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Challenges in Implementing Artificial Intelligence for Nursing Education: A Systematic Review

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Abstract

Context: The use of artificial intelligence (AI) in health sciences education offers numerous benefits; however, a lack of awareness regarding the limitations of these tools may lead to financial and human losses.

Objectives: Given that nurses constitute the largest segment of the healthcare team and their education is of paramount importance, this study explores the challenges associated with the use of AI in nursing education.

Data Sources: A systematic review was conducted in 2025, utilizing databases such as ERIC, CINAHL, PubMed, Scopus, and Web of Science to search for relevant studies. The search employed appropriate keywords, with limitations set to articles published within the last five years and in English.

Study Selection: After identifying relevant articles, their quality was assessed using suitable tools. This step ensured that only high-quality studies were included in the review, providing a reliable basis for analysis.

Data Extraction: Various data were extracted, categorized, and analyzed. This comprehensive approach allowed for a thorough examination of the challenges associated with the use of AI in nursing education.

Results: Out of 307 identified studies, 18 articles were reviewed. Based on the findings of this study, the challenges associated with the use of AI in nursing education were categorized into six main groups: Educational, technological, ethical, trust-building, human resource, and economic challenges.

Conclusions: The challenges identified in this study were grouped into six primary categories, with the roots of these challenges linked to issues related to educational organizations, personnel capabilities, and the design of AI systems. Recognizing the challenges of using AI in nursing education can not only prevent unintended problems but also aid in preserving economic and human resources.

Keywords: Artificial Intelligence, Education Challenges, Nursing Student, Technology Integration

1. Context

In recent years, artificial intelligence (AI) has been increasingly utilized in the healthcare sector, particularly in the diagnosis of diseases, predicting disease progression, and even providing personalized treatment options (1). The AI has the potential to reduce treatment costs and enhance the quality of healthcare services, allowing physicians to dedicate more time to patient care (2). In the field of nursing, AI can assist nurses in better managing their patients (3). This technology, through advanced algorithms, is capable of analyzing clinical data and supporting nurses in their clinical decision-making processes (4).

Another significant application of AI in nursing is its use in the education of nursing students (5). Education in the nursing field serves as a fundamental pillar of the healthcare system, playing a crucial role in improving the quality of healthcare services (6). Given the

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increasing complexities of healthcare and the need to provide optimal services to patients, effective training of nurses is of utmost importance (7). As the first line of defense against diseases and health-related issues, nurses must possess strong clinical abilities and communication skills to serve patients in the best possible manner (8).

One of the advantages of utilizing AI in nursing education includes increased efficiency, improved quality of learning, and the provision of immediate and accurate feedback (9). This technology can help nurses operate with greater confidence in clinical settings, thereby enhancing the quality of healthcare services (10). The AI is recognized as an innovative and effective tool in education. In nursing education, this technology can assist in creating personalized educational programs, clinical simulations, and more precise assessments (9). With the help of AI, nursing students can engage in more interactive and engaging learning experiences, thereby contributing to the development of essential clinical competencies (11).

In recent years, AI has emerged as a novel tool that contributes to the improvement of educational processes in nursing (12). By employing machine learning algorithms and data analysis, this technology can facilitate the development of personalized educational programs and interactive clinical simulations (13). The AI systems can analyze student performance, identify their strengths and weaknesses, and provide immediate and accurate feedback (14). This capability helps students act with greater confidence in clinical environments and strengthens their clinical competencies (15).

However, there are challenges to using AI in nursing education. For example, not all universities have equal access to AI technologies (5) and may lack the necessary capacity to integrate these technologies (4). In addition, there are concerns about the privacy and confidentiality of information (4). Integrity and uncertainty about the quality of information are other challenges to using AI in nursing education (6).

Given these considerations, it can be concluded that AI can not only enhance educational processes in nursing but also lead to improved quality of healthcare services. However, challenges may arise in the implementation of this technology, potentially leading to issues.

2. Objectives

This study conducts a systematic review of the challenges associated with the use of AI in nursing education.

3. Data Sources

This study employed a systematic review approach in 2025, aimed at investigating the challenges associated with the use of AI in nursing education. A systematic search was implemented across reputable academic databases, including ERIC, CINAHL, PubMed, Scopus, and Web of Science, to identify relevant articles. Additionally, to ensure comprehensive coverage, the Google Scholar search engine was utilized, and the references of the identified articles were also examined. The keywords employed in this search included "Artificial Intelligence", "AI", "Nursing Education", "Nursing Training", "Implementation", "Challenges", "Barriers", and "Obstacles". Using these keywords, a search strategy was developed utilizing Boolean operators and the functionalities of the respective academic databases.

