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The Impact of Artificial Intelligence on teachers of the Higher Education Sector - A Systematic Literature Review using PRISMA and VOS viewer.

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ABSTRACT

Introduction: This study analyzes the impact of Artificial Intelligence on higher education teachers through a Systematic Literature Review (SLR) guided by Preferred Reporting Items for Systematic Reviews (PRISMA) and bibliometric methods. The study aims to examine and synthesize the existing body of literature on this topic.

Objectives: This research focuses on identifying the key trends, areas, and gaps in the literature that will give complete insight into how Artificial Intelligence affects higher education from the teachers' perspective over the past decade.

Methods: The analysis was done using the Web of Science and Scopus databases, resulting in 29 articles identified through meticulous filtration of the PRISMA protocol. The study identified gaps in current research, particularly the absence of comprehensive studies examining the long-term effects of AI on teachers' professional growth and academic experiences. VOS software has been used to analyze and visualize bibliometric networks.

Results: While mapping the literature, the study is based on models such as the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and Self-determination theory (SDT) that how AI affects teachers' attitudes, preferences, motivation, etc. with context to the higher education sector. The results of the PRISMA analysis revealed the key issues such as skill adaptation, ethical considerations, and the relationship between AI and human-centered teaching practices.

Conclusions: The study offers valuable insights for researchers, educational institutions, and policymakers who aim to integrate AI while maintaining educators' essential role in the academic landscape.

Keywords: Artificial Intelligence; Higher education; PRISMA, VOS Software, Systematic Literature review

1. INTRODUCTION

The modernization of the educational system, the creation of Society 4.0, considering contemporary accomplishments, and teachers learning the newest techniques all involve artificial intelligence (Shyshkina & Nosenko, 2023). We stress that the productivity of educational activities is greatly increased using artificial intelligence. Given the speed at which artificial intelligence and information and communication technologies are developing, this trend could eventually result in the partial or total replacement of teachers. However, the benefit is that, when properly applied, these technologies in higher education increase the potential for learning, teaching, research, and human capabilities (Kulieshov, 2022). Artificial intelligence systems are therefore not yet prepared to fully replace teachers, but they do present new potential for teaching and learning in higher education. Studies on artificial intelligence in education are now being conducted in a variety of ways, including higher education (Jokhan

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et al., 2018), teachers (Nahar et al., 2021), and student performance (Shen et al., 2022). This systematic literature review's main objective is to synthesize the body of knowledge regarding the effects of artificial intelligence on higher education teachers. In addition to identifying research gaps and developing trends, the current study will offer practitioners and scholars valuable recommendations on how artificial intelligence influences higher education teachers using the reasonably structured PRISMA framework (Ogunmakinde et al., 2024).

Research questions-

RQ1. How has the previous research on AI and Higher education teachers descriptively developed over time?

RQ2. What are the present expectations for upcoming research on AI and Higher education teachers?

RQ3. How can current AI and Higher education research be systematized into a comprehensive framework?

2. THEORETICAL FRAMEWORK

The theoretical framework has undergone a deeper understanding through the systematic literature review (SLR). The research supports that AI impacts teacher education and teaching in the higher education sector. The theories support the fact that is the base of the study. The Technology Acceptance Model (TAM) discusses the acceptance of technology to facilitate work and improve its effectiveness (Davis, 1989). In this way, the model of this paper also professes that AI improves the teacher effectiveness of teachers positively (Zhao, 2022). Moving ahead, another theory Unified Theory of Acceptance and Use of Technology (UTAUT), is the extended model of TAM where the effects of performance expectancy and social influence are also measured (Vankatesh et al., 2003). This model asses the institutional readiness and peer influence of AI in the higher education faculty. Self-determination theory (SDT) suggests that motivation is influenced by several antecedents, as per research. AI is one of such influencing variables on higher education teachers (Ryzheva, 2024; Chang, 2024).

