The Integration of AI in English for Nursing Instructions: A Systematic Literature Review

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ABSTRACT
Integrating artificial intelligence (AI) in English for Nursing instruction has become increasingly important as healthcare becomes more technologically driven and globally connected. This systematic review analyzes 28 studies published from 2022 to 2024 to examine the current state of AI implementation in nursing ESP education. The findings reveal three distinct categories of technological integration: basic digital tools (54%), intermediate AI integration (32%), and advanced AI applications (14%). While the analysis shows promising benefits in personalized learning and authentic communication practice, significant challenges persist in infrastructure, teacher expertise, and resource allocation. The review identifies a notable gap between available AI technologies and their practical classroom implementations. These findings suggest that while AI integration shows great potential for transforming nursing ESP education, substantial work remains to bridge the gap between technological capabilities and practical implementation.

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INTRODUCTION

In recent years, technological advancement, especially artificial intelligence (AI), has brought big changes to nursing education (Buchanan et al., 2021). This creates new demands for English for Specific Purposes (ESP) courses. Healthcare is nowadays becoming more AI-driven and connected globally, so professional nurses need not only clinical expertise but also good English skills to work with AI-powered medical systems, use digital health records, and communicate with colleagues from other countries (Agga & Lavin, 2022; Santamato et al., 2024). The rapid spread of AI in healthcare has made it more important to use new technologies in nursing education across different regions (Dailah et al., 2024). This shows how important it is for nurses to communicate effectively in English in this changing environment.

ESP theory was first introduced by Hutchinson and Waters in 1987. Their theory emphasizes that we must address the specific needs and contexts of learners. However, the recent AI revolution has changed these needs in nursing education significantly. According to Evans & St John's (1998) framework for ESP course design, authentic materials and real-world tasks are very important. It also requires specialized knowledge, methods, and strategies that differ from general English instruction, as it must align specifically with students' fields of study and professional programs (Muliyah & Aminatun, 2020). Nowadays, these materials and tasks must include AI-powered healthcare technologies. Therefore, it is crucial to combine ESP principles with modern AI tools because the healthcare industry is changing rapidly with digital technology.

Traditionally, English for nursing focuses on medical terms, communication with patients, and writing healthcare documents (Fisma, 2024). However, since 2022, when advanced AI technologies became widely used, new language challenges and learning opportunities appeared. Modern AI technologies, especially large language models and intelligent tutoring systems have changed both what we teach and how we teach in nursing ESP courses. New developments in AI-powered language learning apps, virtual patient simulations, and telehealth platforms have transformed approaches to language teaching (Ahmed, 2023; Mananay, 2024; Rahmawati et al., 2024). This development connects to Warschauer's idea (Warschauer, 2009) about electronic literacies, but extends it to meet new demands in the AI era.

Recent systematic and scoping reviews examining artificial intelligence in nursing education done by Koo et al. (2024), Labrague and Sabei (2024), Abualrahi et al. (2024), and Lifshits and Rosenberg (2024) reveal both significant opportunities and challenges in transforming nursing pedagogy and clinical preparation. Koo et al. (2024) and Labrague and Sabei (2024) have demonstrated AI's potential to enhance student engagement, knowledge retention, and clinical decision-making skills through personalized learning experiences and virtual simulations. Abualrahi et al. (2024) highlight the effectiveness of AI-enhanced learning environments and immediate feedback mechanisms, while Lifshits and Rosenberg (2024) emphasize the positive impacts of AI on educational experiences, knowledge acquisition, and mental safety for nursing students and staff.

However, although these papers indicate that AI shows promise in enhancing nursing education and thus imply the need for curricular reform and the adoption of new pedagogies to prepare nurses for the age of AI, they have primarily focused on general nursing pedagogy rather than language instruction specifically. Lifshits and Rosenberg (2024) indeed identified language barriers as one of the challenges in AI implementation,

but their review predominantly addresses clinical skills development rather than language acquisition. This shows that a gap exists in understanding how these technological advances specifically impact ESP instruction for nursing students. This review addresses this gap by specifically examining how AI technologies are being adapted and implemented in nursing ESP instruction, with particular attention to developments since late 2022 when advanced language models became widely available. This focus provides novel insights into the intersection of AI technology, language teaching, and nursing education that previous reviews have not addressed.

