THE USE OF AI APPLICATIONS IN ESP TEACHING AND LEARNING: A SYSTEMATIC REVIEW

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Abstract: *This systematic review is aiming at analysing the main databases, such as WoS, Scopus, Google Scholar, and Science Direct, and searching the current research on the use of artificial intelligence in English for Specific Purposes teaching and learning. This review is goaled to share insights with the academic community on current state of research about use of AI in teaching ESP courses within 2022 - 2025 in the context of higher education regarding the examples of AI incorporated in the ESP, the skills to be developed with AI in ESP, and the challenges of using AI for teachers and students. This review has been inspired by Abdullah Sharadgah and Abdulatif Sa'di's systematic review, and due to the dramatic splash of AI in teaching ELT in recent years aims to study artificial intelligence in English for Specific Purposes teaching and learning. Major findings include that interest in AI in ESP is growing addressing its impact on language skills development, content design, cognitive development and academic integrity. The review indicates that while AI tools are widely used for content creation and automated feedback, more advanced applications like adaptive learning systems and AI-driven role-play are still emerging.*

Keywords: *PRISMA systematic review; artificial intelligence; ESP; higher education; teaching and learning.*

Introduction

In recent years, AI has captured the world's imagination and become deeply embedded across education, technology, and design. While some educators attempted to resist its rapid development for a year or two, its swift and continuous progress has left little room for alternative approaches to compete. This situation fosters educators to secure their constituency with the pace of AI development in all areas and be able to quickly learn how to exploit the possibilities of AI for positive performance and quality. AI is fast becoming a key instrument in English language and teaching, which needs to develop deeper understanding AI issues, challenges and the opportunities. Despite the significance of AI in teaching English as a foreign language (EFL), there remains a scarcity of academic research on the use of AI in English for Specific Purposes (ESP).

This study seeks to update understanding of the effect of AI language models, such as Chatbots on teaching and learning of ESP. Current research recognizes the importance in using AI, particularly ChatGPT, in teaching EFL.

AI tools are the key means to achieve quality and professionalism in teaching (Albadarneh et al. 3011). Design, creation, copywriting, and tuning

are most common areas for adjustment with the AI models, reported by the researchers.

Supporting beneficial assistance of AI, Emmett et al. (17) suggest a wide range of implications for the practice of EFL teachers. The review identifies five core areas in ELT to engage AI tools, such as speaking, writing, reading, pedagogy and self-regulation (17-19).

Along the same lines, AlTwijri and Alghizzi make a similar point in their study that AI educational applications positively influence EFL students to foster their motivation, engagement, attitude, and learning anxiety (2).

The evidence reviewed here seems to suggest the beneficial role of AI tools and models in improvement of teaching and learning.

Other studies have concluded that AI development presents the threat of academic dishonesty in students' use of AI tools. While Perkins agrees that AI is a powerful means for supporting students in writing and creative outcomes, they warn about the breach of academic integrity both from the students and teachers (11). Jeon (1) and Dehghan (71) express their concerns about academic integrity breaches, depressing creative and critical thinking, and higher-order thinking skills. Almanea (2) is worried about students' consistent use of ChatGPT with every possibility, despite the positive attitude of instructors and students.

Overall, there seems to be some evidence to indicate a cautious attitude to the AI use in teaching and learning. Together, these studies indicate that educators are not unanimous in defining the right strategy on how to apply AI in professional and academic practice. While some authors have been careful to exploit the AI tools in a balanced way, the others try to ~~i~~ntegrate the modern pace of technological development into teaching and learning.

According to our knowledge, this systematic review is the first to fill the gap in this topic in WoS, Scopus, Google Scholar and Science Direct databases.

The goals of this review are to analyze the perspectives on AI's application in ESP from academic cohort of university teachers and students. To be exact, this study is set out to share the practical use of AI in teaching ESP, show advantages and highlight challenges for university students and teachers.

Particularly, the review is aimed at the following research questions:

1. What is the span of AI use in teaching ESP?
2. What are the developed skills with AI in teaching ESP?
3. What challenges do university teachers and students face in the context of using AI in ESP?

The significance of this study stems from the fact that ESP educators need to be updated with real-life examples of AI use in instruction enhancing

their professionalism and engaging students in learning to develop critical thinking by providing authentic language practice.

The rest of the article is followed by the methodology and how the studies are selected, the results and answer the research questions based on the articles selected for this systematic review. After pointing out possible limitations in this study, we outline the conclusions and further prospects for future research on the use of AI in ESP course design in university education.

Methods

A systematic review was set out to research the practical application of AI in ESP curriculum design. The research questions raised are focused on investigation the challenges of university teachers' and students' and the benefits of the use of AI in ESP to outline a multifaceted perspective of the current research. This review was based on the guidelines for systematic reviews provided by Page et al. (1) and Peters et al. (2119). At the beginning of the review, the research questions are explicitly articulated as objectives to be addressed. The selected databases for the search are specified, along with the search strings and the criteria used for evaluating and selecting studies. Subsequently, the publications included in the final analysis are presented. The process is structured into three main phases: selection, identification, and synthesis (Gough et al. 2017:8).

Phase 1. Selection.

The Selection phase aimed to determine relevant search keywords and conduct searches across the databases WoS, Scopus, Google Scholar, and ScienceDirect. The goal was to identify academic articles focusing on the use of artificial intelligence in English for Specific Purposes (ESP) teaching and learning limited to the publication period between 2022 and 2025.

Each database was searched beginning with the term "artificial intelligence" in titles, abstracts, and keywords. Subsequently, the terms "English for Specific Purposes (ESP)," "teaching," and "learning" were added sequentially to refine the results.

Phase 2. Identification.

This phase involved screening the search results to determine whether to include or exclude them. The search was limited to research articles in English from journals, focusing on the social sciences and arts and humanities subject areas, while also removing duplicates.

Phase 3. Synthesis.

The final stage involved selecting studies for the review after filtering the results and conducting a rigorous selection process to ensure relevance to our topic. When the number of articles was manageable, we processed them manually and included them in the review (Figure 1). A summary of the included articles has been added in the Appendix.

