

ARTIFICIAL INTELLIGENCE IN ESP LEARNING: BENEFITS AND CHALLENGES PERCEIVED BY ELECTRICAL ENGINEERING STUDENTS

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ABSTRACT

Artificial Intelligence (AI) is increasingly used in English language learning, yet its value may differ across language skills and professional learning contexts. This study examined electrical engineering students' perceived benefits and challenges of using AI for English language learning at Sriwijaya State Polytechnic. A quantitative descriptive survey was conducted with 50 undergraduate students using a seven-item, five-point Likert-scale questionnaire covering speaking, writing, reading, listening, learning motivation, critical thinking, and literacy. The findings showed that reading received the strongest perceived benefit, with 70% of respondents agreeing that AI supported reading, followed by writing (54%) and speaking (50%). Perceptions were less decisive for motivation, where 46% agreed and 50% were neutral, and for listening, where only 32% agreed while 62% selected neutral. Students also reported important concerns: 64% agreed that excessive AI use could reduce critical thinking and 56% perceived a possible decline in literacy. These results suggest that AI is perceived as particularly useful for text-oriented English for Specific Purposes tasks, such as understanding technical texts and specialized vocabulary, while its value for oral and listening development is less certain. The study contributes a skill-specific perspective on AI-assisted English learning in vocational engineering education. English instructors, curriculum developers, and vocational institutions should therefore position AI as a scaffold for guided practice, source checking, feedback, and technical-text comprehension rather than as a substitute for independent reasoning. Because the findings are based on self-reported perceptions from one institution, they should not be interpreted as causal evidence of language-skill improvement.

Keywords: artificial intelligence, english for specific purposes, engineering students, vocational education, student perceptions.

INTRODUCTION

Artificial Intelligence (AI) has become an increasingly visible component of global education, supporting functions such as personalized learning, automated feedback, intelligent tutoring, content generation, and learning analytics. In higher education, these capabilities can expand access to learning support and provide students with immediate assistance beyond scheduled classroom time (Bernal Parraga et al., 2025; Chanda et al., 2025; Parab, 2020). At the same time, the rapid adoption of AI has generated concerns about academic integrity, overreliance, privacy, algorithmic bias, and the possibility that students may replace rather than extend their own cognitive work (Davar et al., 2025; Eden

et al., 2024). Consequently, the educational value of AI should be examined not only in terms of convenience or perceived effectiveness, but also in relation to the learning processes and risks that accompany its use.

In English language learning, AI-assisted tools have been used for conversational practice, automated writing feedback, translation, vocabulary support, adaptive reading, and speech-based activities. Existing research suggests that AI can support language learning through personalized assistance, immediate feedback, and repeated practice, although the benefits are not necessarily uniform across skills (Kaharuddin et al., 2024; Jantakoon et al., 2025; Klimova & Pikhart, 2025). AI-supported writing environments can help learners notice grammar, sentence structure, and vocabulary choices, while reading-oriented applications can explain unfamiliar vocabulary and simplify difficult texts (Chea & Xiao, 2024; Kaharuddin et al., 2024). Research on motivation also indicates potential benefits, but learners' responses may vary depending on familiarity with the technology, instructional design, and the extent to which AI use remains connected to meaningful learning tasks (Moybeka et al., 2023; Purnomo et al., 2025).

The relevance of AI becomes more specific in English for Specific Purposes (ESP), particularly for students in technical and engineering fields. Engineering students need English not only for general communication but also for reading technical manuals and datasheets, understanding specialized terminology, writing reports, and communicating technical information in academic and professional settings (Andayani, 2022; Kausar, 2025). In vocational education, these needs are closely linked to workplace preparation. For electrical engineering students, for example, the ability to interpret component specifications, safety instructions, technical documentation, and troubleshooting information can make reading and vocabulary support especially important. Therefore, the usefulness of AI in this context should be examined in relation to disciplinary language tasks rather than treated as a generic feature of English learning.

Previous research provides evidence of both benefits and limitations. Jantakoon et al. (2025) reported positive effects of AI-supported instruction on speaking and listening in their meta-analysis, while Kaharuddin et al. (2024) highlighted the role of AI-related support in English writing among Indonesian students. Chea and Xiao (2024) discussed the potential of AI-assisted tools for academic English reading while also warning about possible damage associated with overdependence. Bernal Parraga et al. (2025) emphasized personalized learning, whereas Moybeka et al. (2023) and Purnomo et al. (2025) examined motivational dimensions of AI use in English classrooms. Beyond language outcomes, Davar et al. (2025), Eden et al. (2024), and Vashishth et al. (2024) identified ethical, cognitive, and literacy-related challenges that require institutional and pedagogical attention.