3. DESIGN AND METHOD

PRISMA recommendations, which were first published in 2009 and then revised in 2020, were used in conjunction with Cochrane in the current investigation (Sarkis-Onofre et al., 2021). For decision-making, PRISMA seeks to offer a comprehensive, transparent, and thorough systematic review (Fleming et al., 2014; Panic et al., 2013). PRISMA 2020 covers all aspects of reporting, including the abstract, introduction, methodology, results, and discussion. The techniques portion of PRISMA 2020 includes the following: Web of Science eligibility criteria and information sources, search strategy, selection procedure, data collection, data items, study risks, effect measurements, reporting bias statements, and certainty evaluation (Migliorini et al., 2021). Web of Science databases are the biggest repositories of published publications (Mohamed et al., 2021; Zhang et al., 2017). The PRISMA flow diagram is based on the following four steps

1. Identification – In this first step, the researchers seek to identify the relevant studies based on research questions. The steps have clear and defined inclusion and exclusion criteria.
2. Screening- This is the second step where researchers screen the title and abstract of the articles after reviewing the complete articles chosen under the inclusion criteria.
3. Eligibility- Here in this third step, the researcher accesses the articles that have passed in screening step and are relevant to the research questions.
4. Inclusion – This is the fourth stage where articles that are suitable as per eligibility criteria are taken for systematic review, where data is extracted, analyzed, and findings are driven and reported further.

Here in this study, during the initial stage, the keywords were searched “artificial intelligence* OR search: TS = ((Artificial Intelligence) AND (teacher) AND (higher education)). Inclusions were made to articles available in English, complete articles, time frame 2014-2024, and relevant to the study were considered (Table 1). The exclusion criteria were made as in books, conferences, and other language articles.

Moving to the second stage, the systematic review was done based on the PRISMA protocol. The articles were considered till 2024. The search was initiated with 657 articles, and after the exclusion criteria, the final number was reduced to 47. Here, the abstracts and titles of the articles were minutely studied, and articles matching the scope of

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the paper were selected for further research. Finally, the last sample was reduced to 29. The detail has been mentioned in Fig. 1 for more references. The bibliometric network analysis was done using VOS viewer software, where clusters were made. This method has been used in several management research studies (Galleta et al. 2022; Goodell et al. 2023). The Co-occurrence matrix has been made based on several clusters.

4. RESULTS

4.1 Basic observation

Here, Fig 2, indicates the total number of publications from 2014-2024; all these documents were published till November 2024, as AI has been an emerging topic over the last decade, so such suitable publications have been considered before the given time frame.

Table 1: PRISMA model for systematic review.

Methods	Approach
Study design	The study includes a literature review summarising the selected articles sequence-wise.
Eligibility Criteria	Keyword search: TS = ((Artificial Intelligence) AND (teacher) AND (higher education))
Information Source	Web of Science, Scopus
Search Strategy	Exclusion Criteria = Include Article, English Language, Web of Science Index- Social Science Index, Category- Management, Economics, Social Science Interdisciplinary, Search Time Frame 2014-2024.
Selection Process	The abstracts of the articles that were retrieved were manually reviewed. They conducted their research independently and subsequently amalgamated their conclusions.
Data Collection Process	Data from the research papers were gathered by a thorough examination of the publication's spreadsheet, focusing on the study approach, methodologies, keywords, and topics regarding the limitations of sustainable construction.
Data Items	A table was created to document all outcomes for which data were requested.

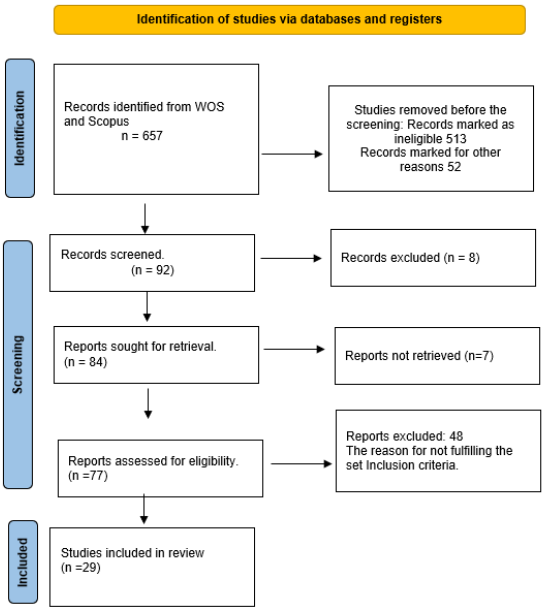

Fig 1: PRISMA flow diagram adapted for the study.

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A methodical and targeted examination of the literature on the effects of artificial intelligence (AI) on higher education teachers was guided by Table 1 and Figure 1. Using exact keyword searches and exclusion criteria, the study made use of the Web of Science and Scopus databases to find publications published between 2014 and 2024 that were in English and indexed under pertinent headings such as Management and Social Sciences. To ensure objective selection, abstracts of retrieved publications were independently examined and synthesized. Data collection focused on study techniques, limitations, and major findings. Together with extra searches on sites like Google Scholar, this methodical technique guaranteed a thorough study, successfully revealing trends, gaps, and research objectives in this field.