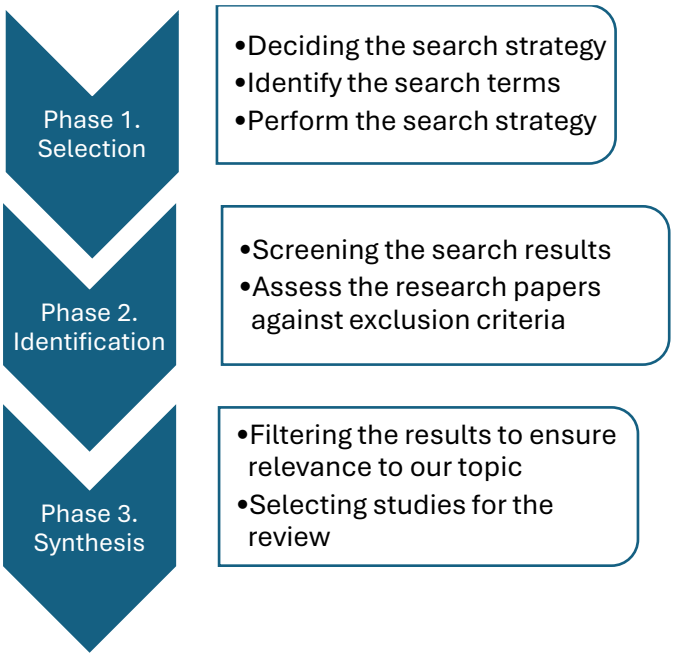

Figure 1. Search strategy phases (created on Gough et al. 2017:8 description)

Findings

The database search began with the term "artificial intelligence" in titles, abstracts, and keywords across four major academic databases. Initially, the search retrieved a vast number of documents: 233,231 in WoS, 414,000 in Google Scholar, 662,678 in Scopus, and 364,529 in Science Direct.

To refine the results, the term "English for Specific Purposes (ESP)" was added, significantly reducing the number of documents: 11 in WoS, 42 in Google Scholar, 18 in Scopus, and 530 in Science Direct.

Further narrowing was achieved by sequentially adding "teaching" and "learning" as additional search terms. After adding "teaching", the results dropped to 7 (WoS), 24 (Google Scholar), 8 (Scopus), and 243 (Science Direct). With "learning", the numbers further decreased to 4 (WoS), 23 (Google Scholar), 8 (Scopus), and 221 (Science Direct).

The search was then limited to publications from 2022 to 2025, yielding 3 results in WoS, 19 in Google Scholar, 6 in Scopus, and 69 in Science Direct. A manual selection process, which excluded conference proceedings, further refined the results: 3 (WoS), 14 (Google Scholar), 3 (Scopus), and 33 (Science Direct).

Finally, the selection was refined to focus solely on the arts and humanities and social sciences disciplines. The final dataset consisted of 3 articles from WoS, 14 from Google Scholar, 3 from Scopus, and 22 from Science Direct (Table 1).

Table 1. Search results at each filtering step (generated by Liashenko I. grounded in the results of research)

Search Step	WoS	Google Scholar	Scopus	Science Direct
"Artificial Intelligence"	233,231	414,000	662,678	364,529
+ "English for Specific Purposes (ESP)"	11	42	18	530
+ "Teaching"	7	24	8	243
+ "Learning"	4	23	8	221
Limited to 2022-2025	3	19	6	69
Excluding conference proceedings	3	12	3	33
Filtered by subject area (Arts & Humanities, Social Sciences)	3	12	3	22

After these exclusions, the total number of results was reduced to 40. We then removed 5 duplicate records, leaving 35 documents.

The list was thoroughly screened manually, and articles that did not align with the focus of our review were excluded. Twenty-four documents were found to be unrelated to the use of artificial intelligence in ESP teaching and learning. The search included some studies related to English corpora as the AI in teaching and learning, and since we needed to refine the AI in ESP, we excluded these documents.

Thus, the final number of documents included in the review is 11 (Figure 2).

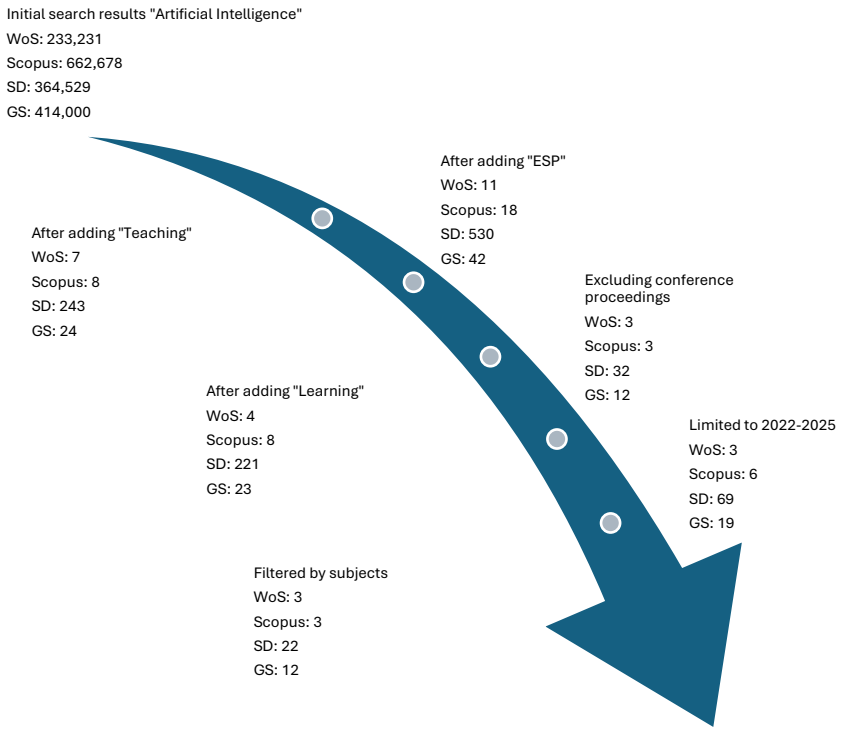

Figure 2. prisma flowchart of document selection (created on page et al.'s description (1) and added by the numbers from current research (liashenko i.))

