

ESP students' use of artificial intelligence-based applications in autonomous English learning: Perceived benefits and challenges

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Abstract

The development of AI has had a significant impact on language learning, including in the context of ESP. Through features like adaptive learning and conversational practice, AI applications empower learners to study autonomously. However, despite proven advantages for general English learners, studies focusing on ESP students' use of AI-based applications and related challenges in autonomous learning contexts remain limited. Furthermore, there is a lack of quantitative, systematic descriptive data on how ESP students use AI and the prevalence of the difficulties they encounter. Therefore, this study aims to investigate the extent to which ESP students use and perceive the benefits of AI-based applications in autonomous English learning and to identify the types and frequency of challenges they face. This study uses a quantitative descriptive method with a survey approach involving 163 students from four departments: Civil Engineering, Management, Communication Science, and Nursing. Data were collected through a structured questionnaire and semi-structured interviews. The questionnaire gathered information on the types of applications used, the frequency and duration of use, and students' perceptions of perceived benefits and challenges using a four-point Likert scale, while interviews were conducted to support and clarify the survey findings. Quantitative data were analysed using frequency, percentage, mean, and standard deviation, and qualitative data were used as confirmatory evidence. The findings show that ChatGPT was the most frequently used AI application (51.77%), and most students reported using AI one to two times per week (35%). Students generally perceive these tools as effective in facilitating comprehension and improving language skills, although challenges such as unstable internet connections, subscription costs, and contextual or technical limitations persist. Overall, the findings provide insights for developing more effective technology-integrated ESP learning strategies.

Keywords: artificial intelligence; autonomous learning; English language; ESP students

INTRODUCTION

English for Specific Purposes is an approach to teaching English that focuses on the communication needs of learners in specific academic or professional contexts. Salmani-Nodoushan (2020) stated that the development of ESP was driven by worldwide demands for English training tailored to professional contexts, influenced by global communication and rapid technological advancement. In recent years, ESP research has continued to evolve in response to disciplinary and professional demands in higher education (Basturkmen, 2022).

According to Hyland (2022) and Basturkmen (2025), modern ESP studies indicate that language teaching is becoming more focused on fostering the specific communicative competencies needed for success in both scholarly and vocational settings. This approach enables students to develop language skills relevant to their career needs, such as writing technical reports, understanding specialized terminology, and communicating effectively in the workplace. Fitria (2024) added that ESP learning has strategic value in preparing students to adapt to the international workplace, which demands cross-cultural communication skills. Thus, ESP serves not only as a linguistic tool but also as a means of improving students' professional competence in their respective fields. As various disciplines and professions develop, the need for students from multiple majors to master English skills relevant to their fields increases significantly. This condition requires a learning approach that

not only emphasises general language proficiency but also encourages independent learning so that students can adapt their language skills to the specific demands of their fields. In this context, there is a need for a learning model that is flexible, adaptive, and oriented towards the real needs of students in the professional field.

The concept of autonomous learning is one of the approaches that best suits these needs. The term 'autonomous' comes from the Greek words *auto*, meaning 'self,' and *nomos*, meaning 'rule'. Palfreyman (2021) stated that Holec's definition of learner autonomy centers on an individual's capacity to oversee their own educational process. Benson (2012) and Little (2016) emphasised that autonomous learning includes self-reflection, independent decision-making, and responsibility for the learning process. While early definitions of learner autonomy focused primarily on individual responsibility, later developments in the field have linked autonomy with self-regulated learning and digital learning environments (Murray, 2017; Teng, 2019). In this study, autonomous learning denotes the students' power to direct their own English language progress independently. This includes managing their tasks in formal and informal environments by leveraging the capabilities of AI-supported learning applications.

Murray (2017) also pointed out that as educational landscapes become more complex, the ability for students to manage their own learning journeys has become essential. This independence allows for a flexible approach where individuals can modify their strategies to meet specific goals. Within ESP frameworks, which demand specialized communication and disciplinary expertise, this flexibility is key, as it facilitates the seamless adoption of emerging technologies, such as AI-driven learning applications.