This will also help find areas where we need more research to improve nursing ESP teaching in an environment where AI is increasingly important. According to Evans & St John (1998), ESP must change to meet new professional demands. Therefore, this review is important to understand current practices and future trends in nursing ESP education as AI continues to develop rapidly.

Based on the theories and gaps mentioned above, this paper addresses the following research questions:

1. What AI tools and digital platforms are currently used in nursing ESP teaching, especially those developed since late 2022?
2. How has the use of AI technology in nursing ESP changed since AI became more advanced?
3. What are the benefits and challenges while using modern AI technologies in nursing ESP programs?
4. What are the gaps between available AI solutions and how they are used in nursing ESP classrooms?

LITERATURE REVIEW

The integration of AI in nursing education has undergone significant transformation in recent years, revolutionizing the field through personalized learning experiences, advanced simulation training, and real-time decision support (Glauberman et al., 2023). Breakthroughs in 2022, such as ChatGPT and DALL-E, have accelerated the development of realistic clinical simulations, adaptive learning platforms, and personalized educational pathways (Ronquillo et al., 2021). While challenges exist in implementing these technologies (De Gagne, 2023), the field has seen rapid expansions since 2017 (Romero et al., 2023).

Building upon these broader developments in nursing education, AI has significantly transformed English for Specific Purposes (ESP) teaching for nursing students. This literature review examines how AI tools and digital platforms are being specifically adapted and applied in nursing ESP instruction, with particular attention to developments since late 2022, when large language models and other advanced AI technologies became more widely available.

Evolution of AI Tools in Nursing ESP Education

Technology integration into nursing ESP education has progressed through three distinct phases, each marked by increasingly sophisticated implementations, though with varying degrees of success and limitations. The foundation of technology integration in nursing ESP began with Learning Management Systems (LMS) and video platforms. These systems primarily facilitated content delivery and basic assessment capabilities (Sáiz-Manzanares et

al., 2020). Traditional platforms like Moodle and Blackboard were adapted for nursing ESP, incorporating specialized medical vocabulary modules and basic communication exercises (Sampayan, 2024). However, Sampayan's (2024) analysis reveals that these early implementations often failed to address the complexities of medical communication and lacked authentic interaction opportunities. Video platforms enabled asynchronous learning through recorded lectures and medical procedure demonstrations, though the interaction was largely limited to basic discussion forums and multiple-choice assessments (Chatzea et al., 2024; Lecturio, 2021). While these platforms provided a foundation for digital learning, Chatzea et al. (2024) note significant limitations in supporting real-time communication practice and personalized feedback.

The second phase marked the introduction of adaptive learning systems and interactive platforms. According to Alotaibi (2024), these systems introduced preliminary AI capabilities, including automated feedback mechanisms and personalized learning paths. Notable developments included adaptive vocabulary training systems that adjusted to student performance, interactive simulation platforms for basic medical communications, automated assessment tools for pronunciation and medical terminology, and basic chatbots for practice conversations in medical scenarios. However, Alotaibi's (2024) study identifies significant limitations in these systems' ability to handle complex medical conversations and cultural nuances in healthcare communication.

The most recent phase, particularly since late 2022, has shown the emergence of sophisticated AI applications that fundamentally transform the learning experience. This phase includes advanced adaptive learning platforms specifically designed for medical terminology and nursing communication, as well as the integration of large language models in ESP curriculum development. Notable features include context-aware language models that understand medical contexts (Sridharan & Sequeira, 2024), AI-powered virtual patients for complex communication scenarios (Gehrman, 2024), predictive analytics for identifying learning gaps in medical communication (Ramadan et al., 2024), and multimodal learning experiences that combine text, speech, and visual elements (Gan et al., 2023). However, while these advances show promise, several critical limitations persist. Sridharan and Sequeira (2024) noted that many context-aware models still struggle with medical jargon and specialized terminology. Gehrman's (2024) research, while innovative, is limited by small sample sizes and short implementation periods. Ramadan et al. (2024) highlight significant technical infrastructure requirements that may limit widespread adoption.

