International Journal of Innovative Research and Scientific Studies, 9(5) 2026, pages: 92-101

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Artificial intelligence and the future of English for specific purposes pedagogy in higher education

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Abstract

Artificial intelligence (AI) is rapidly reshaping higher education, with growing implications for English for Specific Purposes (ESP) pedagogy. Although previous studies have examined AI in general English language teaching, its role in discipline-specific instruction remains underexplored, particularly in emerging higher education contexts. This study investigates how AI is perceived and used in ESP pedagogy in Vietnamese universities, focusing on business, finance, and engineering programs. A mixed-methods design was employed, combining survey data from 212 students enrolled in ESP courses with semi-structured interviews with 15 lecturers. The findings indicate that AI supports access to authentic disciplinary input, personalized learning pathways, immediate feedback, and greater learner autonomy. At the same time, participants identified persistent concerns related to reliability, over-reliance, academic integrity, data privacy, curriculum alignment, and teachers' digital readiness. The study highlights the dual role of AI as both a pedagogical enabler and a source of new instructional and ethical challenges. It argues that effective integration of AI in ESP requires not only technological adoption, but also curriculum redesign, teacher professional development, and institutional policy support. These findings contribute to current discussions on AI-enhanced language education by extending ESP pedagogy toward a more explicitly AI-aware and context-responsive framework.

Keywords: AI literacy, Artificial intelligence, English for Specific Purposes, ESP pedagogy, Higher education, Vietnam.

DOI: 10.53894/ijirss.v9i5.11645
Funding: This study received no specific financial support.
History: Received: 25 February 2026 / **Revised:** 16 April 2026 / **Accepted:** 20 April 2026 / **Published:** 14 May 2026

Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Acknowledgment: The author gratefully acknowledges the financial support from the Banking Academy of Vietnam.
Publisher: Innovative Research Publishing

1. Introduction

Artificial intelligence (AI) has moved from a peripheral innovation to a central issue in higher education. Recent scholarship shows that AI applications in education have expanded from intelligent tutoring systems and automated feedback to generative tools capable of producing extended text, explanation, and interaction at scale. At the same time, the

rapid uptake of large language models has intensified debate over academic integrity, data privacy, transparency, and the pedagogical conditions under which such tools can support meaningful learning rather than superficial task completion [1-3].

English for Specific Purposes (ESP) operates at the intersection of language education and discipline-specific communication, requiring authentic disciplinary content and alignment with professional genres. Although research on AI in higher education and general language education has examined automated feedback, adaptive learning, and language-support tools, comparatively less attention has been paid to AI integration in ESP courses, particularly in relation to disciplinary authenticity, genre specificity, and assessment validity [1, 4, 5]. This gap is important because core ESP principles, such as needs analysis, authenticity, and genre-task alignment, may be reshaped by AI use. A key question, therefore, is whether AI tools can accommodate disciplinary variation, support critical thinking, and maintain assessment validity in ESP contexts.

Vietnam provides a relevant context for examining these issues because higher education institutions are undergoing accelerated digital transformation, yet institutional readiness remains uneven. National policy has increasingly emphasized the use of digital technologies in education, but variation persists in infrastructure, teacher training, institutional support, and implementation capacity across universities. These constraints are especially significant in ESP settings, where effective teaching depends on access to current disciplinary materials, context-sensitive task design, and teachers' ability to integrate technology in pedagogically meaningful ways. In fields such as business, finance, and engineering, instructors may face additional challenges in sourcing up-to-date workplace-relevant materials and aligning technological tools with discipline-specific communication practices [6].

This study explores how AI is perceived and used in ESP pedagogy in Vietnamese universities, focusing on business, finance, and engineering faculties. The research addresses three questions: (1) How do lecturers and students evaluate AI's contributions to ESP learning and teaching? (2) What opportunities and challenges arise when integrating AI tools in ESP tasks and assessments? (3) What curricular, professional development, and institutional supports are required for ethical and effective adoption? Employing a mixed methods design, this investigation draws on survey data and semi-structured interviews to provide empirical insight into a context undergoing rapid digital transformation. The findings aim to contribute to theory by refining ESP frameworks to include AI literacy and to inform practice by recommending actionable pathways for teacher development, curriculum design, and policy alignment.