As technology advances, AI provides a more interactive, personalised, and adaptive learning experience tailored to individual needs. Applications such as Duolingo, Grammarly, and ChatGPT help students learn more flexibly by providing instant feedback, tailored material recommendations, and realistic conversation simulations (Wang et al., 2023; Al-Smadi et al., 2024). More recently, the emergence of generative AI tools such as ChatGPT has attracted significant attention in higher education due to its potential to support language learning and academic tasks (Kohnke et al., 2023).

In addition, AI also has great potential in supporting autonomous learning. Through its ability to tailor learning materials to users' abilities, AI technology encourages learners to be more independent in controlling their learning progress. Kristiawan et al. (2024) emphasised that AI-based technology not only improves learning efficiency but also builds students' confidence to experiment in the learning process without fear of making mistakes. Talla et al. (2023) also stated that AI-based learning plays an important role in expanding access to quality English language education through personalisation features, time flexibility, and cross-context learning opportunities. These characteristics are particularly relevant in higher education, where students are expected to manage their own learning processes more independently. In this context, a growing body of research highlights the transformative potential of artificial intelligence in supporting adaptive and personalised learning (Zawacki-richter et al., 2019; Holmes et al., 2022).

He et al. (2025) found that the use of AI in English language learning can improve speaking and writing skills, as well as provide a contextual learning experience for students from various academic backgrounds. Research by Kim and Sim (2024) reinforced these findings by showing that AI technology can increase students' self-efficacy and cognitive engagement, especially when used independently in an online learning context. In other words, AI is not just a technical tool, but also acts as a facilitator that encourages students' independence in learning and their reflective abilities regarding their learning process.

In the context of English for Specific Purposes, the application of artificial intelligence is becoming increasingly significant because AI can tailor learning to the specific communication needs of each field of study. Asrifan et al. (2025) and Erito (2023) emphasised that AI is capable of bridging the gap between students' academic needs and future professional demands by providing context-

based learning experiences. Through its adaptive features, AI can identify areas of technical terminology, adjust the level of difficulty of the material, and provide relevant feedback according to the needs of students from specific disciplines.

However, the effectiveness of AI in learning greatly depends on user readiness and the quality of its implementation. Kristiawan et al. (2024) emphasised that successful AI integration requires digital readiness from students and lecturers, while Romadhon (2025) highlighted the pedagogical challenges that arise when lecturers are unable to integrate technology into ESP learning design effectively. On the other hand, Syuhra et al. (2025) asserted that each learner has different learning styles and preferences, so a more adaptive and inclusive AI system is needed so that its benefits can be felt evenly.

Although various studies have proven the positive impact of artificial intelligence AI on motivation and learning efficiency in the context of general English (Wang et al., 2023; Al-Smadi et al., 2024), studies that specifically examine how ESP students with diverse academic backgrounds utilise AI-based applications independently are still limited. Most previous studies focused on improving learning outcomes, without examining how students actually use these applications to support autonomous learning, as well as the types and frequency of challenges they face. This gap indicates the need for more systematic research to map students' patterns of use, perceptions, and constraints in integrating AI into English language learning in the ESP context. Therefore, this study aims to investigate the extent to which ESP students utilise and perceive the benefits of AI-based applications in autonomous English language learning, as well as to identify the types and frequency of challenges they encounter during the process.

METHOD

This study employed a descriptive mixed-methods approach to investigate how ESP students leverage AI tools for autonomous learning. Following J. Creswell's (2018) The study's framework integrated quantitative survey data with qualitative insights to provide a holistic view of the subject. While the survey identified broad trends, such as application preferences and perceived utility, semi-structured interviews provided a nuanced exploration of individual learning strategies. This dual approach ensured both a statistical overview and a deep contextual understanding of AI's role in autonomous learning.