4. Study Selection

4.1. Inclusion and Exclusion Criteria

The inclusion criterion for this study comprised articles published in English that encompassed empirical studies, systematic reviews, and other relevant articles addressing the challenges of using AI in nursing education within the timeframe of 2020 to 2025. Articles focusing on the applications of AI in fields other than nursing and non-English publications were excluded from the study.

5. Data Extraction

5.1. Data Collection

Following the identification of eligible articles, the necessary information — including title, authors, year of publication, type of study, and identified challenges in the use of AI in nursing education — was collected. This data was organized into a structured table for subsequent analyses. The retrieved articles were imported into EndNote software, and after consolidation, duplicate articles were removed. The references were then entered into Rayyan software for actions such as smart searching and tagging to select

articles aligned with the study's objectives and inclusion/exclusion criteria. After identifying the initial articles, the title and abstract of each article were reviewed, and those relevant to the study's aim were selected. Subsequently, the full text of the selected articles was read to examine their suitability and relevance to the research topic more precisely. At this stage, particular attention was paid to the challenges and barriers discussed regarding the use of AI in nursing education.

5.2. Evaluation of Article Quality

The quality of the selected studies was assessed using appropriate tools. For original articles, the preferred reporting items for systematic reviews and meta-analyses (PRISMA) checklist was employed. Additionally, theoretical articles were evaluated using validation criteria such as theoretical validity, conceptual coherence, and innovation.

5.3. Data Analysis

Data analysis was conducted both quantitatively and qualitatively. The challenges associated with the use of AI in nursing education were categorized and analyzed based on the reviewed articles. This analysis involved identifying patterns, trends, and key insights related to these challenges. In the qualitative analysis, the full texts of the articles were meticulously read to identify the presented challenges and key points. Subsequently, relevant information regarding the identified challenges from each article was extracted and summarized. In the quantitative analysis, after identifying the challenges, they were categorized into six main groups, and the significance of each challenge was examined using graphical representations.

6. Results

A total of 307 articles were reviewed, of which 18 articles were included in the study (Figure 1).

After extracting the challenges associated with the use of AI in nursing education, these challenges were classified into six main categories, each containing several subcategories (Figure 2).

6.1. Educational Challenges

This category included 11 distinct groups. The primary concerns in this area were the apprehension regarding the decline in critical thinking skills among nurses and the limitations of AI in human interactions. Additionally, obstacles related to the design and implementation of AI-based educational programs, including the need for changes in curricula and teaching methodologies, were also significant challenges (Table 1).

6.2. Technological Challenges

This category encompassed six groups, with the most significant challenge identified in the reviewed studies being algorithmic bias. The AI models may be influenced by biases arising from training data (such as age, race, etc.). Moreover, challenges related to the design and implementation of AI-based educational programs, integration of existing technologies, and the availability of AI technology represented additional issues in this domain (Table 2).

6.3. Ethical Challenges

This category comprised seven groups, among which concerns regarding privacy and information security were of paramount importance. Furthermore, worries about potential plagiarism and data fabrication were classified as ethical challenges (Table 3).

6.4. Trust Challenges

These challenges were associated with users' lack of trust in the use of AI in nursing education and included 11 distinct groups. The most significant factor in these challenges was the users' distrust in the quality of information provided by AI (Table 4).

6.5. Human Challenges

This category included issues related to human resources, such as resistance to change and insufficient awareness and training regarding AI, comprising six groups (Table 5).

6.6. Economic Challenges

These challenges pertained to the costs and risks associated with investing in AI for nursing education and consisted of four groups (Table 6).