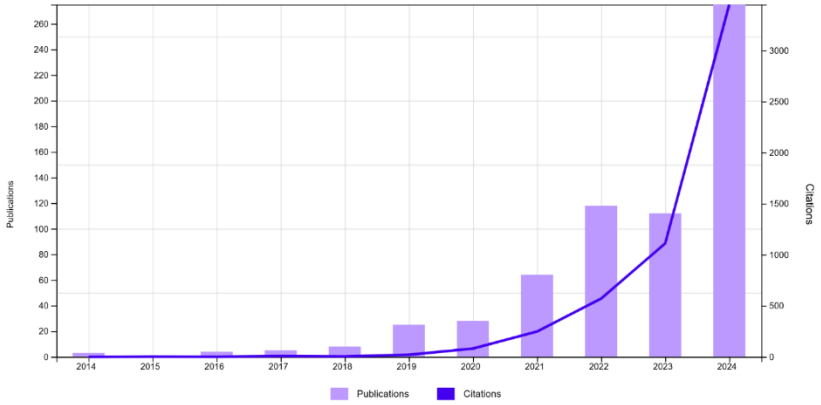

Fig 2: Year-wise detail of publications and citations

The growing number of publications and citations in Figure 2 demonstrates a notable upward trend in research on artificial intelligence (AI) in education from 2014 to 2024. Publications increased gradually between 2014 and 2019, suggesting that interest in the subject was only beginning to gain traction. But starting in 2020, the number of articles skyrocketed, probably because of the COVID-19 pandemic's global move to digital and remote learning, which hastened the use of AI in classrooms. Citations have also increased significantly, especially between 2021 and 2024, with 2023 and 2024 seeing the biggest increases. This pattern implies that academics are becoming more aware of and supportive of AI research. The field's dynamic evolution and crucial significance in influencing the direction of teaching and learning are reflected in the concurrent growth in publications and citations, highlighting the revolutionary potential of artificial intelligence in education.

4.1.1 Co-word Cluster Analysis

Key concerns in AI research in the realm of education are shown by the network visualization in Figure 3. The focal point is "Artificial Intelligence," which has connections to many subjects, including "teacher education," "higher education," "educational technology," and "motivation." Distinct clusters reveal thematic focus: yellow focuses on language processing and teacher preparation; blue discusses ethics and the effects on students; red examines technology, self-efficacy, and evaluation; and green stresses motivation and user approval. The tight ties between nodes and the increasing demand for programs like ChatGPT demonstrate AI's diverse potential to revolutionize education.

4.2 Different Clusters of Artificial Intelligence and Teacher Education

4.2.1 Green Cluster (AI in Teachers and Motivation)

This cluster includes the motivation, acceptance, and perception of teachers towards the AI. By encouraging curiosity, perseverance, and active engagement, AI improves learning behaviour, underscoring the potential of AI-assisted games to completely transform science education (Chang 2024). Key elements impacting the adoption of e-learning were found by the review, including instructor and student compatibility and readiness, motivating and hindering factors, advantages, and implementation methodologies (Khalil 2021). According to a survey, teachers are keen to understand the ethical and legal ramifications of using AI in the classroom (Klopov 2019). The results demonstrate how AI grading systems can be improved by adding human-like communication components to increase student

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acceptance and perceived dependability (Rijhwani 2020). The results imply that integrating FS&I and AP approaches could capitalize on their respective advantages and provide a comprehensive framework to improve learning outcomes (Yuru Lin 2019).

4.2.2 Red Cluster (AI in Teachers and Self-efficacy)

Here, this cluster includes the Variables connected with Self-efficacy. Teachers to stay competitive in a world that is becoming more and more AI-driven, education is essential for giving them the skills they need to use and understand digital technology (Bartelle, 2024). By providing insights into each teacher's performance and opportunities for growth, this method not only increases efficiency but also promotes personalized learning (Zhao 2022). Teachers can more successfully integrate ITSs by addressing these concerns with focused training and assistance, which will promote creative and technologically advanced teaching methods (Dongjo 2022). The substantial advantages of incorporating generative learning techniques into video-based education are demonstrated by this combination, which promotes a more engaging and successful learning environment (Zhongling 2022). When compared to traditional teaching, the framework greatly increased teacher happiness and engagement. There was an increase of 35.15% in cognitive engagement, 26.42% in behavioral engagement, and 43.07% in emotional involvement (Zhicheng 2019). This indicates the increase in self-efficacy due to AI use in teachers.