Respondents

Utilizing a purposive sampling approach, this research targeted students enrolled in ESP courses who actively use AI-based applications for autonomous learning. Following a pre-screening of 201 initial survey participants, a final group of 163 respondents was selected based on these specific criteria. These criteria include: (1) active students who are currently or have previously taken ESP courses; (2) students who independently use AI-based applications such as Grammarly, Duolingo, ChatGPT, or similar applications in the process of learning English. The participants represented a diverse range of academic backgrounds, comprising students from Nursing (53%), Communication Science (18%), Civil Engineering (15%), and Management (14%). While the sample showed a higher female representation (75%) than males (25%), this aligns with the actual gender distribution across the selected classes. In terms of semester level, most participants were in semester 3 (66%, $n = 108$), followed by semester 1 students (33%), while only (1%) were in semester 5. No participants were from semester 7, providing a focused insight into students' AI learning habits in the early to mid-stages of their university education. In the qualitative data stage, four participants from diverse academic departments were chosen for semi-structured interviews. Four distinct departments were included in the study to reflect the varied communication needs across different ESP academic fields. These participants were selected because they had all undergone ESP-related English training and passed the research pre-screening process. By focusing on these specific groups, the researcher ensured that the data gathered was pertinent to the ESP context and provided a reliable representation

of the students under investigation. These individuals satisfied the specific study requirements, enabling the collection of multifaceted viewpoints and the validation of numerical data through varied disciplinary insights.

Instruments

In alignment with the descriptive mixed-methods design, this study utilized two primary instruments: a questionnaire and semi-structured interviews. The quantitative data were gathered via a Google Forms-based questionnaire, which comprised closed-ended items and a four-point Likert scale. The closed-ended section was specifically aimed at documenting demographic profiles and usage patterns, including the types, frequency, and duration of AI tool integration in autonomous English language learning. Complementary to this, the Likert scale items assessed students' perceptions regarding learner autonomy, self-efficacy, and cognitive engagement. To ensure academic rigor, the questionnaire's constructs were adapted from Kim and Sim (2024) and contextualized for the ESP environment. Furthermore, the instrument underwent content validation through expert judgment by ELT specialists to verify its relevance and clarity.

Prior to the primary data analysis, the research instrument's quality was verified through rigorous validity and reliability assessments. To evaluate internal consistency, McDonald's Omega (ω) was employed, as it determines how effectively questionnaire items collectively measure a single construct (Revelle & Condon, 2019). The analysis yielded a coefficient of 0.821. Given that values exceeding 0.80 signify robust reliability, this result confirms the instrument's high internal consistency.

Furthermore, validity was tested using item–rest correlation, which assesses the relationship between individual items and the total scale score, excluding the item being tested. Following Field's (2019) criteria where values above 0.30 are deemed valid, the recorded range of 0.802 to 0.951 indicates exceptional validity. Ultimately, these metrics confirm that the questionnaire was a highly dependable and appropriate tool for investigating how ESP students utilize AI applications for autonomous language study.

To enrich the quantitative findings, semi-structured interviews were conducted to explore the qualitative dimensions of students' experiences with AI in autonomous English language learning. This instrument employed open-ended questions to investigate students' management strategies, the challenges encountered, and their respective solutions within the learning process. By adopting this qualitative approach, the study facilitated a deeper evaluation of AI integration, allowing for flexible, in-depth data collection that captured the participants' nuanced perspectives (Creswell, 2018).

Procedures

This study employed a hybrid approach to data collection, combining online questionnaires with in-class coordination. First, the researcher obtained permission from lecturers teaching ESP courses in the selected departments. After receiving permission, the researcher coordinated with the lecturers and student representatives to distribute the questionnaire link. At the beginning of the session, the researcher attended the class to provide technical instructions regarding the questionnaire distribution. Information about the purpose and benefits of the research, data confidentiality, and voluntary participation was provided in writing at the beginning of the online questionnaire. Before completing the main questionnaire, respondents were required to complete a pre-screening section to ensure they met the research criteria. Only data from respondents who met the criteria were included in the analysis. The completed questionnaire data were downloaded and prepared for descriptive statistical analysis.