7. Discussion

This systematic review study aims to identify the challenges associated with the use of AI in nursing

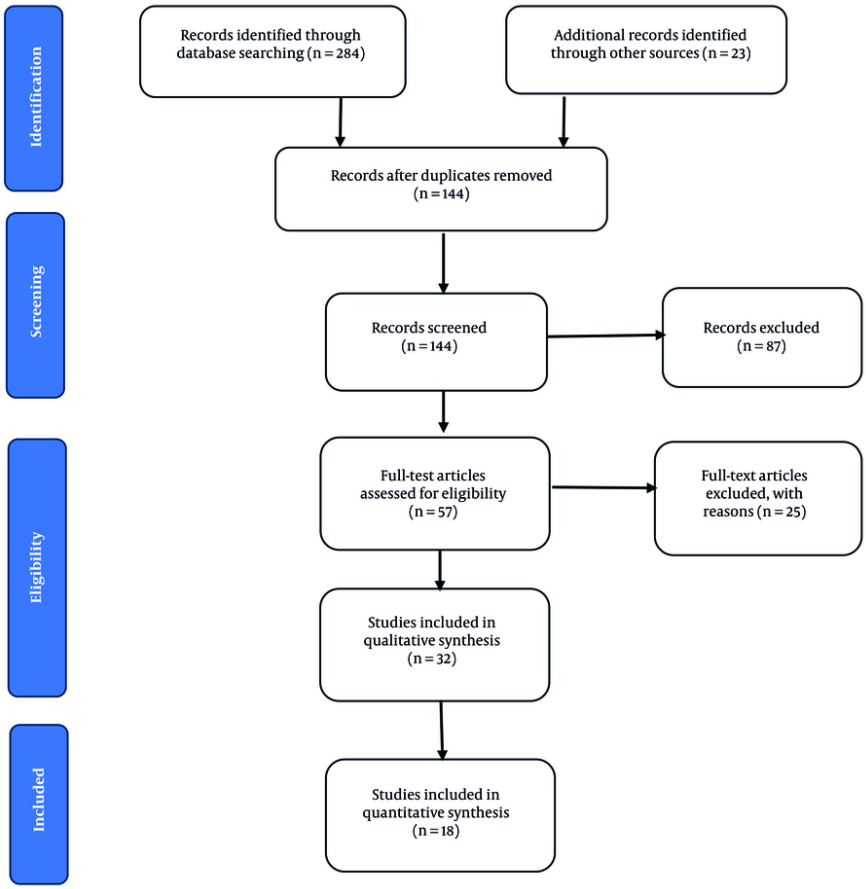

Figure 1. preferred reporting items for systematic reviews and meta-analyses (PRISMA) steps

education. The researchers believe in the benefits of employing this technology; however, recognizing the challenges related to the implementation of AI in nursing education can not only prevent unintended problems but also help avoid the waste of financial and human resources. Based on the findings of this study, the challenges of using AI in nursing education can be categorized into six main groups: Educational, technological, ethical, trust-building, human resources, and financial challenges.

Buchanan et al. emphasize the necessity of adapting the curriculum when utilizing AI (5). Additionally, Alkhaqani and Abdulai and Hung stress that special attention should be given to enhancing students' critical thinking skills when AI is employed for education (18, 19). Krumsvik also notes that the use of AI may not adequately address the specific educational needs of individual students (26).

The most significant challenge of using AI in health sciences education is the excessive reliance on technology. This issue can lead to a reduction in knowledge and a superficial understanding among students. On the other hand, such dependency hinders the development of essential skills like critical thinking and problem-solving. Therefore, educators and instructors must design and implement structured programs to strengthen these skills throughout students' education while being aware of these challenges.

White et al., along with Ball Dunlap and Michalowsk, indicate that the use of AI may perpetuate existing biases in training data (such as age, gender, race, etc.)