2. Literature Review

2.1. AI in Higher Education

Artificial intelligence has become one of the most visible technological forces reshaping higher education. Recent systematic reviews identify four dominant areas of application: intelligent tutoring systems, automated assessment and feedback, adaptive learning environments, and learning analytics [1, 7]. Intelligent tutoring systems simulate one-to-one instruction by analyzing learners' responses and adjusting the level of difficulty or type of scaffolding provided. Automated assessment systems, including AI-driven writing evaluators and exam-proctoring platforms, have attracted attention for their ability to deliver immediate, large-scale feedback [4]. Adaptive learning platforms, meanwhile, curate individualized pathways through content by combining predictive analytics with learner behavior data.

Despite their promise, AI systems in higher education have sparked intense debate. Scholars emphasize risks concerning authenticity and originality of work, especially with the rise of large language models [5]. Plagiarism and the potential erosion of academic integrity remain central concerns, as AI tools may generate fluent but inaccurate or fabricated outputs [2]. Ethical issues extend to algorithmic bias, transparency of decision-making, and data privacy. For example, recent scholarship suggests that while AI can broaden access to feedback and personalization, poorly designed systems may also reproduce inequities embedded in data, design, and implementation contexts [2, 8]. The literature therefore presents a dual narrative: AI holds transformative potential for personalization and efficiency, yet requires careful governance to safeguard academic standards and equity.

2.2. AI in Language Education

Language education has been a prominent domain for the pedagogical application of artificial intelligence (AI), particularly in EFL and ESL contexts. Research has examined how tools such as machine translation and automated writing feedback systems influence learner performance and learning processes. Early skepticism toward tools such as Google Translate has evolved into more balanced perspectives, with studies suggesting that machine translation can support language learning when used critically and integrated with pedagogical guidance [9, 10].

In writing instruction, AI-based automated feedback systems provide immediate and scalable support for revision, contributing to improvements in linguistic accuracy and writing quality [4]. More broadly, research indicates that AI-enhanced tools can increase access to feedback and promote learner autonomy, although their effectiveness depends on appropriate instructional design and critical use [1, 8].

These developments are particularly relevant to English for Specific Purposes (ESP), where learners must engage with discipline-specific discourse and authentic professional communication. While AI tools may enhance access to specialized input and targeted feedback, their integration also raises important questions regarding authenticity, disciplinary alignment, and the role of teacher mediation in ensuring meaningful learning.

2.3. ESP Pedagogy

English for Specific Purposes (ESP) is distinct from general English instruction in its emphasis on authentic disciplinary input, specialized genres, and workplace communication practices. Foundational theorists such as Hutchinson and Waters [11] and later Basturkmen [12] highlight needs analysis and alignment with professional communication as cornerstones of ESP course design. Authenticity is particularly valued: students preparing for careers in business, law, medicine, or engineering must engage with texts, discourses, and communicative situations that mirror those encountered in their target domains.

Contemporary ESP pedagogy faces several persistent challenges. First, sourcing authentic and up-to-date materials remains difficult, especially in fast-evolving fields such as finance and information technology. Teachers often rely on outdated textbooks or generalized materials that do not adequately reflect workplace realities. Second, teacher preparedness is a recurring issue. Many ESP instructors are trained primarily in general English and lack specialized knowledge of disciplinary discourse [13]. Third, assessment in ESP is frequently misaligned with professional communication tasks: standardized proficiency exams rarely capture the specific writing genres, oral presentations, or collaborative problem-solving skills demanded in professional contexts [14]. These challenges create space for technological innovation, but also highlight the importance of maintaining ESP's theoretical commitment to authenticity, needs analysis, and context-sensitivity.

2.4. Research Gap

Despite growing research on AI in higher education and language learning, empirical work connecting AI specifically to ESP pedagogy remains limited. Existing studies largely focus on general English learning, writing support, or vocabulary development, while giving less attention to how AI intersects with core ESP principles such as authenticity, needs-based design, genre awareness, and alignment with workplace communication. This gap is especially important in emerging higher education contexts, where institutional readiness, teacher preparedness, and technological access may shape AI adoption differently from more digitally mature settings. In Vietnam, universities are undergoing rapid digital transformation, yet uneven infrastructure and limited professional support continue to constrain implementation [6]. The present study addresses this gap by examining both the opportunities and the constraints of AI integration in ESP pedagogy in Vietnamese universities through a mixed-methods design.

3. Methods

3.1. Research Design

This study adopted a mixed-methods design, combining a quantitative survey of students with qualitative interviews of lecturers. Mixed-methods approaches are increasingly recognized in applied linguistics and educational technology for their ability to capture both breadth and depth of perspectives [15, 16]. The quantitative strand allowed for a systematic mapping of student experiences with artificial intelligence (AI) in English for Specific Purposes (ESP) courses, while the qualitative strand offered richer insights into teachers' perceptions, classroom practices, and institutional challenges. The integration of both strands was intended to provide triangulation and enhance the validity of findings [17].