In addition to the questionnaire, the researcher conducted semi-structured interviews with four respondents who met the research criteria and represented different departments. These interviews were conducted online with respondents who voluntarily agreed to participate. The purpose of these interviews was to gain deeper insights into students' experiences using AI-based applications for

autonomous English learning, including their learning strategies, challenges, and perceived benefits. The interview data were used to complement and enrich the quantitative findings. The overall data collection procedures followed systematic survey research steps, emphasizing clear procedures, ethical considerations, and effective communication with respondents (J. Creswell, 2018).

Data analysis

The quantitative data derived from the questionnaires were subjected to descriptive statistical analysis. This process involved data entry into statistical software, where the information was tabulated and categorized according to three indicators adapted from Kim and Sim's (2024) theoretical framework: (1) the utilization level of AI-based applications in autonomous English language learning, (2) perceived application effectiveness, and (3) the nature and frequency of encountered obstacles. Frequencies and percentages were calculated to discern general usage patterns, while the mean and standard deviation of Likert-scale items were computed to evaluate students' perceptions. These findings were illustrated through tables and graphs, supported by narrative descriptions to fulfill the research objectives.

Simultaneously, qualitative data from semi-structured interviews with four ESP students from different departments were used to support and clarify the quantitative findings, in line with mixed-method research procedures (Marwan et al., 2023). This method provided a systematic yet flexible framework for exploring participants' personal experiences, strategies, and challenges regarding AI integration. The analytical procedure included data familiarization through iterative reading, initial code generation, and the subsequent development and refinement of broader themes. These qualitative insights served to triangulate and enrich the quantitative results, providing a profound contextual understanding of students' journeys in autonomous English language learning.

RESULTS AND DISCUSSION

This section provides a detailed interpretation of the data gathered through questionnaires and semi-structured interviews, structured into distinct Results and Discussion components. This study aims to investigate the extent to which ESP students utilise and perceive the benefits of AI-based applications in autonomous English language learning, as well as to identify the types and frequency of challenges they encounter during the process. The Results portion offers a comprehensive look at the empirical findings, utilizing descriptive statistics to outline patterns of AI tool usage while integrating thematic insights from interviews to capture students' lived experiences and learning strategies. Subsequently, the Discussion section synthesizes these integrated findings by evaluating them against the research objectives and established theoretical frameworks. By comparing these outcomes with existing literature, the analysis clarifies how ESP students navigate AI-driven autonomous learning and situates the study's contributions within the broader academic landscape.

ESP students' use of AI-based applications for autonomous English learning

This section presents the findings related to the first research objective, which is examining the extent to which ESP students use AI-based applications in autonomous English learning. The investigation focuses on the kinds of AI tools that students choose, how often and in what ways they use them, and how they feel these apps help them learn on their own. To give a thorough picture of students' real practices and experiences, both quantitative and qualitative data are offered.

Table 1. Types of AI-based applications used

NO.	Name of Application	Percentage
1	ChatGPT	51.77%
2	Gemini	27.67%
3	Duolingo	9.87%
4	Grammarly	5.14%
5	Perplexity	1.57%
6	Claude AI	0.78%
7	Google AI Studio	0.40%
8	Microsoft Copilot	0.40%
9	Bing	0.40%
10	Memrise	0.40%
11	Bitu	0.40%
12	Dola	0.40%
13	Google Translate	0.40%
14	Cici AI	0.40%

Table 1 regarding AI tool preferences among ESP students reveals a significant lean toward Large Language Models. ChatGPT emerged as the primary resource, used by 51.77%, followed by Gemini at 27.67%. Adoption rates for specialized language tools were notably lower: Duolingo accounted for 9.87%, while Grammarly and Perplexity were used by only 5.14% and 1.57% of students, respectively. An additional 4% of respondents reported using various other tools, including Claude, Bing, and Google Translate, suggesting that while a variety of niche applications exist, student autonomy is currently dominated by a few flagship AI platforms.