Even grounding in the small number of sieved results, the analysis of refined studies showed that the number of research on AI in ESP is consistently growing (Figure 3). The bar chart illustrates the steady growth of research on AI in ESP over recent years. In 2022, no studies were recorded, indicating either a lack of research focus or limited availability of relevant publications. However, in 2023, the first study appeared, marking the beginning of scholarly interest in the field. The number of studies grew significantly in 2024, with four publications, and surged even further in the first quarter of 2025, reaching six studies. This upward trend suggests an increasing academic engagement with AI applications in ESP, highlighting its growing importance and potential for future exploration.

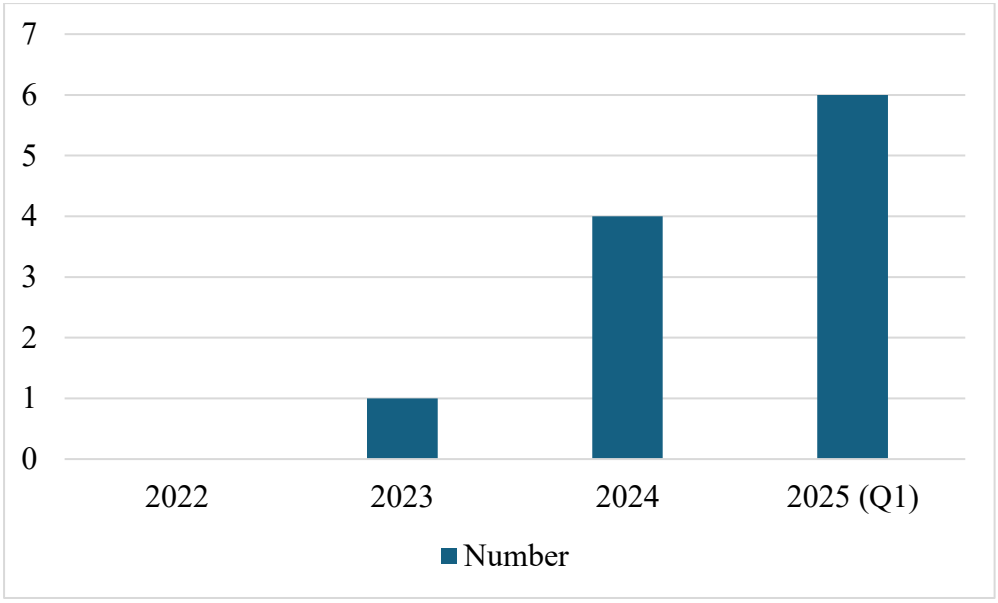

Figure 3. Growth of studies on AI in ESP (2022 – 2025 (Q1) (generated by Liashenko I. grounded in the number of studies)

Although it is hard to state the representativeness of the geographical distribution in the refined documents in our review, the analysis shows that the studies on AI in ESP come from a diverse set of countries, reflecting a global interest in the topic. The most active contributors are China, Ukraine, Saudi Arabia, and Iran, each producing two studies, indicating a balanced research output across different regions. These countries likely prioritize AI-driven language learning due to educational and technological advancements or specific needs in ESP instruction.

Other countries, including Indonesia, Benin Republic, and Scotland (UK), contributed one study each, suggesting emerging interest but possibly limited research resources or a narrower academic focus on this topic.

This distribution highlights the dominance of Asia and the Middle East, with some representation from Africa and Europe. The absence of studies from North America, Australia, and broader European regions suggests that AI in ESP might not yet be a major research focus in those areas or that existing studies are categorized under broader AI and language learning themes.

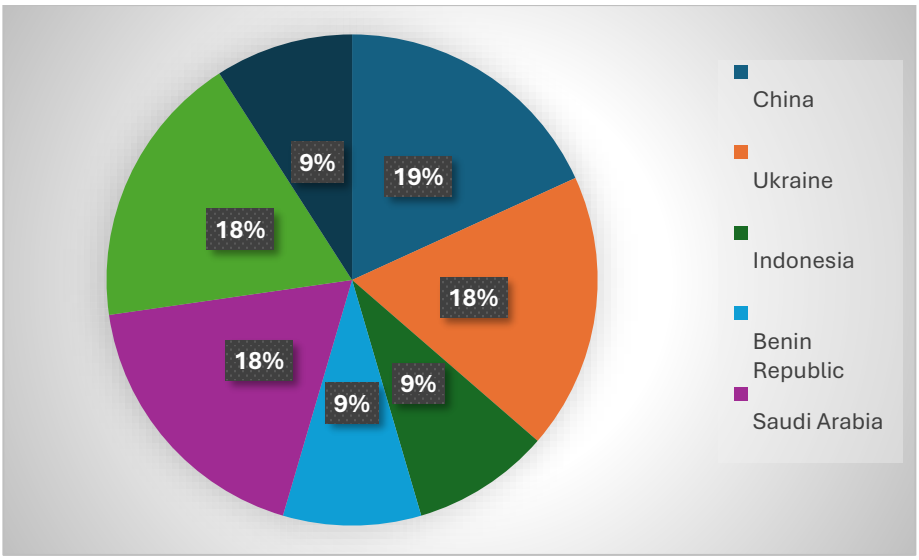

Figure 4. Geographical distribution of studies on AI in ESP (generated by Liashenko I. grounded in the current research)

Eight out of the eleven selected studies are indexed in both Web of Science (WoS) and Scopus, the primary databases for international multidisciplinary academic literature (Aghaei Chadegani et al. 18). One study is published in a journal indexed in Scopus, while the remaining two are published in journals with other indexing.

The selected studies on AI in ESP cover a diverse range of language skills and educational aspects. The most commonly addressed skill is writing, with two studies examining how AI can support or enhance this aspect of ESP learning. Other studies focus on oral communication skills, including general oral skills (1 study), oral communication in an ESP context (1 study), and conversational skills (1 study), highlighting AI's role in interactive language use.

Beyond core language skills, several studies address broader educational objectives. One study explores motivation, creativity, and critical thinking, emphasizing AI's impact on cognitive and affective domains. Another study investigates backward design in Technical English, demonstrating AI's potential for structured curriculum planning. Additionally, AI's role in enhancing ESP coursebooks (1 study) and reducing teacher workload (1 study) suggests a shift toward AI-assisted instructional design.

Other research areas include AI for talent training in the job market (1 study), reflecting the growing demand for AI integration in vocational education. Studies also explore students' and teachers' attitudes toward AI (1 study) and its influence on critical evaluation of AI-generated content, ethical AI use, and confidence in utilizing AI tools (1 study) (Figure 5).