4.2.3 Blue Cluster (AI in Teachers and Ethics)

This cluster focuses on several studies connected with ethics. The study underlined how crucial it is that educators and learners receive training on how to use AI tools efficiently. Based on student directives, it concluded that AI-generated work shouldn't be regarded as plagiarism (Sthéfano 2024). The conundrums highlight the necessity of careful regulations and moral standards to direct the ethical application of AI in education (Venezuela 2023). Regarding the application of generative AI in economics education, the study found a void in the literature (Mădălina 2023). Students, educators, developers, legislators, and institutional decision-makers are among the groups that this framework seeks to educate (Nguyen 2023). In Ukrainian education, AI is now an auxiliary rather than an exclusive component. Since AI has the potential to revolutionize education, more scientific research is needed to determine its viability and need (Anna Boiko 2022).

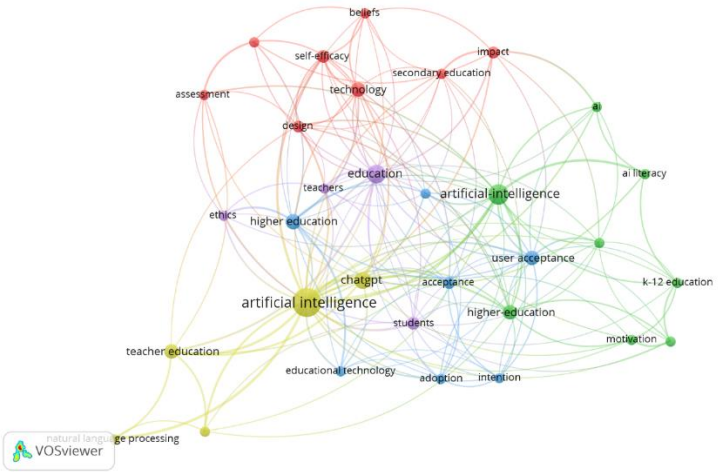

Fig 3: Co-word Cluster

4.2.4 Yellow Cluster (AI in Teachers and Technology)

This cluster includes the studies related to the boons and banes of this technology. The developments highlight AI's revolutionary potential to change higher education by enhancing understanding and retention while also creating a more engaging and dynamic learning environment (Ryzheva 2024). Such technologies impact in a positive manner on teachers (Chang 2024). According to this, AI is a powerful tool for improving synchronous learning environments in varied and mixed classrooms (Gao 2024). Strong technical solutions and strategic frameworks must be combined to address these issues and guarantee their successful and inclusive integration into the educational system

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(Shanghao 2024). The findings show the need for structured interaction in AI improved group dynamics and learning outcomes (Fengjuan 2019). The results highlight how smart classrooms have the power to revolutionize contemporary education (Zhicheng 2018).

5. DISCUSSION

The findings of PRISMA analysis completely support several theories, such as the TAM and UTAUT model, as teacher effectiveness, self-efficacy is affected by AI, as mentioned in the red and green clusters. These theories study the interplay of technology and learning in a detailed manner. Table 2 highlights the contributions of many contributors to the study and displays a range of participation levels. With five records apiece (6.41% of the total), the top contributors, Chai CS and Chiu TKF, are notable names in the field. With four records (5.128%), Lin XF comes in second, indicating a high degree of interest. With three records (3.846%), Hwang GJ, Li WY, Pi ZL, Yang JM, and Zhang Y are other noteworthy contributors who enhance the scope of the study. Furthermore, Yang YQ contributes with one record (5.128%) in a targeted yet significant manner. All things considered, the distribution shows a cooperative study effort, with a larger group giving a variety of viewpoints on the area and important authors establishing trends.