The interview data confirm the dominant reliance on large language model-based applications. ChatGPT was consistently mentioned as the primary tool for autonomous learning by all four participants. A nursing student explained that she frequently uses ChatGPT *"to understand foreign terms and explain English material in simpler terms,"* indicating its role as a comprehension support tool. Similarly, a management student stated that AI tools such as GPT are preferred because they produce more accurate sentences than conventional translation tools. They noted that Google Translate often feels *"less valid"*.

Despite the fact that Grammarly and other such specialized tools were mentioned less frequently in the survey, the qualitative findings indicate that such applications are used strategically for specific purposes. One participant mentioned using Grammarly to ensure her writing was grammatically correct, especially when preparing academic assignments. Meanwhile, a civil engineering student reported regularly using Gemini and described its translation features as the most helpful function.

The interviews suggest that students often combine multiple AI platforms depending on their learning needs, even though the quantitative data show relatively low usage percentages for certain tools. As one communication studies student described, AI functions *"like a private tutor that is available 24/7"*, reflecting how large language models are perceived as flexible learning companions rather than merely tools.

Overall, the quantitative finding that ESP students' autonomous English learning is largely centered on conversational AI platforms, particularly ChatGPT, is strengthened by the qualitative evidence, while other tools are used more as complementary resources rather than as primary learning platforms.

The findings of this study suggest that ESP students employ AI-based applications in autonomous English language learning. Quantitatively, the majority of respondents utilise AI on a regular basis and tend to select platforms based on large language models such as ChatGPT and Gemini. These findings align with those reported by Wang et al. (2023), Al-Smadi et al. (2024), who assert that AI facilitates flexible and personalised learning. However, in contrast to the studies conducted by He et al. (2025) This study, which concentrates more on enhancing language skills through AI utilisation, this study underscores the practical application of AI in the context of ESP, particularly concerning its integration into students' autonomous learning processes across diverse academic disciplines. Therefore, this study considers not only the impact on learning outcomes, but also the students' actual usage experiences and learning habits.

Table 2. Frequency of AI-Based Application Use

NO.	Usage Frequency	Frequency	Percentage
1	Very often	39	24%
2	Often	51	31%
3	Sometimes	57	35%
4	Rarely (<1x/week)	16	10%

Analysis of usage frequency among the 163 participants for Table 2 indicates a strong trend toward regular AI integration in autonomous learning. The largest segment of respondents (35%, n=57) utilized AI applications "sometimes" (1–2 times weekly), followed closely by "often" (3–4 times weekly) at 31% (n=51). While daily usage was reported by nearly a quarter of the cohort (24%, n=39), only a marginal group (10%, n=16) rarely engaged with these tools less than once per week. These findings suggest that for the majority of ESP students, AI tools have become a consistent, albeit not always daily, component of their study routines.

According to the interview data, AI usage patterns are dictated by assignment schedules and material difficulty. Frequency ranged from *"two to three times a week"* for students in Nursing and Management to *"nearly every day"* for those in Civil Engineering. Furthermore, the time spent on these platforms varied significantly, with complex assignments requiring sessions longer than an hour. These findings illustrate that students do not follow a rigid schedule but instead incorporate AI as a versatile tool within their weekly academic activities.