The review of those studies reveals several critical gaps in current research and implementation. First, while technological sophistication has increased dramatically, research on pedagogical effectiveness has not progressed at the same rate. Many studies (e.g., Gan et al., 2023; Sridharan & Sequeira, 2024) focus on technological capabilities without rigorous evaluation of learning outcomes. Second, there is limited research on how these technologies support the development of complex communication skills necessary in medical contexts. Third, studies often overlook the practical challenges of implementing these technologies in diverse educational settings, particularly in resource-limited environments. Finally, while recent advances in AI show promise, there is insufficient longitudinal research examining their long-term impact on nursing ESP education.

RESEARCH METHODS

This systematic review used PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), guidelines to ensure the search and analysis process was clear and could be repeated by other researchers (Page et al., 2021). Similar to a recent systematic review in EFL contexts (Pardede, 2024), the review procedures were developed to systematically find, choose, and analyze relevant studies about AI technology in nursing ESP, focusing particularly on developments since late 2022.

Search Strategy

The literature search was conducted in Google Scholar as the main database. Google Scholar was chosen because it covers many academic publications, includes research from different fields, and is easy to access for researchers worldwide. The search was limited to English-language publications published between January 2022 and January 2024, a period when AI technologies became widely available. The following search terms and combinations were used: (1) "ESP" AND "nursing" AND ("AI" OR "artificial intelligence" OR "technology"); (2) "ESP" AND "nursing education" AND ("AI integration" OR "ChatGPT" OR "digital tools"); (3) "English for Nursing" AND ("teaching" OR "instructions") AND ("AI" OR "artificial intelligence"); (4) "Medical English" AND "nursing" AND ("AI" OR "language model" OR "technology") and (5) "ESP" AND "nursing" AND ("virtual" OR "AI simulation" OR "intelligent tutoring").

Study Selection Process

The search step provided the researchers with 198 initial studies. Administering the PRISMA guidelines, the studies were screened based on titles and abstracts, resulting in 18 duplicates. The remaining 180 articles were rescreened using the following inclusion and exclusion criteria. The inclusion criteria include: (1) they focus on teaching English for nursing purposes; (2) they include AI technologies or digital tools in teaching/learning; (3) they were published in peer-reviewed journals or conference proceedings; (4) they were published between January 2022 and January 2024; (5) they were written in English; and (6) they present actual research data (quantitative, qualitative, or mixed methods). The exclusion criteria include: (1) they only discuss general medical English without specific nursing context; (2) they talk about technology in nursing education but not about language learning; (3) they only present theories without actual research evidence; (4) they are book reviews, editorial letters, or opinion pieces; and (5) they were published more than once (like conference papers later published as journal articles). The focus on studies presenting actual research data was essential as our research questions aimed to examine the practical implementation and effectiveness of AI technologies in real classroom settings. While conceptual papers provide valuable theoretical frameworks, empirical studies were necessary to assess concrete outcomes, implementation challenges, and measurable benefits of AI integration in nursing ESP contexts.

Using these criteria, 132 articles were excluded. The remaining 48 articles were once again screened through a full-text assessment. During this detailed review, 20 articles were excluded for various reasons, including insufficient data reporting, methodology concerns, or limited focus on AI integration in ESP teaching. This thorough screening process resulted in 28 studies that fully met the criteria and were included in this systematic review (See Figure 1).
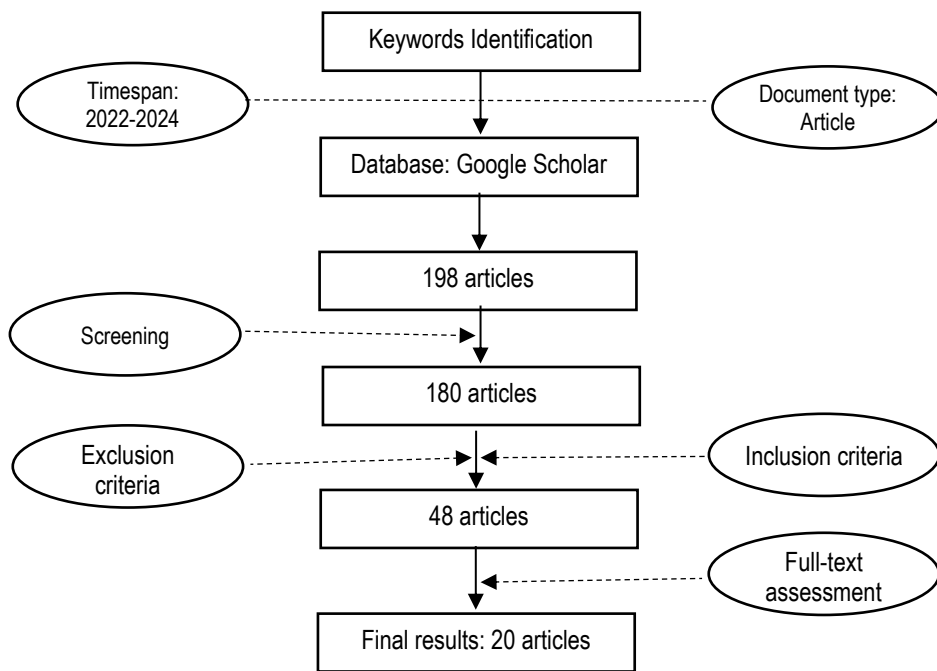
Figure 1. PRISMA Flow Diagram

