Table 2, the integration of AI in education presents a multitude of challenges. Studies consistently highlight different concerns from teachers' viewpoints on the effects of AI in education, particularly regarding the availability of resources to effectively support their teaching with integrated AI technology. From the learners' standpoint, AI raises anxieties about academic outcomes, as dependence on AI could potentially reduce their capacity for critical thinking and logical reasoning. Moreover, there are significant concerns that the overuse of AI technology may lead to a decline in essential communication and collaboration skills. Beyond these points, AI also poses other challenges, including the possibility that many individuals in currently trained professions may face job displacement due to AI advancements, and the danger that inaccurate AI algorithms could result in flawed perceptions and understandings.

IV. Discussions

Education plays a vital role in equipping individuals to navigate the shifts brought about by the Fourth Industrial Revolution. This necessitates the cultivation of 21st-century skills and the integration of digital technologies (Elayyan, 2021). The COVID-19 pandemic spurred the adoption of AI in education, highlighting both its potential to revolutionize learning and its inherent limitations and challenges (Grassini, 2023; Mallik & Gangopadhyay, 2023). As AI rapidly reshapes society, including education, a more globally-minded approach to learning is essential, alongside addressing the difficulties educators encounter in this era of technological advancement (Elayyan, 2021).

The integration of AI in education presents both opportunities and challenges for teachers. AI can aid teachers in planning by simplifying content preparation, the design of activities and evaluations, and their adjustment to diverse learner abilities. The potential of AI to optimize teaching and learning is significant, offering personalized learning experiences, automated assessment, and intelligent tutoring (Mallik & Gangopadhyay, 2023). Consequently, AI optimizes various tasks that facilitate the implementation of active and interactive learning models, enriching student learning by making it more meaningful and profound. AI has the potential to elevate education across all levels, from preschool to high school, with a notably positive influence on disadvantaged populations (Pelaez et al., 2022). While teachers are largely receptive to AI, they face considerable challenges that must be addressed for its successful integration into the educational environment. A key initial challenge is the digital divide and limited access to technology (Sharifuddin & Hashim, 2024), highlighting the need for inclusive policies that ensure all schools, regardless of location, have technological resources. Furthermore, the successful adoption of AI in the classroom hinges on teachers' preparedness and openness to adapting to these new technologies (K. Kim & Kwon, 2023). Teachers need to be trained in using AI tools to support their teaching. Effective AI implementation in classrooms, ensuring students develop critical and ethical approaches to its use, relies on this proper training (Chen & Zou, 2024).

This evolving AI environment introduces a new challenge for students: redefining their role. They must develop essential competencies such as critical thinking, creativity, and complex problem-solving skills. It is vital to carefully balance students' engagement with AI to prevent the erosion of their critical and analytical abilities,

which are fundamental for making informed and ethical decisions regarding AI (García-Peñalvo et al., 2024). Building technological self-efficacy in both educators and learners is crucial (Pelaez et al., 2022), and parents' digital literacy plays a significant role in supporting student learning (Han et al., 2024). Moreover, teachers' characteristics and competencies, notably their capacity for reflection, self-efficacy, and professional development, significantly influence students' academic outcomes (López-Martín et al., 2023). Therefore, cooperation among stakeholders is indispensable for addressing the challenges and maximizing the opportunities that AI presents in education (Grassini, 2023).

V. Conclusions

It's clear that AI offers significant advantages to education. Nevertheless, these positive impacts are accompanied by considerable challenges for teachers, learners, and stakeholders. Effectively addressing these challenges necessitates a clear and comprehensive strategy, ranging from teacher training and teaching technology support to providing students with the means to learn effectively using AI technology. Moreover, to fully realize AI's potential in education, a comprehensive approach that balances technological advancement with human-centered principles is essential. Such an approach not only resolves ongoing difficulties but also guarantees the equitable and ethical incorporation of AI, preparing students to flourish in a rapidly transforming technological landscape.

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