Table 2: Author details

Authors	Record Count	% of 78
S	5	6.41
Chiu TKF	5	6.41
Li WY	3	3.846
Pi ZL	3	3.846
Yang JM	3	3.846
Yang YQ	1	5.128
Zhang Y	3	3.846

Table 3 Geographic distribution of research

Selected	Country	Documents	Citations	Total link strength
☑	england	5	31	6
☑	peoples r china	20	633	5
☑	usa	6	36	3

Table 3 highlights the number of papers, citations, and overall link strength, showcasing the contributions of the USA, China, and England to the field. China leads with 20 publications and 633 citations, reflecting its significant impact. England, with 5 publications and 30 citations, boasts the highest overall link strength (6), indicating robust international research connections and collaboration. The USA has a moderate presence, contributing 6 papers with 36 citations and a total link strength of 3. Collectively, these countries exemplify leadership in advancing research, with China excelling in output and influence, while England is noted for its strong collaborative efforts.

6. IMPLICATION OF STUDY

This study has important ramifications for educators, lawmakers, researchers, and institutions, among other stakeholders, as artificial intelligence (AI) continues to transform education.

Teachers

The results emphasize how important it is for teachers to successfully incorporate AI technologies into their lesson planning. By facilitating individualized learning and raising student engagement, technologies like ChatGPT, generative AI models, and natural language processing systems have the potential to completely transform education. Nonetheless, the report emphasizes how important it is for teachers to embrace new teaching strategies and advance their digital literacy. To ensure a balance between technology and the human element of education, training programs are crucial for giving teachers the tools they need to employ AI intelligently and successfully.

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Policymakers

To foster an atmosphere that encourages the application of AI in education, policymakers are essential. The study emphasizes how crucial it is to create thorough frameworks and regulations that give ethical issues like learner autonomy, equity, and data protection priority. To guarantee that the advantages of AI reach institutions and schools with limited resources, it is also critical to address concerns of equity and access. Specifically, infrastructural investments—such as current hardware and high-speed internet—are essential for the smooth integration of AI technology, particularly in emerging nations.

Academicians

This study opens many new research directions. The long-term effects of AI on teaching strategies, instructor responsibilities, and student outcomes are an important topic. The ethical ramifications of AI adoption, such as algorithmic bias and the dangers of relying too much on AI skills, are encouraged to be investigated by academics. Examining the changing dynamics of AI in education is also necessary, especially concerning how it affects the social, emotional, and cognitive aspects of learning.

7. CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS

This study highlights how artificial intelligence (AI) can completely change teaching and learning methods in education, especially in higher education. ChatGPT, generative AI models, and educational tools are examples of AI technologies that facilitate personalized learning, increase teaching effectiveness, and promote creative pedagogical approaches. Though the results show the potential of AI, they also emphasize the necessity of a well-rounded strategy that respects ethical issues and is consistent with conventional teaching techniques. To guarantee that AI enhances rather than replaces the human element in education, successful integration necessitates meticulous planning, strong frameworks, and attention to the changing needs of students, instructors, and institutions.

This study has limitations despite its contributions. There are gaps in our knowledge of AI's wider ramifications because the data mostly focuses on higher education and little attention is paid to its usage in elementary and secondary education. Furthermore, the geographic scope is limited to regions, which may cause it to ignore variations in AI adoption and issues around the world. Publications published between 2014 and 2024 might not cover the most recent developments and new trends in artificial intelligence. Additionally, the study lacks longitudinal data, which makes evaluating the long-term effects of AI on educational achievements challenging. A more thorough investigation of algorithmic bias and inclusion is necessary, even while ethical concerns like learner autonomy and data privacy are addressed. Additionally, the study places a lot of emphasis on technology integration, possibly ignoring psychological and sociocultural aspects that affect the acceptance of AI in educational settings. To assess the long-term impacts of AI on educational results, teaching roles, and institutional practices, researchers ought to carry out longitudinal studies. To close current gaps, this research ought to take an interdisciplinary approach, combining viewpoints from the social sciences, computer science, and education. To improve teaching effectiveness and student engagement, educational institutions must invest in AI-driven tools and infrastructure. They should also cultivate collaborations with AI developers to develop context-specific solutions. Prioritizing ethical norms with unambiguous criteria is necessary to reduce bias, safeguard data privacy, and guarantee inclusivity. International cooperation should be promoted worldwide to exchange best practices, knowledge, and approaches for integrating AI, especially between developed and poor countries. These collaborations can aid in resolving inequalities and advancing fair access to AI's advantages. Lastly, to maintain the interpersonal and socioemotional aspects of education, a comprehensive strategy that strikes a balance between integrating AI and human-centric teaching approaches is advised.

We declare there is no conflict of interest.

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