Data Extraction and Analysis

Both researchers reviewed the titles and abstracts separately to see if they met the standards for inclusion and exclusion. Then, the screening results were compared, and any disagreements were discussed. This two-step process helped ensure that the articles chosen were reliable and fair. For the selected articles, data extraction was performed collaboratively using a standardized form that captured: publication information (authors, year, journal), research setting and participants, type of AI technology used, research method, main findings, benefits and challenges found, and teaching implications.

Data was analyzed collaboratively by both researchers. It involved two analysis techniques: quantitative and thematic analyses. The quantitative analysis included descriptive statistics of: the number of studies published in different months during the period, the types of AI technologies used in nursing ESP. the research methods used, the numbers of participants, and the place settings of the studies. The quantitative analysis systematically recorded all numerical data in a spreadsheet to track publication trends, technology types, and research characteristics. The researchers calculated percentages and frequencies to identify patterns in the distribution of different AI implementation types and implementation challenges across the studies.

The thematic analysis dealt with AI technology implementation, the benefits and challenges reported, the implications for teaching, and the learning outcomes achieved. Using the thematic analysis, the researchers carefully reviewed each selected paper to identify recurring patterns and key findings. Both researchers independently analyzed the content of each paper, focusing on implementation approaches, reported benefits, challenges, and teaching implications. They then compared the findings and organized them into major themes such as technological integration patterns, evolution of teaching

approaches, and implementation challenges. This process helped ensure a comprehensive and systematic analysis of the qualitative aspects of the studies.

Reliability

In conducting the systematic review, the researchers implemented several measures to ensure reliability. The searches on the Google Scholar database were well documented with details of specific search terms, timing of searches, and result quantities for each query. The researchers established explicit inclusion and exclusion criteria for study selection. Two researchers independently evaluated articles for inclusion, utilizing a standardized data extraction form across all studies. To visually represent the article selection process, the researchers developed a comprehensive PRISMA flow diagram.

FINDINGS AND DISCUSSIONS
Current AI Tools and Digital Platforms in Nursing ESP Teaching

The analysis of the 28 included articles revealed three different categories of technological implementation in English for nursing classrooms (Table 1). Basic digital tools, primarily consisting of Learning Management Systems (LMS) and video platforms, were most frequently employed in 15 studies (54%). Intermediate AI integration, such as adaptive learning and interactive systems, was found in 9 studies (32%). Advanced AI application (sophisticated AI implementation) was discovered in 4 studies (14%). This distribution aligns with Buchanan et al.'s (2021) findings on the general state of AI adoption in nursing education, where they also found a predominance of basic technological implementations. Similar to Duman et al.'s (2015) findings in mobile-assisted language learning, our review suggests that despite rapid technological advancement, most institutions are still in the early stages of AI adoption. Several factors may explain this pattern. First, English for nursing still lacked infrastructure and resources. The high percentage of basic digital tool usage (54%) reflects resource limitations and the challenge of keeping pace with rapidly evolving AI technology. This finding echoes Agga and Lavin's (2022) observations about the barriers to AI implementation in nursing education. Second English for nursing still met pedagogical integration challenges. The relatively low adoption of advanced AI applications (14%) aligns with Ahmed's (2023) findings on ESP implementation challenges. Both studies highlight difficulties in effectively integrating sophisticated AI tools into the existing pedagogical frameworks. Third, there was still an implementation gap. While advanced AI technologies show promising benefits in research settings, the gap between available solutions and classroom implementation (shown by 67% of the studies). This finding corresponds with Mananay's (2024) findings about AI integration challenges in language teaching.