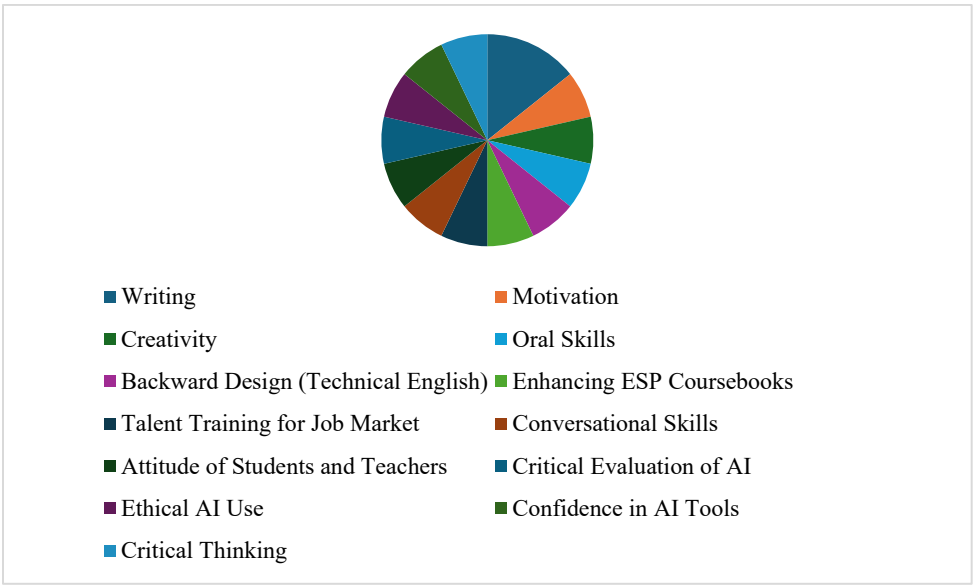

Figure 5. Distribution of research according to the skill developed (generated by Liashenko I. grounded in the current research)

Discussion

This study carried out a systematic review of research literature on the use of AI in ESP with the analysis of related research spanned from 2022 to 2025. It focused on updated view on AI's role in teaching and learning ESP.

The findings prove the suggestion that the use of AI in ESP teaching and learning is gaining momentum. They are aligned with recent studies stating that AI in ESP is at the opening stage whereas ELT field is more explored (Abdullah Sharadgah and Abdulatif Sa'di 338).

In addition, this review outlined the current point of AI in ESP and dealt with the research questions stated in the study.

The scope of AI use in ESP teaching and learning

We defined several areas of AI application in ESP education grounding in the reviewed studies. The use of AI for developing learning materials and content creation relates for Category 1 with a focus of AI's role in the generation of educational materials for ESP learners.

Engaging AI in ESP learning materials shifts the lesson design and content creation into up-to-date level, aligning the technology of teaching ESP with the real-life demands in professional education. Utilizing AI, such as natural language processing (NLP) or large language models like GPT-3, fosters methodology in teaching and assessment in generating summaries of longer texts, extracting key information and outlining succinct information.

Another use of AI pivots around professional content design in ESP generating articles, blog posts, product description as well as engaging chatbots into conversational practice with the use of professional lexis. AI is also used in translation and text completion to predict the next word or phrase in a given specific context, enhancing authentic professional language (Rudik and Onyshchuk 91) and engaging in task-based learning (Lytovchenko et al. 7).

Tang (101914) emphasizes the need for AI-powered ESP courses in digital environments for career guidance**,** recognizing the students' needs for discipline**,** and**,** social development. Qaralleh and Ahmed (101) integrate AI into a backward design approach for curriculum development in Technical English.

Skill development and language learning relates to Category 2 where researchers used AI-driven applications to enhance specific language skills to meet the requirement for professional training. This accords with the Teba's study (1165), which showed evidence that oral skills in ESP learners have been improved with the help of AI-based language learning apps (Duolingo, Memrise). The study corroborates the notion that the use of AI, such as Grammarly for grammar correction and Duolingo, develops conversational skills, enhances motivation and improves student performance. Consistent with the literature, this review supported idea that the chatbots are to develop professional conversational practice, facilitating role-plays and supporting students' interpersonal relationships (Hariany 19, Derakhshan et al. 108416).

Category 3 includes studies on engaging AI for personalized and adaptive learning. Thus, Haryani finds that AI in ESP education is still in its early stages, with most teachers using tools like Grammarly for grammar correction and Duolingo for vocabulary building in personal education (22). Ngo and Hastie introduced an AI literacy module (AI for Academic Purposes - AIAP), integrating AI-based learning into an EAP course (22)**.** Similarly, Tang integrated AI the course for talent training for the job market (101914).

Category 4 comprises studies related to AI in cognitive and critical thinking development, exploring AI's impact on motivation, creativity, and decision-making in ESP education. Lytovchenko et al.'**s** research not only investigates the use of AI chatbots in task-based learning but also promotes the development of structured learning activities such as listing, ordering, problem-solving, and creative tasks (9). Lijie et al. examine AI's role in enhancing critical thinking, motivation, and creativity in Business English learners, proving the link among motivation, critical thinking, and creativity in business English learners from Chinese higher vocational colleges (101578). Khojasteh et al. study how ESP instructors use cognitive strategies to detect AI-generated content and balance ethical concerns with authentic learning (104952).

Category 5 deals with the concerns around AI use arising in assessment, ethical considerations, and academic integrity. Khojasteh et al. analyze how instructors evaluate AI-generated content to ensure ethical language development (104952). Alharbi surveys teachers and students on AI's benefits and challenges, including its impact on academic honesty and AI detection systems (1).

The analyzed studies demonstrate that the use of AI applications in ESP is evolving across multiple dimensions not necessarily related to the professional aspect. The addressed areas to be impacted by AI cover curriculum design, skill enhancement, adaptive learning, cognitive development, and academic integrity in the ESP. AI tools are widely used for content creation and automated feedback, more advanced applications like adaptive learning systems and AI-driven role-play are still emerging.

The skills to be developed with AI in teaching ESP

Shifting our discussion to the skills enhanced and developed with the AI applications, we analysed the selected studies in terms of the language or other skills and AI applications used (Table 2).