3.2. Participants

Two groups of participants were recruited through purposive sampling. The first group comprised 212 undergraduate students enrolled in ESP courses across business, finance, and engineering faculties at three Vietnamese universities. Students represented second- and third-year cohorts, as these groups were considered to have sufficient exposure to both English learning and disciplinary content. The second group included 15 ESP lecturers drawn from the same institutions. These lecturers had between three and fifteen years of teaching experience, ensuring a range of perspectives on AI adoption and pedagogical practices. The selection of multiple institutions enhanced representativeness by capturing variation in digital readiness and institutional resources [6]. This sampling strategy was intended to capture variation across disciplinary ESP contexts while ensuring that both student and lecturer participants had relevant experience with technology-mediated teaching and learning.

Table 1.
Participant Profile.

Category	Subgroup	n	Percentage (%)
Students (n = 212)	Business	78	36.8
	Finance	64	30.2
	Engineering	70	33.0
	Year 2	108	50.9
	Year 3	104	49.1
Lecturers (n = 15)	Business/Finance	7	46.7
	Engineering	8	53.3
	3–7 years experience	6	40.0
	8–15 years experience	9	60.0

Note: Percentages are calculated within each participant group. The distribution reflects representation across disciplines and experience levels in the participating institutions.

3.3. Instruments

Data were collected through a student survey and semi-structured lecturer interviews.

Table 2.
Overview of Data Collection Instruments.

Instrument	Participants	Purpose	Format
Student Survey	Undergraduate students	Examine AI usage patterns, perceived benefits, and challenges in ESP learning	Structured questionnaire
Lecturer Interviews	15 ESP lecturers	Explore experiences, perceptions, and pedagogical implications of AI integration	Semi-structured interviews

Student survey: The survey comprised three sections. The first collected demographic information (discipline, year of study, prior experience with AI tools). The second contained 20 Likert-scale items (5-point scale) measuring frequency of AI use, perceived benefits (e.g., learning autonomy, efficiency), and challenges (e.g., reliability, plagiarism). The final section included two open-ended questions to capture nuanced reflections. The survey instrument was adapted from prior studies on AI use and language learning, then contextualized for ESP teaching and learning in Vietnamese higher education. It was designed to capture three domains central to the study: patterns of AI use, perceived pedagogical benefits, and perceived challenges or risks. Care was taken to ensure conceptual alignment between survey items and constructs identified in prior research.

Table 3.
Structure of the Student Survey Instrument.

Section	Content Description	Item Type	No. of Items
Section 1: Demographics	Discipline, year of study, prior experience with AI tools	Multiple-choice	—
Section 2: Core Measures	Frequency of AI use; perceived benefits (e.g., autonomy, efficiency); challenges (e.g., reliability, plagiarism)	5-point Likert scale	20
Section 3: Open-ended	Reflections on AI use in ESP learning	Open-ended questions	2

Note: Survey items were informed by prior research on AI use and language learning, then adapted to reflect ESP teaching and learning in Vietnamese higher education (Li, 2022).

Lecturer interviews: Semi-structured interviews were conducted with 15 lecturers, each lasting between 45 and 60 minutes. The interview guide focused on (a) observed patterns of AI use among students, (b) personal experiences of integrating AI into ESP teaching, (c) perceived opportunities and risks, and (d) recommendations for future curricular and policy support. Semi-structured formats were selected to allow comparability across participants while enabling elaboration of unique experiences [18].

Table 4.
Interview Protocol for Lecturer Participants.

Component	Description
Participants	15 ESP lecturers
Duration	45–60 minutes per interview
Interview Type	Semi-structured
Key Focus Areas	(1) Student AI usage patterns (2) AI integration in ESP teaching (3) Opportunities and risks (4) Pedagogical and policy recommendations
Rationale	Ensures comparability while allowing in-depth exploration of individual experiences

Note: The semi-structured format follows established qualitative research guidelines to balance consistency and flexibility.
Source: Bryman [18]

3.4. Data Analysis

The analysis was conducted in two stages.