Table 3. Descriptive Statistics of AI-Based Application Use and Perceived Benefits

No.	Factor	Statement	Mean	SD	Category
1	Usage	I use AI-based applications to support my independent English learning.	3.104	0.654	High
2		I use AI applications when I have difficulty understanding English learning materials.	3.135	0.681	High
3		AI applications are a regular part of my English learning activities.	2.828	0.690	Moderate
4		I frequently use AI applications to do English exercises or assignments outside the classroom.	2.939	0.654	Moderate
5		I use AI applications to evaluate my learning outcomes, such as grammar, vocabulary, or writing.	2.994	0.749	Moderate
6	Benefits	AI applications help me understand English learning materials more easily.	3.067	0.630	High
7		The suggestions or feedback provided by AI applications are accurate and useful.	2.834	0.641	Moderate
8		AI applications improve my reading, writing, speaking, or listening skills.	2.969	0.689	Moderate
9		The use of AI applications makes the English learning process more efficient.	3.006	0.643	Moderate
10		Overall, AI applications effectively support my English learning.	3.012	0.667	High

The results presented in Table 3 show ESP students' responses to the questionnaire items related to the use, effectiveness, and challenges of AI-based applications in autonomous English learning. For Factor 1, which focuses on students' use of AI-based applications to support autonomous learning. The mean scores were interpreted using three categories: low (1.00–2.00), moderate (2.01–3.00), and high (3.01–4.00). These categories were used to describe the level of respondents' agreement toward the statements. The highest mean score was found for the statement number 2, *"I use AI applications when I have difficulty understanding English learning materials"* ($M = 3.135$, $SD = 0.681$), while the lowest mean score was reported for number 3, *"AI applications are a regular part of my English learning activities"* ($M = 2.828$, $SD = 0.690$).

The interview findings strongly corroborate these results. Several participants explicitly described using AI to help them understand English materials. A nursing student explained that she uses AI when reading academic journals, stating that she uses it to *"explain the material in simpler terms"* so that she can better comprehend complex texts. Similarly, a civil engineering student said that AI helps her to translate and clarify difficult content, especially when classroom explanations are insufficient.

Participants' perceptions of AI as part of regular learning activities were also reflected in their narratives. Although the frequency varied, students described AI as being integrated into their academic routines. One management student stated that she uses AI for *"refining sentences and writing tasks"*, while a communication studies student described AI as *"like a private tutor who is available 24/7"*, indicating continuous accessibility and support.

In the context of ESP, the results of this study are also consistent with those of Basturkmen (2022), who emphasise that ESP continues to evolve to suit the needs of specific disciplines. In this study, students from nursing, civil engineering, management, and communication science employed artificial intelligence to comprehend technical terminology and academic contexts that are particular to their respective disciplines. This finding aligns with the perspectives of Holmes et al. (2022) and Zawacki et al. (2019), who contend that AI in higher education functions as an adaptive system capable of customising material to user requirements. Nevertheless, this study demonstrates that this

adaptive capability still requires students' digital literacy so that AI responses are appropriate to the context of their discipline.

Regarding Factor 2, which examines students' perceptions of the perceived benefits of AI-based applications, all items also fell into the high category, with mean scores ranging from 2.834 to 3.067. Statement number 6, "*AI applications help me understand English learning materials more easily*", obtained the highest mean ($M = 3.067$, $SD = 0.630$), indicating a generally positive perception of AI perceived benefits in supporting English learning.

This positive perception was also evident in the interviews. Participants consistently reported that AI simplified complex explanations and boosted their confidence in learning. One student noted that AI was "*very helpful in improving English*", particularly in speaking and comprehension practice. Another participant explained that AI enabled her to ask questions repeatedly until she had a full understanding, highlighting its role in facilitating self-paced learning. These qualitative insights serve to reinforce the statistical findings that ESP students perceive AI-based applications to be as effective tools in supporting autonomous English learning.