The refined studies present the diverse scope of AI applications and tools for developing language and other skills critical for ESP teaching and learning or interwoven with it. Thus, AI tools like ChatGPT, Grammarly, and AI-based writing assistants help students refine their writing but require human oversight for deeper aspects like creativity and communicative effectiveness (Khojasteh et al. 104952, Lytovchenko et al. 15). AI-driven chatbots and speech recognition tools (like Elsa Speak) support conversational practice and pronunciation improvement (Haryani 23). The research of Teba presents the use of gamified apps (Duolingo, Memrise) and AI-driven interactions to increase learner motivation (1175). Ngo’s and Hastie’s study is aimed at encouraging learners to evaluate AI-generated content critically (23), and Khojasteh et al.’s research presents another dimension of treating AI technologies: developing cognitive flexibility with ESP teachers to recognize the style of the Chatbots (104952).

Overall, these studies have accorded with the notion that there is a need for AI literacy training to ensure ethical AI usage in learning and assessment.

According to the reviewed literature, more and more educators rely on AI in generating domain-specific materials and simulating professional communication scenarios, which sparks motivation and provides up-to-date professional lexis critical for teaching ESP (Rudik and Onyshchuk 90-92).

Table 2. Skills for ESP developed with AI assistance

Language skills enhanced with AI assistance		
Language skill	AI Applications used	Studies

Writing	Grammarly, ChatGPT, AI writing assistants	Khojasteh et al., Lytovchenko et al.
Speaking and oral communication	AI-driven chatbots, Duolingo, Memrise, Voice Recognition Systems	Teba, Haryani, Derakhshan et al.
Listening	AI-driven robots, virtual assistants	Derakhshan et al.
Reading and comprehension	AI text summarization, NLP for content adaptation	Rudik and Onyshchuk
Grammar and vocabulary	Grammar-checking tools, Adaptive learning platforms	Haryani
Other skills developed		
Skill	AI Applications used	Studies
Critical thinking	ChatGPT, AIAP (AI for Academic Purposes)	Lijie et al., Ngo and Hastie
Creativity	AI-assisted content generation, interactive writing tasks	Lijie et al., Lytovchenko et al.
Motivation and engagement	AI chatbots, gamified language learning apps (Duolingo, Memrise)	Teba, Haryani
Academic integrity awareness	AI detection tools, ethical AI literacy programs	Alharbi, Ngo and Hastie
Empathy and socio-cognitive skills	AI-driven robots for role-play and interactive conversations	Derakhshan et al.
Decision-making and pedagogical strategies	AI-generated content detection, heuristic reasoning	Khojasteh et al.
Job market readiness (ESP talent training)	AI-powered needs analysis for professional communication	Tang
Curriculum design and learning adaptation	AI-enhanced backward design, adaptive learning systems	Qaralleh and Ahmed

Challenges faced by university teachers and students in the context of using AI in ESP

The studies reviewed highlight a range of challenges in incorporating AI into ESP education. These challenges can be categorized into linguistic limitations,

technological and infrastructural barriers, pedagogical concerns, ethical considerations, and assessment difficulties.

Linguistic limitations and content development

In Rudik'**s** and Onyshchuk's study AI models trained on general English struggle with domain-specific language limitations (92-93). They lack the specialized terminology and discourse patterns required for different professional fields. According to the study, the absence of large, annotated datasets for ESP raises the challenge in training AI tools for discipline-specific instruction.

Lytovchenko et al. describe the issue of lacking higher-order thinking skills with the students to craft effective prompts, and state that the AI-generated content's accuracy and relevance depend on input quality (18).

Technological and infrastructural barriers

This challenge mostly depends on the technological state of AI models described at the time of doing research. Teba claims that the limited access to technology prevents equitable AI adoption (1165), while Qaralleh and Ahmed state that the lack of investment in digital infrastructure and professional development for instructors hinders effective AI implementation (101). Since the development of artificial intelligence is evolving in swift succession, we assume that the lack of investment in the technological sphere would not be an issue in the nearest time.

Another challenge stated in Ngo's and Hastie's study is the absence of a unified approach to AI literacy across institutions, which creates confusion among students, coming along with our concerns (28).

Pedagogical concerns and teaching methodologies

The key concern about consistent use of AI in teaching and learning, specifically in ESP, may reduce human interaction, which is critical for language acquisition (23).

In terms of developing teaching content, AI-driven feedback lacks pragmatic and cultural appropriateness, raising concerns about the quality of language instruction, which poses a challenge in the precision of meeting student needs and maintaining pedagogical relevance. AI-generating materials still needs to be thoroughly controlled and refined to ensure they are relevant (Rudik and Onyshchuk 90).

Another challenge Rudik and Onyshchuk claim is that decomposing abstract language skills makes it difficult for AI to replace teacher scaffolding in instruction (93).

Ethical considerations and AI literacy

The key issue that has been faced by teachers and students since the emergence of AI and adapting it to teaching and learning is that AI can facilitate academic dishonesty, leading to a decline in critical thinking and research skills (Alharbi 2). In doing their assignments, students tend to blindly trust AI-generated content, highlighting the need for AI literacy training (Ngo and Hastie 28). This situation is underpinned by the lack of a sector-wide policy on AI use and creates inconsistency in academic expectations which appears a double-edged sword. On the one hand, AI literacy should be developed; on the other hand, a clear policy should be introduced to define the boundaries and restrictions on AI use. With the rapid development of AI capabilities, it is becoming increasingly difficult to distinguish between human contributions and AI-generated content.

Assessment challenges

The integration of AI-generated content complicates academic assessments, necessitating the development of adaptive strategies to differentiate student work from AI output (Khojasteh et al. 104952). The study by Rudik and Onyshchuk discusses the challenges of AI in differentiated assessment (92-93). While AI offers potential in this area, its role remains constrained, as educators must critically evaluate and refine AI-suggested evaluation methods. In task-based learning, AI's impact on language quality remains limited, as its effectiveness hinges on students' ability to formulate clear and purposeful input (Lytovchenko et al. 16).

While AI offers promising opportunities in ESP education, the studies underscore significant challenges related to content accuracy, technological accessibility, pedagogical integration, ethics, and assessment methodologies. Effectively addressing these issues necessitates investment in digital infrastructure, professional development for educators, and AI literacy initiatives to promote responsible and effective AI use in language learning.