- Quantitative analysis: Survey data were analyzed using descriptive statistics (frequencies, means, standard deviations) to establish patterns of AI adoption and perceived benefits. Responses to open-ended survey items were thematically coded and cross-checked against interview findings. Statistical procedures were performed using SPSS version 26. No inferential statistical analyses were conducted, as the quantitative strand was designed to provide descriptive insights into patterns of AI use and perception rather than to test causal relationships.
- Qualitative analysis: Interview transcripts were transcribed verbatim and analyzed thematically using NVivo 12 software. Following Bryman [18] six-step approach, codes were generated inductively and organized into themes reflecting opportunities, challenges, and pedagogical implications. Reliability was enhanced through researcher

triangulation: two researchers independently coded a subset of transcripts, achieving a Cohen's kappa of 0.82, which indicates strong agreement [19].

Integration occurred at the interpretation stage, where descriptive survey patterns were compared with recurrent qualitative themes in order to identify areas of convergence, divergence, and contextual explanation.

3.5. Ethical Considerations

Ethical principles guided all stages of this research. Participation was voluntary, and all respondents provided informed consent before data collection. Students and lecturers were assured of anonymity and the right to withdraw at any time. Institutional approval was obtained from the research ethics committees of the participating universities. Care was taken to avoid coercion by ensuring that course grades or evaluations were not linked to participation. These measures align with best practices for research ethics in applied linguistics and educational technology [20].

4. Findings

This section presents the major findings from the survey of 212 ESP students and the semi-structured interviews with 15 ESP lecturers. Results are organized into three overarching themes: (1) benefits of AI in ESP pedagogy, (2) challenges and concerns, and (3) patterns across groups. Illustrative quotes from interviewees are included to highlight salient perspectives.

4.1. Benefits of AI in ESP Pedagogy

4.1.1. Provision of Authentic Input

The data indicate that AI plays an important role in expanding access to authentic, discipline-specific input within ESP learning environments. As reported in Table 5 76% of students agreed that AI facilitates access to up-to-date and relevant materials, highlighting its effectiveness in addressing persistent limitations in sourcing current domain-specific content.

Supporting this quantitative evidence, qualitative findings reveal that students actively engage with specialized genres, including financial reports, technical documentation, and market analyses through AI-assisted tools. These practices reflect a meaningful shift toward increased exposure to authentic professional discourse, which is central to ESP pedagogy.

Table 5.
AI-Enabled Provision of Authentic Input in ESP Learning.

Dimension	Indicator / Item	Evidence Type	Agreement (%)	Interpretation
Authentic Input Access	AI enables access to up-to-date, discipline-specific materials	Survey (Students)	76	Students report enhanced access to current, industry-relevant input
Disciplinary Relevance	AI supports engagement with specialized genres (e.g., reports, technical documents)	Interview (Students)	—	AI facilitates interaction with authentic professional discourse
Instructional Design	AI assists lecturers in sourcing and integrating real-world materials	Interview (Lecturers)	—	AI streamlines material development and improves task authenticity
Material Accessibility	AI reduces barriers to accessing complex or hard-to-find texts	Interview (Students)	—	AI broadens access to technical resources in ESP contexts

Note: Percentages represent the proportion of the 212 student respondents selecting *Agree* or *Strongly Agree* on a 5-point Likert scale for the relevant item(s). Interview findings reflect recurring themes derived from qualitative analysis of student and lecturer responses.

From the instructional standpoint, lecturers emphasized that AI substantially reduces the time required to identify, adapt, and integrate real-world materials into teaching. This efficiency gain enables more consistent incorporation of authentic content, thereby strengthening the alignment between classroom activities and professional communication contexts.

Taken together, the findings suggest that AI enhances not only the accessibility but also the pedagogical relevance of ESP input. By broadening access to specialized discourse and streamlining material development, AI contributes to more contextually grounded and professionally oriented language learning. This interpretation is consistent with prior research underscoring the role of AI in facilitating access to domain-specific corpora and authentic materials in language education.

4.1.2. Personalized Learning Pathways and Instant Feedback

Table 6.
AI-Supported Personalized Learning and Instant Feedback in ESP.

Dimension	Indicator / Item	Evidence Type	Agreement (%)	Interpretation
Instant Feedback	AI provides immediate feedback on language use (grammar, vocabulary, style)	Survey (Students)	78	Students strongly value real-time feedback, which supports accuracy and iterative improvement in ESP writing
Writing Development	AI supports independent discipline-specific writing practice	Interview (Students)	—	AI enables autonomous practice and self-correction in domain-specific tasks
Personalization	AI adapts tasks to individual proficiency levels	Interview (Lecturers)	—	AI facilitates differentiated instruction in heterogeneous ESP classrooms
Instructional Support	AI complements limited teacher feedback in large classes	Interview (Lecturers)	—	AI enhances scalability by supporting pre-feedback and reducing teacher workload

Note: Percentages represent the proportion of the 212 student respondents selecting *Agree* or *Strongly Agree* on a 5-point Likert scale for the relevant item(s). Interview findings reflect recurring themes derived from qualitative analysis of student and lecturer responses.