The results of the study indicate that ESP students employ AI applications to facilitate autonomous English learning. The findings demonstrate that students utilise a variety of AI tools, though only a small number of applications are employed with greater frequency. The majority of students surveyed reported regular use of AI-based applications, ranging from occasional to frequent use. Moreover, the results of the questionnaire demonstrate that students generally hold positive perceptions of the use and effectiveness of AI-based applications. It was found that students perceived AI tools as beneficial in supporting independent learning activities, enhancing comprehension of learning materials, and improving language skills, thereby increasing learning efficiency. The findings, when considered as a whole, demonstrate that AI-based applications play a significant role in the autonomous English learning practices of ESP students. This is reflected in their usage patterns and frequency of use, and the positive perceptions reported in the questionnaire data. The validity of these findings is further substantiated by interview data, wherein participants articulated that AI constitutes an indispensable facet of their academic pursuits, particularly in circumstances wherein challenges arise in the comprehension of course material or the successful completion of assigned tasks. It was observed by a number of students that AI assisted them in comprehending content with greater ease and enabled them to pose numerous inquiries until they attained a comprehensive understanding. Conversely, others have drawn parallels between the experience and that of utilising a private tutor. The findings of this study suggest that AI applications have the potential to play a significant role in supporting independent English language learning practices for ESP students.

From an autonomous learning perspective, these findings lend support to the theories of Palfreyman (2021), Benson (2012), and modern studies by Murray (2017) and Teng (2019), which affirm that digital technology can strengthen students' ability to control their own learning processes. This finding aligns with the conclusions of Kim and Sim's (2024) study, which demonstrated that the independent utilisation of AI can enhance students' sense of self-efficacy and promote cognitive engagement. In this study, students utilised AI when encountering difficulties in comprehending the subject matter, requesting clarifications, and pursuing elucidation until achieving complete understanding. It is evident that AI functions not only as a technical apparatus but also as a facilitator of autonomous learning. This autonomous learning process supports reflection and repetition.

The present study also found that the effectiveness of AI is greatly influenced by students' ability to formulate prompts appropriately. This extends the discourse on the significance of digital literacy and self-regulated learning in technology-based learning, as posited by Fathi (2022). This suggests that, despite the advantages offered by AI in terms of convenience and personalisation, its effective utilisation is contingent on the users' aptitude and proficiency in managing interactions with the system.

Challenges of ESP students encounter in using AI-based applications

This section presents the findings related to the second research objective, which explores the challenges faced by ESP students in using AI-based applications for autonomous English learning. The study emphasizes the kinds and prevalence of challenges that students have reported, such as those that are technical, economic, or usability-related. To give a better picture of how these difficulties affect students' learning experiences, qualitative insights are used to boost quantitative results.

Table 4. Challenges Encountered by ESP Students in Using AI-Based Applications

No.	Factor	Statement	Mean	SD	Category
1	Challenges	I often experience technical problems (errors, application crashes) when using AI applications.	2.411	0.799	Moderate
2		Unstable internet connections often hinder the use of AI applications.	2.914	0.670	Moderate
3		The subscription cost of AI applications becomes an obstacle in my learning process.	2.810	0.872	Moderate
4		AI applications sometimes provide responses that do not match my learning needs.	2.816	0.714	Moderate
5		The use of AI applications sometimes slows down my learning process because I need time to adapt to their features.	2.521	0.773	Moderate

As illustrated in Table 4, the subsequent section details the results of the study, which describe the challenges that ESP students encountered when using AI-based applications for autonomous English learning. The most prevalent issue, as indicated by the highest mean score ($M = 2.914$, $SD = 0.670$), was unstable internet connections, suggesting that students frequently encountered connectivity issues. This finding is strongly supported by the interview data. As asserted by a student of Civil Engineering, the primary impediment was attributed to *"poor signal or slow device"*. In contrast, a student of Communication Studies highlighted *"the significance of internet access,"* particularly in external locations, as a crucial factor in their academic pursuits. These responses serve to corroborate the notion that a lack of connectivity continues to represent a significant barrier.