Conclusions

This study systematically reviewed the use of AI in ESP teaching and learning from 2022 to 2025, examining the scope of AI use in ESP, its impact on language skills, assessment, and pedagogy, and addressing the challenges faced. Findings suggest a growing interest in the use of AI applications in ESP, particularly after 2024, highlighting its potential in optimizing language learning for professional education.

The refined selection of the studies demonstrates that AI applications in ESP are evolving across multiple dimensions – curriculum design, skill enhancement, adaptive learning, cognitive development, and academic integrity. While AI tools are widely used for content creation and automated

feedback, more advanced applications like adaptive learning systems and AI-driven role-play are still emerging. The review highlights a growing interest in integrating AI into ESP education, but challenges remain in implementation, training, and ethical considerations.

The distribution of studies indicates a broad but uneven focus on AI's application in ESP. Writing skills receive notable attention, likely due to the increasing use of AI-powered text-generation tools in academic and professional settings. Oral communication, a crucial skill in ESP, is also explored, though with fewer studies, suggesting the need for further research in AI-supported spoken interaction. At the same time, the systematic review identified two opposing groups of educators: those who enthusiastically promote the use of AI in ESP and those who are deeply concerned about its potential for dishonest use. Our position is in the middle, gravitating to the balanced, honest, and sane incorporation of AI into the development of skills and technologies.

Additionally, the presence of studies on motivation, critical thinking, and ethics reflects the growing awareness of AI's broader impact beyond linguistic proficiency. The interest in AI's role in curriculum design, course materials, and job market preparation suggests that researchers are not only investigating AI's impact on learners but also on educators and institutional practices.

Despite its potential, AI in ESP remains in its initial stages. This study is limited by the chosen databases, and given the fact that more and more studies on this topic are appearing, the current review didn't evaluate all perspectives in this area. Very few studies suggest the practical utilization of AI for ESP students' needs, and detailed descriptions of the AI tools and applications in the instruction are lacking, which limits its replicability. Furthermore, the selected studies prove the deficiency of ESP real-life cases, professional role-plays, or samples of AI use in ESP content development, which might be efficient for the development of ESP instruction and assessment. In terms of development of other than language skills, the selection lacks focusing on collaboration to be developed with the AI-assistance which is critical for most jobs.

Given the diversity of topics, future research could aim to balance the focus across different skills, particularly in areas like listening and reading, which are notably absent in the current dataset. A greater focus on AI's role in ESP assessment and feedback mechanisms could produce interesting findings that account more for instructional applications.

Findings from this study can guide researchers in identifying gaps in AI-driven ESP research, help educators integrate AI tools effectively into ESP instruction, and support AI developers in improving algorithmic efficiency for language for specific purposes learning applications. This systematic review

may help researchers grasp how the literature is progressing and spark further research grounding in this scope. At the same time, this review revealed the urge to elaborate on a more detailed policy on the use of AI aimed at awareness of responsibility and literacy in utilizing AI in ESP.

As AI technology continues to evolve, its integration into ESP must be accompanied by critical evaluation, ethical considerations, and pedagogical advancements.

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Appendix

Article title	**Adopted Technology**	**Research Method**	**Instrument and Tool**	**Journal**	**Year+Index**	**Language Skill and Others**	**Level and Country**	**Effect Description**	**Issues and Challenges**
Mind the gap, please! (Alharbi, 2024)	The study surveyed 78 teachers and 243 students from public and private universities offering English for Specific Purposes (ESP) courses. Using Likert-scale items and an open-ended question, the research explored AI tools' benefits, challenges, and impact on learning and academic integrity.	mixed-methods, utilizing both quantitative surveys and qualitative open-ended questions	ChatGPT Grammarly	International Journal of Computer-Assisted Language Learning and Teaching	2024 WoS Scopus	Attitude of students and teachers	Higher education Saudi Arabia	A significant awareness gap exists between students and teachers regarding AI tools, particularly in language assessment, with students adopting these tools faster than teachers can adapt. This discrepancy is especially critical in foreign/second language instruction, necessitating targeted teacher	can facilitate academic dishonesty and hinder the development of critical thinking, research, and problem-solving skills if misused

	Survey Focus Areas: • General AI Knowledge • AI in Education & Specific Disciplines • Future of AI in Education • Personal Experiences & AI Usage in Assignments • Academic Honesty & AI Detection • AI and Learning Outcomes • Regulation & Training • Impact on Academic Integrity Participants included teachers with diverse							training. Ethical concerns also arise, as many students admit to using AI for unauthorized assistance, while teachers struggle to ensure academic integrity. Addressing this requires clear guidelines, ethical frameworks, revised assessments, and AI literacy integration into EAP/ESP curricula to educate both students and teachers on responsible	

	backgrounds and students from disciplines such as Medicine, Engineering, Technology, and Management Sciences.							AI use. A collaborative approach—fostering open dialogue, mutual understanding, and shared responsibility—can help navigate AI's role in language education effectively.	
Investigating the usefulness of artificial intelligence-driven robots in developing empathy for English for medical purposes communication: The role-play of Asian and	Artificial Intelligence-driven robots enhance students' socio-cognitive engagement by stimulating prior knowledge and adapting conversatio	quasi-experimental study an embedded mixed methods design	Artificial Intelligence driven (non)-robots	Computers in Human Behavior	2025 WoS Scopus	oral skills	Higher education Iran	Students have developed empathy and socio-cognitive skills in enhancing speaking and listening in EMP through Artificial Intelligence driven	not stated

African students (Derakhshan et al., 2025).	ns to meet communication needs. They facilitate role-play, allowing students to visualize social interactions and develop empathy in authentic situations. Additionally, these robots promote active participation in learning, helping students build interpersonal relationships and understand others' needs more effectively.							(non)-robots. The statistical analysis indicated that in performing role-play to teach oral skills to the Artificial Intelligence-driven robot, the participants achieved significantly greater communication competence than those who did role-play for virtual agents.	