The findings indicate that AI plays a substantive role in supporting personalized learning and feedback in ESP contexts. As shown in Table 6, 78% of students reported valuing the immediacy of AI-generated feedback on language use, suggesting that real-time correction is a key driver of perceived learning effectiveness. This aligns with the notion that timely feedback facilitates iterative learning and skill refinement, particularly in writing-intensive ESP tasks.

Qualitative evidence further contextualizes this result by demonstrating how AI tools are used to support independent, discipline-specific practice. Students reported engaging in self-directed writing activities and using AI to revise and improve their outputs without immediate teacher intervention. From the lecturers' perspective, AI was also recognized as a mechanism for addressing learner diversity, as it enables the adaptation of tasks to varying proficiency levels within large ESP classes. In such contexts, AI serves as a form of "pre-feedback," allowing students to self-correct before receiving instructor input.

Overall, the combined evidence suggests that AI enhances both the efficiency and scalability of feedback provision while promoting learner autonomy. However, these benefits are contingent upon appropriate pedagogical integration to ensure that AI-mediated feedback complements, rather than replaces, deeper instructional engagement.

4.1.3. Support for Learner Autonomy and Motivation

The findings demonstrate that AI integration significantly enhances learner autonomy and motivation in ESP contexts. As shown in Table 7 73% of students agreed that AI enables self-paced and independent learning, while 71% reported increased motivation to practice ESP tasks regularly. These results indicate a clear shift toward more learner-centered and self-directed learning approaches facilitated by AI.

Qualitative evidence further supports these patterns. Students reported using AI tools for authentic, discipline-specific activities such as listening to technical podcasts, generating transcriptions for note-taking, and completing self-directed exercises. In addition, AI features such as instant feedback, progress tracking, and automated scoring were found to play a key role in sustaining motivation. As one student noted, "AI tools make me practice more… I feel like I am competing with myself to improve," highlighting the motivational impact of gamified feedback mechanisms.

Table 7.
AI-Supported Learner Autonomy and Motivation in ESP Learning.

Dimension	Indicator / Survey Item	Agreement (%)	Interpretation
Learner Autonomy	AI enables self-paced and independent ESP practice	73	Students perceive AI as facilitating flexible, self-directed learning
Motivation	AI makes me more motivated to practice ESP tasks regularly	71	AI enhances learners' willingness to engage consistently with ESP activities
Learning Behaviors	Use of AI tools (e.g., transcription, podcasts, exercises)	—	Students actively use AI for authentic, domain-specific practice tasks
Gamification Features	Progress tracking and immediate feedback support engagement	—	AI-driven feedback and tracking mechanisms contribute to sustained motivation

Note: Percentages represent the proportion of the 212 student respondents selecting *Agree* or *Strongly Agree* on a 5-point Likert scale for the relevant item(s). Interview findings reflect recurring themes derived from qualitative analysis of student and lecturer responses.

Overall, the findings suggest that AI enhances both autonomy and engagement by enabling flexible, personalized, and feedback-rich learning environments. This aligns with prior research emphasizing the role of AI-supported tools in promoting feedback access, learner autonomy, and more individualized learning processes in language education [1, 8].

4.2. Challenges and Concerns

4.2.1. Reliability of AI-Generated Content

Despite generally positive perceptions of AI, concerns regarding the reliability and appropriateness of AI-generated content were consistently raised by both students and lecturers. A central issue concerned the accuracy of outputs in discipline-specific contexts such as business, finance, and engineering, where precision is essential. Several lecturers observed that AI systems can produce responses that appear fluent and plausible while still containing factual inaccuracies, oversimplifications, or contextually inappropriate information. From the student perspective, AI was often used to generate initial drafts or support comprehension; however, participants also expressed uncertainty about how far such outputs could be trusted. These findings point to a gap between usability and evaluative competence: students benefit from AI-assisted efficiency, yet may lack the disciplinary knowledge or critical literacy required to verify output quality. Taken together, the results suggest that while AI can support task completion and reduce workload, its use in ESP requires explicit guidance in verification, source evaluation, and domain-specific judgment. This interpretation is consistent with recent scholarship emphasizing the risks of factual inaccuracy and "hallucinated" content in generative AI systems [2, 5].