Table 1 presents the categorization of studies based on their technological implementation in English for nursing classes. The studies are classified into three levels: basic digital tools (15 studies), intermediate AI integration (9 studies), and advanced AI applications (4 studies). Basic digital tools include commonly used platforms like Google Classroom, YouTube, and TikTok. Intermediate AI integration involves more sophisticated technologies like augmented reality and specialized nursing-English platforms. Advanced AI applications demonstrate the most complex integration, featuring computer-assisted vocabulary learning and augmented reality applications specifically designed for medical

English literacy. This distribution of studies across different technological levels reflects the evolving landscape of AI integration in nursing ESP education

Table 1. Technological Implementation in English for Nursing Classes

Basic digital tools	1. Google Classroom in pandemic era covid 19 (Fransiska, 2022) 2. Instructional interactions in the online classroom (Dahlina et al., 2022) 3. Digital storytelling method (E. A. Albaaly, 2022) 4. Blended learning effectiveness (Mafruudloh et al., n.d.) 5. Video-viewing techniques for oral performance (Halim & Rohmah, 2020) 6. YouTube as second classroom(Kailani et al., 2023) 7. Ideational meaning and visual aspect relations in Virginia Allum's videos (Arwinda et al., 2023) 8. Bridging EFL with ESP via English as a lingua franca (Cheng, 2023) 9. Synchronous online vs face-to-face esp course (Hosseini et al., 2023) 10. Improving nursing students' speaking skills through TikTok application (Kaban & Rokhima, 2023) 11. Exploring the effect of Google Docs on learning technical vocabulary in ESP courses (Cheraghi et al., 2024) 12. Video-based medical English teaching 13. Enhancing nursing students 'EFL-course-missing' listening and speaking skills through 'Easy English' website-based activities (E. Albaaly, 2024) 14. Improving learners' English writing skills through digital technology (Glomjai & Suryani, 2024) 15. Utilizing video clips and content-based practice sheets (Nemet & Vojnović, 2024)
Intermediate AI integration	16. AR for medical English (Saragih & Mahriyuni, 2023) 17. Exploring nursing students' perception of an online class with the TPACK framework(Handayani et al., 2022) 18. Digital technology integration (Suryani et al., 2024) 19. Promoting technological nursing institute students' EFL oral communication skills and willingness to communicate through a neared-based program(Aboulfotoh, 2024) 20. The effect of project-based learning using Canva on student's ability to write health promotion text (Harahap & Fahmi, 2024) 21. Uncovering user experience evaluation in nursing English several platforms through SUS and PSSU (Natrio et al., 2024) 22. Enhancing speaking proficiency and terminology learning among ESP learners through edutainment activities (Grami et al., 2024) 23. The use of language functions in developing ICT-based English learning material for nurses (Susanta et al., 2024) 24. Effect of integrated English hybrid learning (Haroen et al., 2024)
Advanced AI applications	25. The development of computer-assisted vocabulary learning to improve English lexical retention of nursing students (Kristanto et al., 2024) 26. Enhancing ESP vocabulary proficiency through five elements of online cooperative learning for nursing students (Sofyan et al., 2024) 27. Elevating EFL learners' professional English achievements and positive learning behaviors (Hwang & Chang, 2024) 28. Enhancing augmented reality technology to improve medical English literacy (Hashim et al., 2024)

Evolution of AI Technology Use in Nursing ESP

The analysis of the 28 included studies revealed distinct patterns in how AI and digital tools are being implemented in nursing ESP teaching. Table 2 presents the distribution of these technological implementations across three main categories: basic digital tools,

intermediate AI integration, and advanced AI applications, The details can be seen in Table 3.