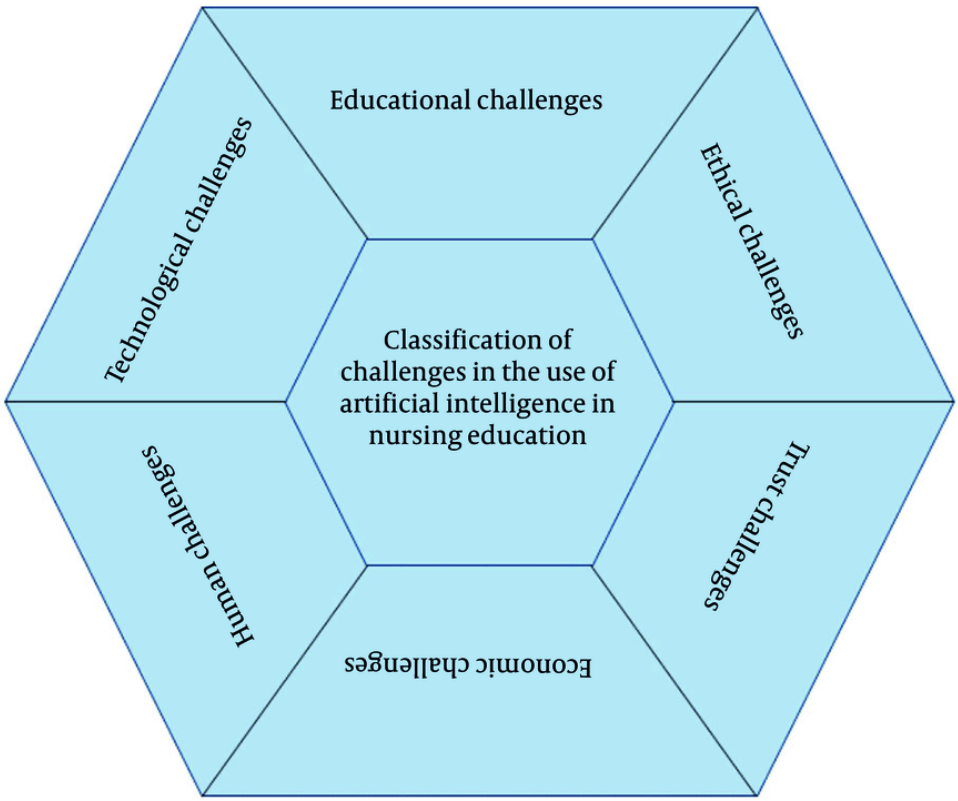

Figure 2. Classification of challenges in the use of artificial intelligence)AI) in nursing education

(28, 29). This can negatively impact the evaluations and feedback provided to students. Moreover, O'Connor et al. discuss the lack of understanding regarding how algorithms operate, noting that some algorithms and predictive models are referred to as "black box AI", meaning that even experts may not fully comprehend how they function or the reasons behind specific outcomes (23).

To address the technical challenges associated with the use of AI, a variety of measures must be implemented, including government investment in this field to ensure universal access to this technology. Furthermore, employing standardized and specialized AI platforms can significantly aid in overcoming these challenges. Additionally, studying the history of a platform and comparing it with other AI platforms can help mitigate some of these issues.

Tam et al. note in their study that the use of this technology may result in increased copying among students, as they might rely on these tools to complete their assignments (21). Detecting this type of cheating is difficult, as the text produced by AI typically does not match existing sources. Additionally, regarding privacy, Kavanagh and Sharpnack raises concerns, stating that AI cannot guarantee the confidentiality and privacy of information (27).

The best solution for addressing the ethical challenges arising from the use of AI in health sciences education is to conduct workshops and training sessions for students. In these workshops, ethical and legal considerations should be addressed, and the consequences of cheating and data fabrication should be clearly outlined for participants. Moreover, before the commencement of training, students should be

Table 1. Classification of Educational Challenges in the Use of Artificial Intelligence in Nursing Education

Subcategory	Explanation	Number	Reference
Course content	The current content of students' courses is not suitable for using AI as an educational tool.	1	(5)
Decreased critical thinking skills	The use of AI in education may reduce students' critical thinking skills.	4	(16-19)
Comprehensiveness of AI algorithms	The comprehensiveness of AI algorithms may not be sensitive to the diversity of patient populations and different cultures.	1	(16)
Over-reliance on technology	Students may use the tools of AI will become overly dependent and lose various skills such as critical thinking, human communication, problem solving, and relationship building.	3	(20-22)
False self-confidence	Student use From AI It may increase students' false self-confidence.	1	(23)
Limitation of human interaction	The use of AI for education may lead to a reduction in human interactions during the learning process.	4	(4, 23-25)
Educational justice	The use of AI tools may cause educational injustice and discrimination.	2	(22, 26)
Individual learning	AI may not take into account the individual capabilities of the student and the overall learning process may be considered.	1	(26)
Gap between training and practical needs	It is possible that due to changing treatment methods, AI cannot prepare graduates to enter the job market.	1	(27)
Inability to convey human emotions	AI cannot simulate emotions like empathy and compassion, which are at the core of the nursing profession.	1	(18)
Simplistic approaches	The AI may ignore the individual complexities of patients and provide answers based on simplistic approaches.	1	(18)

Abbreviation: AI, artificial intelligence.