4.2.2. Ethical Concerns: Plagiarism, Over-Reliance, and Data Privacy

Ethical considerations emerged as a salient and recurrent theme across both quantitative and qualitative findings, highlighting critical risks associated with AI integration in ESP learning. As shown in Table 8, 41% of student respondents reported frequent reliance on AI-generated answers when completing academic tasks, indicating a meaningful level of dependence that may constrain deeper cognitive engagement. This pattern is consistent with lecturers' concerns regarding academic integrity, particularly the possibility that students may submit AI-assisted work without sufficient critical processing. Beyond over-reliance, lecturers also expressed concern about the implications of AI use for higher-order thinking, noting that the ease of accessing AI-generated responses may reduce students' engagement in core ESP-related cognitive processes such as analysis, evaluation, and discipline-specific reasoning. Data privacy was likewise identified as an area of uncertainty, with lecturers reporting limited awareness of how student inputs might be collected, stored, or used by commercial AI platforms. Taken together, the findings reveal a clear tension between the pedagogical affordances and ethical risks of AI. These concerns point to the need for explicit institutional policies, responsible AI use guidelines, and pedagogically grounded integration strategies.

Table 8.
Ethical Concerns Regarding AI Use in ESP Learning.

Dimension	Indicator / Item	Evidence Type	Agreement (%)	Interpretation
Over-reliance	Students report frequent reliance on AI-generated answers	Survey (Students)	41	Indicates a substantial dependence on AI that may limit deeper cognitive engagement
Academic Integrity	Risk of submitting AI-generated work without engagement	Interview (Lecturers)	—	Highlights concerns about reduced authenticity and ownership of learning
Critical Thinking	AI may reduce critical reasoning in ESP tasks	Interview (Lecturers)	—	Suggests potential weakening of higher-order cognitive processes
Data Privacy	Concerns about student data use by AI platforms	Interview (Lecturers)	—	Reflects uncertainty regarding ethical and legal dimensions of AI usage

Note: Percentages represent the proportion of the 212 student respondents selecting *Agree* or *Strongly Agree* on a 5-point Likert scale for the relevant item(s). Interview findings reflect recurring themes derived from qualitative analysis of student and lecturer responses.

4.2.3. Teachers' Digital Readiness and Lack of Professional Training

Lecturers consistently emphasized limited preparedness for integrating AI into ESP pedagogy. Many reported uncertainty about evaluating AI-generated materials, selecting appropriate tools, and designing tasks that balance AI support with critical engagement. Importantly, this concern was not framed as resistance to innovation, but rather as recognition that existing professional preparation in ESP had not adequately addressed AI-related pedagogical, ethical, or assessment issues. In this sense, teacher readiness emerged as a structural rather than merely individual challenge. The findings suggest that without targeted professional development, lecturers may either avoid AI altogether or incorporate it in uneven and pedagogically inconsistent ways. This interpretation aligns with research indicating that the educational value of AI depends not only on tool availability, but also on teachers' digital literacy, confidence, and institutional support [1, 8].

4.3. Patterns Across Groups

4.3.1. Students' Optimism

A clear cross-group pattern in the data is that students expressed a more optimistic orientation toward AI integration in ESP learning than lecturers. As presented in Table 9, 82% of respondents agreed that AI improves their learning outcomes, while 74% reported that AI makes ESP courses more interesting. In addition, approximately 78% perceived AI as supporting self-directed and flexible learning. Together, these findings indicate that students value AI primarily for its practical affordances, especially accessibility, convenience, responsiveness, and support for independent practice. This positive orientation contrasts with the more cautious stance observed among lecturers and

suggests a divergence in how the two groups interpret the pedagogical role of AI. Such a pattern is consistent with broader research suggesting that the pedagogical value of AI depends not only on tool availability, but also on how it is interpreted and integrated by educational stakeholders [1, 8].

Table 9.
Students' Perceptions of AI Integration in ESP Learning.

Dimension	Survey Item	Agreement (%)	Interpretation
Learning Effectiveness	AI improves my learning outcomes	82	Students perceive AI as enhancing comprehension and academic performance
Engagement	AI makes ESP courses more interesting	74	AI contributes to increased learner interest and classroom engagement
Autonomy	AI supports self-directed and flexible learning	78*	AI promotes learner autonomy and control over the learning process

Note: Percentages represent the proportion of the 212 student respondents selecting *Agree* or *Strongly Agree* on a 5-point Likert scale for the relevant item(s). Interview findings reflect recurring themes derived from qualitative analysis of student and lecturer responses.