Artificial Intelligence Use in ESP Teaching among Indonesian ESP Teachers Association Members (Haryani, 2025)	The findings indicate that the AI application in ESP learning is in the infancy stage. A great majority of lecturers answered that they used AI mainly to perform simple tasks in automated feedback, such as through grammar-checking tools or letting students practice their speaking with AI-driven chatbots.	mixed methods quantitative survey	AI-driven chatbots chat GPT Gemini grammar-checking tools Grammarly Duolinguo Virtual Assistants: Google Assistant or Microsoft Cortana Voice Recognition Systems: Elsa Speak Adaptive Learning Platforms: Smart Sparrow and Century Tech	Journal of English Language Teaching and Applied Linguistics	2025	conversational skills	higher education Indonesia	This study addresses the uprising role of Artificial Intelligence (AI) in English for Specific Purposes (ESP) learning by Indonesian ESP lecturers. These are still somewhat embryonic findings that outline great prospects AI has on enhancing engagement, improvement in speaking skills, and customized learning experiences in a classroom	over-reliance on technology, reducing the place of human interaction, especially in language learning; AI needs to complement rather than replace the traditional ways of teaching; concerns regarding the quality of the feedback produced by AI, especially about complex linguistic issues like cultural context or pragmatic appropriateness.

	Such tools as Grammarly are widely used for corrections at the grammar level and building vocabulary with Duolingo. These mostly had to do with a range of chatbots-anything from Replika, but also ones that come within institutional learning management systems for simulated conversational practice. But very few had							setup. Successful adaptation of AI to ESP learning environments, however, remains impeded due to three identified major hurdles: insufficient educators' training aimed at better academic practice, deficiency in technological infrastructure, and quite inadequate research studies relating to the development of	

	moved to adaptive learning systems or other use of AI for analytics around watching longitudinal student performance and engagement.							functional applications of AI.	
Decision-making in decryption AI-generated content: Emotive dynamics and pedagogical strategies in ESP education (Khojasteh et al., 2025)	Teachers apply a scope of mental strategies to recognize AI-generated content, complementary principled considerations with the prerequisite to foster authentic language developmen	qualitative study	GPT-3 and ChatGPT	Teaching and Teacher Education	2025 WoS Scopus	writing	higher education Iran	Emotional replies significantly impact ESP writing instructors' decision-making, with a heavier necessity on innate findings over logical approaches. The pedagogical strategies ESP writing	Teachers are now challenged with the task of individual between authentic student work and AI-generated content, a encounter that demands adaptive assessment strategies

	t. This analysis examined the cognitive strategies employed by ESP writing teachers to spot AI-generated content, finding a major dependence on instinctive processes such as Expert Judgment and Heuristic-Based Reasoning							instructors assume highpoint a preference for increasing in-class writing tasks and penalizing AI use, rather than integrating AI responsiveness into the curriculum. There is a compound interplay between innate and analytical strategies, persuaded by emotional features.	that can evolve alongside these quickly progressing skills
The facilitating properties of critical thinking on the	The students recycled ChatGPT for over 3 months in their	non-experimental correlational revision	ChatGPT	Thinking Skills and Creativity	2024 WoS Scopus	stimulus creativity critical thinking	higher education China	This study searched the connections with motivation, critical	No straight intervention consequence was recognized between

motivation and creativeness of Business English learners in the age of AI: Mental flexibility theory (Lijie et al., 2024)	learning process.							thinking, and imagination in business English learners from Chinese higher professional colleges in the context of AI. The constructive effect was linked to critical thinking expansion, although creativity was neglected.	motivation and imagination.

The use of chatgpt in task-based ESP learning at university: Does it make a difference? (Lytovchenko, 2025).	The students used ChatGPT to complete the tasks in TBL lesson. Each team independently carried out the following tasks in a google document: 1) listing, 2) ordering and sorting, 3) problem solving, 4) sharing personal experience, 5) comparing, and 6) creative tasks. The experimental group performed the tasks with the employment of	mixed-methods	ChatGPT	International Journal of Interactive Mobile Technologies (iJIM)	2025 Scopus	writing	higher education Ukraine	Results indicate that students using ChatGPT showed the same level of achievement as those who did not use it in generating ideas and structuring initial drafts but struggled with the deeper aspects of writing, such as communicative achievement and creativity. Also, the ChatGPT's ability to enhance language accuracy	The use of ChatGPT did not provide a clear advantage in improving the language quality of the proposals. The accuracy of AI models is impacted by the quality of the data they are trained on. However, it also depends on the quality of the input provided by students. If their query is not clear, concise, and relevant, the system might not understand

	ChatGPT. The control group performed the tasks using the internet resources except for AI tools. For the data gathering, a questionnaire was utilised based on a review of existing literature and adapted to this specific context. It consisted of 7 Likert scale ques-tions, ranging from strongly agree (1) to strongly disagree (5), and 1 open-							was evident, yet not superior to traditional methods. Students generally perceive ChatGPT positively, appreciating its role in facilitating the writing process and providing immediate assistance. However, they also acknowledge the necessity for critical evaluation and human refinement of artificial intelligence (AI)-generated texts to ensure the quality and	and produce an inaccurate response. Higher-order thinking skills will help students articulate their prompts in a way that can be easily understood by the system and critically evaluate the accuracy and relevance of the responses gener-ated by the system.

	ended question. The Likert scale questions measured students' perceptions of ChatGPT's utility in aspects such as ease of use, contribution to task completion, and quality improvement.							originality of their work. This study concludes that while AI tools, such as ChatGPT, can complement traditional teaching methods, they cannot replace human evaluation and expertise.	

Artificial Intelligence for academic purposes (AIAP): Integrating AI literacy into an EAP module (Ngo and Hastie 2025).	10-week AI-integrated EAP module to incorporate AI literacy at a Scotland college	mixed-methods	Generative AI (GenAI) as ChatGPT or Microsoft Copilot, Elicit, Consensus, Perplexity, Quillbot	English for Specific Purposes	2025 WoS Scopus	critically evaluate GenAI output, enhancing confidence in using a greater variety and purposes of AI tools, awaring of ethical AI use	higher education UK, Scotland	embedding AI literacy within an EAP curriculum significantly enhances students' confidence in using AI tools, broadens the range of academic applications for which these tools are utilised, and deepens their understanding of ethical considerations surrounding AI use. Importantly, students also developed a more critical perspective on the biases and	an increase in AI-related academic misconduct, a lack of understanding from students of how to interact with or prompt these tools effectively (Walter, 2024) and a tendency to blindly trust information output from GenAI (Ding et al., 2023). The lack of a sector-wide cohesive approach to the use of GenAI might have additionally confused students. This is

								limitations of generative AI, which is crucial in fostering a responsible and informed approach to technology in academic settings.	illustrated by Jordan's comment that their high school teachers told students they would not be allowed to use AI at university. Students were afraid of using it before the module due to concerns over unethical use.