Table 2. Classification of Technological Challenges in the Use of Artificial Intelligence in Nursing Education

Subcategory	Explanation	Number	Reference
Inaccessibility	All universities and students have not the same access to technology.	1	(5)
Fragmentation of AI systems	The integration of AI systems with one another and with existing infrastructures is one of the most significant challenges in utilizing AI in nursing education.	2	(16, 17)
Algorithm bias	The AI models may possess biases stemming from their training data (age, race, etc.). This issue is particularly concerning for programs aimed at preparing nurses to work with diverse populations.	4	(20, 23, 26, 28)
Lack of complete understanding of algorithms	Some predictive algorithms and models in AI exist that experts cannot fully understand how they work or why they produce specific results.	2	(23, 29)
Possibility of error	Given the importance of nursing education and patient safety, it is essential that AI-developed scenarios are monitored and evaluated to identify and correct any errors or inaccuracies within them.	1	(25)
Organizations ' capacity to adopt technology	Lack of a clear strategy or clear leadership for accepting AI as an educational tool is also another challenge the use of this tool is for teaching nursing students.	2	(4, 30)

Abbreviation: AI, artificial intelligence.

required to sign agreements affirming their commitment to maintaining privacy and data security.

O'Connor et al. indicate in their study that the dissemination of incorrect information by AI-based tools can negatively impact the education and evaluation of students (23). Similarly, Srinivasan et al. acknowledge that issues related to data quality and access to necessary information can affect the effectiveness of AI (24). Furthermore, Seibert et al. argue that the provision of erroneous results can lead to incorrect decision-making in care processes (4).

The primary reason for the lack of trust among educators and students in AI in education is the uncertainty regarding the quality, accuracy, and reliability of the information. Therefore, the results and information provided by this technology should be critically assessed based on scholarly sources and literature.

Table 3. Classification of Ethical Challenges in the Use of Artificial Intelligence in Nursing Education

Subcategory	Explanation	Number	Reference
Privacy rules	When using AI to educate nursing students, the privacy of students, patients, and instructors must be respected.	8	(4, 16, 17, 19, 23, 24, 27, 31)
Data security	The use of sensitive patient data in simulation and AI raises concerns about security.	5	(4, 16-18, 24, 29)
Plagiarism	With the increasing use of AI tools for text writing and content creation, there are concerns regarding plagiarism and the validity of student works.	2	(22, 23)
Responsibility	When using AI for education, is it unclear who is responsible for the content provided by this technology if an error occurs?	2	(18, 23)
Cheating and data fabrication	The use of AI may cause copying or data mining among students when presenting assignments.	4	(18, 19, 21, 31)
Quality of care	Concerns regarding patient privacy and automated data collection may impact the quality of care	1	(6)
Legal parameters	There are no specific legal frameworks for using AI for nursing education.	2	(6, 22)

Abbreviation: AI, artificial intelligence.

Table 4. Classification of Trust Challenges in the Use of Artificial Intelligence in Nursing Education

Subcategory	Explanation	Number	Reference
Biased data	Some AI systems may use data that is relevant to a specific community.	2	(5, 6)
Trust of students and instructors	Students and educators may be skeptical about the use of AI-based technologies or feel that these technologies cannot replace human interaction.	2	(5, 6)
Cultural sensitivity and inclusiveness	Algorithms must be sensitive to diverse patient populations in order to provide equitable learning experiences.	1	(17)
Data quality	If the data is inaccurate, incomplete, or biased, it may produce misleading information that can negatively impact students' learning.	6	(6, 19, 21, 23, 24, 29)
Data integrity	Challenge in collecting and analyzing data for training AI models due to the diversity of data sources.	1	(6)
Accuracy of answers	The AI-based tools may generate incorrect or inappropriate information, which can negatively affect students' learning and their confidence.	3	(4, 19, 23)
Distortion of reality	Artificial intelligence may produce unrealistic information to fill its weaknesses, which can mislead users.	1	(23)
Insufficient transparency	Many machine learning models exhibit a lack of transparency, which may lead to a decrease in nurses' trust in AI systems.	1	(29)
Lack of ongoing research and evaluation	There is a need for more research to evaluate the effectiveness and importance of pastoral education, to identify gaps in its implementation.	2	(28, 31)
Creation a valid tool for measurement	There is still no valid and reliable tool for measuring. The accuracy of the information provided by AI has not been established for training in various fields.	1	(28)
Alignment with nursing processes	The AI-generated educational content needs to be aligned with nursing practice processes and aligned with patient goals.	1	(25)

Abbreviation: AI, artificial intelligence.