AI subscription costs were also reported as a significant impediment ($M = 2.810$, $SD = 0.872$). Furthermore, the interview participants alluded to the limitations inherent in the free versions of the software. One student explained that certain features were inaccessible due to insufficient financial resources, and another expressed difficulty in affording paid features as a student. This phenomenon can be attributed to financial constraints that limit the optimal utilisation of AI tools.

Furthermore, a significant proportion of students reported that AI applications did not always align with their learning requirements ($M = 2.816$, $SD = 0.714$). This issue was reiterated in the interviews. It was posited by a nursing student that *"AI responses were not always appropriate within the context of nursing"*, thus necessitating further refinement. In addition, another participant noted that, on occasion, AI-generated responses might not be entirely accurate and therefore necessitate verification.

In addition to technical constraints, the process of adapting to AI application features was also identified as an obstacle that could slow down learning activities ($M = 2.521$; $SD = 0.773$). This assertion was corroborated during an interview with a Communication Science student, who emphasised that the efficacy of AI output is contingent on the user's proficiency in formulating instructions. The student further elucidated that the outcomes achieved are contingent on the manner in which the prompt is entered. These findings indicate the necessity for digital literacy and prompt-writing skills for students. Concurrently, technical issues such as system failures or errors manifested at a moderate level ($M = 2.411$; $SD = 0.799$). It was confirmed by Civil Engineering students that obstacles such as *"poor signal or slow devices"* were encountered, which ultimately resulted in practical difficulties being encountered in their independent learning.

The results, both quantitative and qualitative, indicate that, despite the active utilisation of AI-based applications by ESP students, challenges pertaining to internet stability, financial limitations, contextual accuracy, and technical usability persist. Nevertheless, these impediments do not hinder students from incorporating AI into their autonomous English learning practices.

With regard to the second objective of the study, which is to identify the types and frequency of challenges, the results demonstrate that the primary obstacles are unstable internet connections, limited paid features, and the irrelevance of AI responses to the context. These findings align with the conclusions of Kristiawan (2024), who underscores the significance of digital readiness in the integration of AI. Additionally, Romadhon (2025) highlights pedagogical challenges in applying AI in ESP classrooms. However, in contrast to Romadhon (2025), who places greater emphasis on lecturer readiness, this study identifies that technical barriers at the student level – including internet access and device limitations – exert a more substantial influence on their autonomous learning experience.

The findings indicate that AI has become an integral component of ESP students' autonomous English learning practices. Notwithstanding the constraints imposed by technical and financial factors, students continue to hold a favourable opinion of the efficacy of AI. These findings align with the conclusions of Kohnke et al. (2023), who assert that generative AI holds considerable potential for application in higher education, particularly in the domain of language learning. Consequently, this study makes a significant contribution to the development of technology-based ESP learning strategies and provides valuable insights into the opportunities and challenges associated with utilising AI to enhance the effectiveness of autonomous learning in higher education.

CONCLUSION

The present study investigated the extent to which ESP students use AI-based applications in autonomous English learning, and identified the challenges they encounter. The findings revealed that the majority of ESP students regularly use AI-based applications, particularly large language model-based platforms, to support understanding of learning materials and improve their language skills. It was generally perceived by students that AI was effective in facilitating autonomous learning activities. However, the study also found that students experienced several challenges, including unstable internet connections, subscription costs, and occasional technical or contextual limitations. Notwithstanding the obstacles referenced above, AI is still employed with great frequency and as a supportive tool in the autonomous English learning practices of ESP students.

This study provides practical implications for the development of technology-based ESP learning strategies, particularly in promoting autonomous learning through AI-supported tools. Nevertheless, the study has several limitations, including the limited number of interview participants and the focus on students from selected departments within one institutional context. Future research is recommended to involve a wider range of ESP contexts, larger qualitative samples, and comparative studies across institutions to gain deeper insights into how AI can be optimally integrated into autonomous English learning.

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