Advancing transnational education by Integrating Artificial Intelligence Technology and backward design principles in technical English curriculum (Qaralleh & Ahmed, 2024).	using artificial intelligence (AI) technology to develop a backward design curriculum for Technical English in preparatory year programs, targeting the CEFR A2-B1 level.	mixed-methods	artificial intelligence (AI) technology	Advances in Educational Marketing, Administration, and Leadership	2025 WoS Scopus	backward design within the context of Technical English	higher education Saudi Arabia	The findings demonstrated a notable enhancement in student learning outcomes through implementing an AI-enhanced curriculum, as seen by considerably higher engagement scores in the experimental group.	instructors should undergo professional development, investment in digital infrastructure, and collaborative curriculum planning should be implemented

Artificial inteligence tools for developing educational resources: Enhancing digital learning experience for teachers and learners (Rudik & Onyshchuk, 2024).	AI tools for creating ESP learning materials and their potential applications in different professional and academic contexts. 1. Text Summarization: Automatically generating concise summaries of longer texts, which is useful for extracting key information from documents or articles. 2. Dialogue Systems: Creating conversatio	mixed-methods	natural language processing (NLP) and large language models such as GPT-3	Transcarpathian Philological Studies	2024	complementing ESP coursebooks with the most relevant and up-to-date content, making teaching more effective and reducing the workload for teachers	higher education Ukraine	The integration of AI tools into the creation of ESP learning materials presents a paradigm shift in language education. By leveraging the power of AI technologies, educators can efficiently create contextualized, relevant, and engaging learning materials tailored to specific professional or academic domains.	Domain-Specific Language Limitations – AI models trained on general English may struggle with specialized terminology and discourse patterns unique to different professional fields. Lack of Domain-Specific Datasets – Building effective AI models for ESP requires large, annotated datasets, which can be difficult and time-

	nal agents or chatbots that can engage in natural language conversations with users, providing information or assistance. 3. Content Creation: Automatically generating articles, blog posts, product descriptions, and other types of content for various purposes, including marketing, journalism, and content generation platforms. 4. Language								consuming to collect, especially for niche disciplines. Diverse Learner Needs – ESP learners have varied backgrounds, proficiency levels, and goals, making it challenging for generic AI models to provide personalized learning experiences. Data Privacy and Security – AI-powered platforms collect and process sensitive personal and professional

	Translation: Translating text from one language to another, where advanced language models can improve translation quality and fluency. 5. Text Completion: Predicting the next word or sequence of words in a given context, which is useful for auto-completion features in text editors or search engines.								data, requiring strict compliance with privacy regulations to maintain trust. Assessment and Feedback Accuracy – AI must effectively evaluate learners' proficiency and provide meaningful, targeted feedback tailored to ESP contexts. Effort in Differentiated Instruction – While AI can help generate differentiated materials, teachers still

									need to refine and personalize AI-generated content to ensure relevance and effectiveness. Challenges in Alternative Assessments – AI can suggest real-world applications for assessments, but teachers must still adapt and validate these ideas to ensure they align with learning objectives. Difficulty in Decomposing Abstract

									Skills – Breaking down complex language skills into manageable parts is a challenge, requiring AI to support but not replace the teacher's role in scaffolding instruction.

Artificial Intelligence-based needs analysis for English Specific Purposes in a digital environment (Tang, 2023).	AI in ESPcourses to relevant majors	mixed-methods	AI technologies	Learning and Motivation	2023 WoS Scopus	talent training for job market	secondary, higher education China	The usage of AI in ESP should be advanced, enriched, enhanced, practiced and continuously established in agreement with the requirements of the College English teaching guide.	highpoint the purpose of tools, differentiate academic and professional needs, deeply integrate the new generation of information technology, understand the divergence of teaching methods, and implement expanded and full coverage assessment methods; provide essential teacher development support to progress the professional

									and systematic literacy of artificial intelligence English for specific purposes (AI ESP) teachers.

Using artificial intelligence to improve Beninese ESP advanced learners7 communication skills in Institut de Formation et de Recherche en Informatique (IFRI) and Haute Ecole de Commerce et de Management (HECM) in Benin Republic (Teba, 2024).	"Duolingo" and "Memrise" applications have been used on the experimental group (EG) to improve learners' oral skills and a post-test has been administered to both groups and the overall performance of experimental group have been compared to control group	mixed methods and quasi-experimental designs	Natural Language Processing (NLP) Machine Learning (ML) Deep Learning (DL) Machine Translation (MT) AI Writing Assistants Chatting Robots (Chatbots) "Duolingo" and "Memrise"	International Journal of Innovation and Applied Studies	2024	oral communication skills in an ESP context	higher eduction Benin Republic	This study presentes the effect of AI technology integration on the oral communication skills of advanced learners of English for Specific Purposes (ESP) in Benin. Using a quasi-experimental methodology, the study collects relevant information from both quantitative and qualitative sources. It highlights the importance and impact	In Beninese didactic system, the integration of AI is subject to many challenges. In the learners' respondents, figure 2 shows that majority of learners are interested about the idea of uniting AI technology with English language learning experience (87%) and figure 4 grants the problems in the implementation of AI tools in ESP classes. The difficulties

								of AI technology on learners' oral communication skills in an ESP context, arguing that traditional teaching methods should evolve to meet the requirements of today's world and improve learners' oral communication skills. The TOEFL iBT test was used to measure learners' oral performance. The results, derived from	faced in implementation of AI tools by teachers are the concerns to integrate AI tools into the curriculum, the scarcity of access to technology, the lack of student's willingness and the scarcity of interest to learning activities. Agreeing to Akram et al (2022) and Yang (2022), the integration of AI into curriculum requires course designers to regulate the content and

								questionnaires addressed to ESP teachers and advanced learners, interviews with some teachers and school authorities, classroom observations, and experimentation, show that the level of learners' oral communication skills can be improved through the use of AI tools in classes.	procedure for teaching within the curriculum.