Abuzaid et al. note that most nurses feel that curricula should include foundational knowledge about AI (30). The lack of formal training regarding the applications of AI can pose a significant barrier to the integration of this technology into nursing practice. Shepherd emphasizes the need for appropriate training for educators and nurses on the use of advanced language models to address any concerns or misconceptions about AI technology (25). It seems that the most important solution to address the human resource challenges in using AI in nursing education is to educate and inform the educators.

De Gagne and Jung state that implementing AI-based education may require significant financial investment (16, 17). Krumsvik also points out that the high costs of implementing AI technologies may hinder the widespread adoption of these tools for student education (26). Nassef and Zeid predict that the integration and assimilation of AI-based educational technologies may demand considerable investment (31). Currently, the most viable solution for addressing financial challenges is to utilize free and shared platforms between institutions instead of those that incur costs.

7.1. Conclusions

The use of AI in nursing education can offer significant benefits, including improved educational

Table 5. Classification of Human Challenges in the Use of Artificial Intelligence in Nursing Education

Subcategory	Explanation	Number	Reference
Trainer training	Educators must learn the ability to effectively use AI-based tools, which requires additional time and resources.	5	(5, 23, 25, 27, 30)
Change educational methods	Educators will need to modify their curricula and teaching methods to effectively integrate AI — which may require additional time and effort.	1	(21)
Resistance to change	One of the main challenges is the slow adoption of new technologies by educators, who often prefer to rely on traditional teaching techniques.	3	(6, 27, 32)
Need for rapid adaptation of teachers	The urgent need for teachers to adapt to this new technology requires appropriate educational planning and the provision of policies and training for responsible use.	1	(19)
Need for training and specialized courses	Lack of formal education about what AI applications can do. This is a serious obstacle to using this technology in nursing education.	3	(4, 6, 30)
Interaction between educators and technology experts	Use of AI nursing education requires collaboration between nursing educators and AI experts it is.	2	(16, 17)

Abbreviation: AI, artificial intelligence.

Table 6. Classification of Economic Challenges in the Use of Artificial Intelligence in Nursing Education

Subcategory	Explanation	Number	Reference
Cost and resource allocation	Implementation And using AI to train nurses may require significant financial investment.	2	(16, 17)
Technology adoption	The high cost of implementing technologies AI may hinder widespread adoption of academic social networks.	1	(6)
Integration costs	The AI integration training requires significant investment in the provision of advanced technologies, specialized software, and ongoing technical support.	1	(24)
Support costs	To effectively integrate new technologies such as VR and XR, infrastructure must be properly supported, which may be costly or require major changes.	1	(31)

Abbreviations: AI, artificial intelligence; VR,virtual reality; XR, augmented reality.

quality, increased access to resources, and enhanced learning processes. This technology can assist educators and students in making better decisions regarding patient care by analyzing data and providing more accurate information. However, to effectively harness these advantages, it is essential to identify and address the existing challenges in this field. This study revealed that the challenges associated with the use of AI in nursing education can be categorized into six main groups: Educational, technological, ethical, trust, human, and financial challenges. Each of these categories has subcomponents that can negatively impact the learning process and the quality of education. In particular, issues such as distrust in data quality, algorithmic bias, and barriers related to the design and implementation of educational programs are among the most significant challenges. Identifying and analyzing these challenges can facilitate the integration of AI in nursing education and help prevent unintended problems.

7.2. Recommendations

In order to address the identified challenges, it is recommended that educational institutions develop comprehensive and targeted training programs for both teachers and students in the field of AI. These programs should encompass both theoretical and practical training on AI applications, while also addressing ethical and technological concerns. The design of educational programs must include clearly defined content, covering various aspects of AI such as machine learning, natural language processing, and computer vision, as well as diverse pedagogical approaches, including interactive workshops, lectures,

and group projects to enhance effective learning experiences.

Footnotes

Authors' Contribution: M. D. and M. H. P. conceptualized and designed the study, supervised the systematic review process, and contributed to writing and revising the manuscript. M. H. P. and H. Kh. conducted the literature search, performed data extraction and quality appraisal, and drafted the initial version of the manuscript. M. D. and M. H. P. and H. Kh. assisted with data analysis and interpretation, contributed to critical revisions of the manuscript, and approved the final version for submission. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

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