Table 2. Types of AI/Digital Tools Used in Nursing ESP Teaching (2022-2024)

Category	2022	2023	2024	Total	Percentage
Basic Digital Tools	7	5	3	15	54%
Intermediate AI Integration	2	3	4	9	32%
Advanced AI Applications	0	0	4	4	14%

A clear evolution in AI technology use is evident from 2022 to 2024, as shown in Tables 2 and 3. The data reveals a significant shift in implementation patterns: basic digital tools decreased from 7 implementations in 2022 to 3 in 2024, while advanced AI applications dramatically increased from zero implementations in 2022-2023 to 4 implementations in 2024. This quantitative trend is reflected in qualitative changes in teaching approaches. Earlier studies (2022) primarily focused on developing isolated language skills using basic digital tools, while recent research shows a trend toward integrated language skill development in authentic learning environments. The intermediate AI integration shows steady growth from 2 implementations in 2022 to 4 in 2024, indicating the increasing adoption of more sophisticated technology while maintaining practical feasibility. This development builds upon Warschauer's (2009) predictions about electronic literacies, extending them into the AI era. Recent studies show greater attention to developing communicative competence in real-world healthcare contexts, particularly through AI-supported interactions. This development advances beyond the traditional ESP approach described by Evans & St John (1998), incorporating new technological capabilities.

Table 3. Implementation of AI/Digital Technology in Nursing ESP Education (2022-2024)

Year	Category	Papers Found
2022	Basic Digital Tools	• Papers 1, 2: Google Classroom implementation and online classroom instructional interactions • Papers 3, 4: Digital storytelling method and blended learning effectiveness • Paper 5: Video-viewing techniques for oral performance • Papers 6, 7: YouTube as second classroom and analysis of Virginia Allum's videos
	Intermediate AI Integration	• Paper 16: AR for medical English • Paper 17: Exploring nursing students' Perception on online Classes with TPACK Framework
	Advanced AI Application	-
2023	Basic Digital Tools	• Papers 8, 9: EFL-ESP bridging and synchronous online ESP course • Paper 10: Improving nursing students' speaking skill through TikTok • Paper 11: Google Docs for technical vocabulary learning • Paper 12: Video-based medical English teaching
	Intermediate AI Integration	• Paper 18: Digital technology integration • Paper 19: Promoting Technological Nursing Institute students' EFL through Nearpod • Paper 20: Project-based learning using Canva for health promotion text
	Advanced AI Application	-

Table 3. Implementation of AI/Digital Technology in Nursing ESP Education (2022-2024) (cont.)

Year	Category	Papers Found
2024	Basic Digital Tools	• Paper 13: Enhancing nursing students' EFL-course-missing listening and speaking skills • Paper 14: Improving learners' English writing skills through digital technology • Paper 15: Utilizing video clips and content-based practice sheets
	Intermediate AI Integration	• Paper 21: User Experience Evaluation in nursing-English Platforms • Paper 22: Enhancing speaking proficiency through edutainment • Paper 23: Language functions in ICT-based English learning materials • Paper 24: Effect of integrated English hybrid learning
	Advanced AI Application	• Paper 25: Computer-assisted vocabulary learning to improve English lexical retention • Paper 26: ESP vocabulary proficiency through online cooperative learning • Paper 27: Professional English achievements and learning behaviors • Paper 28: Enhancing AR technology to improve medical English literacy

Benefits and Challenges of Modern AI Technologies

The analysis of the 28 studies revealed several key benefits and challenges in implementing AI technologies for nursing ESP education. Table 3 presents the frequency of reported benefits and challenges across the studies.

The review of the studies reveals several key benefits and persistent challenges in implementing AI technologies for nursing ESP education, as shown in Table 4. The benefits are categorized into three main areas: learning effectiveness, student engagement, and skill development. Learning effectiveness is demonstrated through enhanced personalization of learning experiences and improved access to authentic medical English materials. Student engagement showed improvement through interactive content and authentic medical scenarios. Significant skill development was noted particularly in medical terminology acquisition and communication abilities.

The challenges fall into three main categories: technical barriers, pedagogical challenges, and implementation issues. Technical barriers, particularly infrastructure limitations, were reported in the majority of studies, while teacher expertise gaps were also commonly identified. Implementation issues focused on resource allocation and training requirements. These findings indicate that while AI integration shows significant potential for enhancing nursing ESP education, substantial work remains to bridge the gap between technological capabilities and practical implementation.