4.3.2. Teachers' Concerns about Curriculum Misalignment

In contrast, lecturers highlighted structural and curricular misalignment. They worried that ESP curricula, traditionally focused on authentic texts and communicative tasks, were not designed to incorporate AI-generated materials. Some noted that current assessment practices did not adequately account for AI's influence, raising questions about fairness and validity. As one senior lecturer explained, *"Our curriculum is designed for textbooks and case studies. With AI, students bypass some steps, and our assessment no longer reflects their true ability."* These concerns resonate with broader findings that curriculum and assessment frameworks must evolve to accommodate AI, rather than treating it as an external disruption [2, 5].

4.3.3. Institutional Constraints

Lecturers also reported that institutional constraints, including limited infrastructure, unclear policy frameworks, and insufficient technical support, hampered effective AI adoption. In the absence of institutional guidelines, teachers were often left to rely on individual judgment when deciding whether and how AI could be used in assignments and classroom activities. This pattern suggests that AI integration in ESP is shaped not only by teacher beliefs or student attitudes, but also by broader institutional conditions that either enable or constrain pedagogical innovation.

4.4. Illustrative Quotes

The interview excerpts reinforce the central tension identified throughout the findings: AI is perceived as both pedagogically enabling and pedagogically disruptive. On the one hand, participants emphasized efficiency, authenticity of input, and increased learner motivation. On the other hand, they raised concerns about superficial engagement, over-reliance, and inadequate teacher preparation. These excerpts do not introduce entirely new themes; rather, they deepen the interpretation of earlier findings by showing how participants themselves understood the trade-offs of AI integration in ESP pedagogy. Collectively, the quotes suggest that AI should be viewed not as a neutral technological add-on, but as a development that reshapes classroom practices, assessment assumptions, and professional expectations within ESP.

5. Discussion and Implications

5.1. Discussion of Findings

This study contributes to current scholarship on AI in higher education by showing that its pedagogical value in ESP is both substantial and conditional. Across the dataset, AI was associated with benefits that are especially relevant to ESP, including expanded access to authentic disciplinary input, more personalized learning pathways, faster feedback, and greater learner autonomy. At the same time, these benefits were accompanied by concerns regarding reliability, over-reliance, academic integrity, data privacy, curriculum alignment, and teacher preparedness. The overall pattern therefore supports a balanced interpretation: AI can strengthen ESP pedagogy, but only when integrated through sound instructional design, critical literacy, and institutional guidance rather than treated as a stand-alone solution.

Yet, AI also emerges as a disruptive force. Concerns about plagiarism, over-reliance, data privacy, and the reliability of generated content mirror issues raised in the literature on generative AI in education [1, 8]. Teachers in this study highlighted a deeper disruption: the misalignment between ESP curricula, traditionally grounded in authentic human-produced texts, and AI-generated or AI-assisted content. This echoes Hyland and Hamp-Lyons [14] caution that assessment practices must evolve alongside changes in discourse practices.

A unique contribution of this study lies in its insights from Vietnam. The findings highlight three interrelated contextual dimensions: digital divide, institutional constraints, and cultural attitudes. The digital divide manifests in uneven access to infrastructure and training across universities, reflecting broader concerns about uneven institutional readiness for digital transformation in Vietnamese higher education [6]. Institutional constraints include a lack of clear policies and guidelines regarding AI use, leaving teachers to make ad hoc decisions. Cultural attitudes toward technology also shaped responses: while students expressed optimism and enthusiasm, teachers approached AI cautiously, reflecting generational differences in digital literacy and professional responsibility. These findings illustrate how the global discourse on AI is refracted through local sociocultural and institutional contexts.

5.2. Theoretical Implications

The findings suggest that existing ESP pedagogy frameworks should be extended to incorporate both digital literacies and AI literacy. Traditional ESP models emphasize needs analysis, authenticity, and alignment with workplace genres [12, 13] but these frameworks were developed in an era in which texts were primarily human-authored and classroom tasks were mediated largely through textbooks and teacher guidance. The increasing presence of AI tools challenges these assumptions by introducing new questions about authorship, mediation, evaluation, and the status of authenticity in AI-supported communication.

AI literacy, defined as the ability to critically evaluate, appropriately use, and ethically integrate AI systems into learning, must now be considered a core competence for ESP learners and teachers alike [21]. This shifts the theoretical focus from simply preparing learners to engage with authentic disciplinary genres to preparing them to evaluate and negotiate AI-mediated representations of those genres. Such a perspective broadens ESP's theoretical scope by linking it with digital literacies research, which stresses the importance of critical awareness, multimodality, and socio-technical contexts [22].