Implementation Gaps Between Available Solutions and Classroom Practice

Based on the identified gaps and challenges, several key areas require attention, some of which extend beyond previous research recommendations. Those were technological integration, pedagogical development, and research priorities. The technology integration addressed the development of sustainable models for AI integration, building upon Dailah et al.'s (2024) framework, the creation of standardized implementation frameworks, and the enhancement of existing infrastructure. Pedagogical development focused on the creation of AI-specific teaching methodologies that extend traditional ESP approaches, the development of assessment tools for AI-enhanced learning, and the integration of professional nursing competencies. The research priorities were long-term effectiveness studies addressing gaps identified by multiple researchers (Ahmed, 2023; Mananay, 2024),

cost-benefit analyses of different implementation approaches, and investigation of scalability factors.

Table 4. Benefits and Challenges of AI Technology Implementation in Nursing ESP (2022-2024)

	Aspects
Benefits	**Learning Effectiveness** Enhanced personalization of learning experiences (Papers 12, 21, 24, 26) Improved access to authentic medical English materials (Papers 7, 13, 15, 28) Immediate feedback opportunities (Papers 19, 21, 25) Integration of professional nursing contexts (Papers 16, 20, 27)
	Student Engagement Higher motivation through interactive content (Papers 10, 19, 22) Better engagement in medical scenarios (Papers 16, 24, 28) Increased student participation (Papers 6, 10, 25) Enhanced learner autonomy (Papers 8, 11, 26)
	Skill Development Improved medical terminology acquisition (Papers 11, 25, 26) Enhanced communication abilities (Papers 19, 21, 24) Integration of professional skills (Papers 16, 20, 27) Vocabulary retention (Papers 12, 25, 26)
Challenges	**Technical Barriers** Infrastructure limitations (Papers 1, 2, 9, 13, 17, 23) Integration with existing systems (Papers 2, 17, 21) Technical support needs (Papers 1, 9, 16, 24) Internet connectivity (Papers 2, 9, 13, 19)
	Pedagogical Challenges Teacher expertise gaps (Papers 2, 16, 17, 21, 23) Need for specialized materials (Papers 13, 15, 20, 28) Assessment adaptation (Papers 19, 21, 24) Curriculum integration (Papers 17, 20, 23)
	Implementation Issues Resource allocation (Papers 1, 16, 21, 24) Training requirements (Papers 2, 17, 23) Teacher preparation needs (Papers 16, 20, 23) Curriculum adaptation (Papers 17, 23, 28)

The findings suggest that while AI integration in nursing ESP shows promise, significant work remains to bridge the gap between technological potential and practical implementation. This conclusion aligns with broader observations in both ESP research (Fisma, 2024) and AI in healthcare education (Santamato et al., 2024). Future efforts should focus on developing sustainable, pedagogically sound approaches that address both technical and educational needs while building upon established ESP principles.

CONCLUSIONS

This systematic review analyzed 28 studies on AI integration in English for Nursing education from 2022 to 2024. The findings reveal a clear pattern in the implementation of AI technologies, with most institutions (54%) utilizing basic digital tools, while fewer have progressed to intermediate (32%) or advanced (14%) AI applications. The analysis shows an increasing trend toward more sophisticated AI integration, as particularly shown in the 2024 studies.

The review identified significant benefits of AI integration in nursing ESP education, particularly in advanced implementations. These benefits include higher learning outcomes

in medical terminology acquisition, improved communication skills, and more engaging learning environments. However, there were challenges to the implementation, especially in infrastructure, teacher expertise, and resources.

The gap between available AI technologies and their practical implementation in nursing ESP classrooms is that even though there is an AI technology that works well in research settings, many teachers aren't using it due to several reasons a lack of the right equipment, lack of technical help, and teachers need special learning materials.

The findings of this review have important implications for different stakeholders in nursing ESP education. For institutions, they highlight the need for systematic approaches to AI integration, including robust infrastructure development and comprehensive teacher training programs. For educators, they emphasize the importance of balancing technological innovation with pedagogical effectiveness. For researchers, they identify areas requiring further investigation, particularly in developing sustainable models for AI integration. Overall, this review deepens our understanding of AI integration in nursing ESP education and provides a foundation for future development in this rapidly evolving field.

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