Moreover, the Vietnamese case suggests that theoretical frameworks must account for unequal technological readiness across institutions and regions. Global theories of ESP pedagogy need to be flexible enough to accommodate contexts where AI infrastructure and training are uneven, ensuring that pedagogy remains inclusive rather than exacerbating digital divides.

5.3. Pedagogical Implications

The pedagogical implications of these findings are multifaceted.

5.3.1. AI as Supplement, Not Replacement

First, AI should be integrated as a supplement to teacher guidance, not a replacement. Students valued AI feedback for speed and convenience, but teachers highlighted its limitations in ensuring accuracy and depth. This supports prior arguments that AI-related educational tools are most effective when embedded within teacher-guided pedagogical design and critical instructional support [8]. Pedagogical design should therefore encourage students to treat AI as a drafting or practice tool, followed by teacher feedback and peer discussion to ensure deeper learning.

5.3.2. Task Design for Critical Thinking

Second, task design must prioritize critical engagement rather than passive acceptance of AI outputs. For example, assignments could require students to compare AI-generated drafts with authentic texts or evaluate the reliability of AI-produced summaries. Such practices align with broader arguments that AI in education should be used to support critical engagement rather than merely surface-level task completion [2, 8]. In ESP contexts, this approach helps maintain the discipline-specific focus while leveraging AI affordances.

5.3.3. Teacher Training in AI Literacy

Third, professional development is essential. Many lecturers expressed limited confidence in integrating AI into ESP tasks. Training programs should focus not only on the technical use of AI tools but also on pedagogical strategies for integrating them responsibly. Similar initiatives in other contexts have demonstrated that teacher training in AI literacy enhances both confidence and classroom practice [8]. Without such programs, AI risks becoming either underutilized or misapplied, thereby diminishing its pedagogical value.

5.4. Policy Implications

At the policy level, the findings suggest that both universities and the Ministry of Education and Training (MOET) in Vietnam must take active roles.

5.4.1. Institutional Infrastructure and Guidelines

Universities should invest in digital infrastructure and develop clear institutional guidelines on acceptable AI use in coursework, assessment, and academic support. Such policies should balance innovation with academic integrity by clarifying when AI use is permitted, how it should be acknowledged, and which forms of use may compromise independent learning or assessment validity. In the absence of such guidance, lecturers may be left to rely on individual judgment, resulting in uneven practice across courses and institutions. These findings suggest that policy development must accompany technological adoption if AI is to be integrated responsibly, consistently, and pedagogically effectively in ESP education.

5.4.2. Professional Development Support

MOET and universities must also prioritize teacher professional development. Structured programs on AI literacy, curriculum integration, and assessment redesign should be introduced. These initiatives would align with MOET's digital transformation agenda and help standardize AI adoption across institutions.

5.4.3. Collaboration Between Academia and Industry

Finally, collaboration between academia and industry is crucial to ensure that AI integration in ESP reflects real workplace needs. Partnerships with sectors such as finance, business, and engineering can help design authentic tasks that

mirror professional uses of AI. This collaboration ensures that ESP remains responsive to evolving workplace communication practices in an AI-mediated economy.

5.5. Limitations

Several limitations should be acknowledged. First, the study was conducted in three Vietnamese universities and focused on business, finance, and engineering ESP contexts; accordingly, the findings should be interpreted as analytically informative rather than broadly generalizable. Second, much of the evidence is perception-based, relying on self-reported survey responses and interview accounts rather than direct classroom observation or performance measures. Third, the study offers descriptive and thematic insight into AI use in ESP, but does not test causal relationships between AI use and learning outcomes. Future research could strengthen this line of inquiry by combining perception data with classroom observation, document analysis, experimental task design, or longitudinal performance tracking.

5.6. Future Research Directions

The findings suggest several directions for further inquiry. First, longitudinal studies are needed to track how students' use of AI evolves over time and whether initial gains in autonomy and motivation translate into sustained improvements in ESP proficiency. Second, comparative studies should be conducted between ESP and general English contexts. Such research would clarify whether AI's benefits and risks differ in discipline-specific versus general language learning. Third, cross-national research involving emerging economies beyond Vietnam would provide insights into how institutional capacity, cultural attitudes, and policy frameworks shape AI integration. Comparative work with technologically advanced contexts would also highlight whether observed challenges—such as teacher readiness or curriculum misalignment—are universal or context-specific. Finally, future research should explore pedagogical experiments that integrate AI into ESP tasks in controlled ways. Studies could examine whether AI-supported critical evaluation tasks improve higher-order thinking, or whether AI-assisted feedback enhances genre awareness.

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