Despite this growing literature, several gaps remain. Much of the existing research focuses on general university or language-learning populations, while vocational engineering students have received less attention. Studies also frequently discuss AI in broad terms or emphasize overall learning gains, with fewer studies comparing students' perceptions across the four macro language skills while simultaneously examining risks to critical thinking and literacy. Evidence is particularly limited for electrical engineering students at Sriwijaya State Polytechnic, whose English needs are shaped by the demands of ESP and technical communication. A context-specific descriptive profile is therefore needed to show where students perceive AI to be most useful, where they remain uncertain, and which risks they consider most serious.

The novelty of this study lies in its dual, skill-specific perspective. Rather than treating AI as uniformly beneficial or harmful, the study compares perceived benefits for speaking, writing, reading, listening, and learning motivation with perceived challenges related to critical thinking and literacy. This approach places students' perceptions within a vocational ESP context and provides a more differentiated basis for instructional decisions. Importantly, the study does not test causal learning gains; it describes how electrical engineering students evaluate AI-supported English learning based on their own experiences.

Accordingly, this study aims to examine the perceived benefits and challenges of AI use in English language learning among electrical engineering students at Sriwijaya State Polytechnic. It addresses two research questions: (1) What benefits do students perceive from using AI for speaking, writing, reading, listening, and motivation in English learning? and (2) What challenges do students perceive regarding the possible effects of AI use on critical thinking and literacy? The findings are expected to inform English instructors, ESP curriculum developers, and vocational education institutions seeking to integrate AI in ways that support technical English learning while preserving independent reasoning and active engagement.

METHODOLOGY

1. Research Design

This study employed a quantitative descriptive survey design to examine electrical engineering students' perceptions of the benefits and challenges of using AI for English language learning. A descriptive survey was appropriate because the research questions focused on the distribution of students' responses rather than on testing causal effects or statistical relationships. The term perceived benefits is used throughout the study to distinguish self-reported judgments from objectively measured language-skill gains (Creswell & Creswell, 2018).

The analysis was conducted at the item level using frequencies and percentages. Accordingly, the study provides a contextual profile of student perceptions and does not claim that AI caused improvement or decline in English proficiency, critical thinking, or literacy.

2. Participants and Sampling

The study was conducted at Sriwijaya State Polytechnic and involved 50 undergraduate students from the Electrical Engineering program. Participants were recruited from students who were accessible during the data-collection period and willing to complete the questionnaire; thus, the study used a non-probability volunteer/convenience sampling approach. This sampling strategy was considered appropriate for an exploratory descriptive survey intended to profile perceptions within a specific vocational program rather than to estimate population parameters. The sample size of 50 provided a practical basis for describing response patterns across the seven questionnaire items, but it was not intended to support inferential generalization to all electrical engineering students. Participants included male and female students, and their identities were kept confidential.

3. Instrument Development

Data were collected using a seven-item questionnaire developed from recurring themes in the literature reviewed for this study. Five items represented perceived benefits of AI for English learning: speaking, writing, reading, listening, and learning motivation (Bernal Parraga et al., 2025; Jantakoon et al., 2025; Kaharuddin et al., 2024; Moybeka et al., 2023). Two items represented perceived challenges: possible decreases in critical thinking and student literacy (Chea & Xiao, 2024; Davar et al., 2025; Vashishth et al., 2024). Each statement was rated on a five-point Likert scale ranging from Strongly Agree to Strongly Disagree. Because each domain was represented by a single item rather than a multi-item psychometric scale, the questionnaire was analyzed as seven descriptive perception indicators rather than as one internally consistent composite construct.

4. Data Collection Procedure

The questionnaire was distributed to the 50 participating electrical engineering students after they were informed about the purpose of the study and the confidentiality of their responses. Students completed the seven items by selecting one response on the five-point Likert scale. The questionnaire focused on their experiences and perceptions of AI use for English language learning rather than on performance testing. Participation was voluntary, and no personally identifying information was reported in the analysis.

5. Data Analysis

Questionnaire responses were analyzed descriptively using frequencies and percentages for each response category. For interpretive summaries, Strongly Agree and Agree were combined as cumulative agreement, while Neutral responses were reported separately because neutrality should not be treated as either a positive or negative judgment. Disagree and Strongly Disagree were also retained in the tables. No inferential statistical tests were conducted, and the results are interpreted as students' perceived benefits and challenges rather than as evidence of causal impact.

RESULTS AND DISCUSSION

Results

The results of this study describe electrical engineering students' perceptions of the benefits and challenges of using Artificial Intelligence (AI) in English language learning. Data obtained from 50 respondents were analyzed descriptively using frequencies and percentages to identify patterns across language skills, learning motivation, and potential academic risks. The findings are presented in two main categories. The first focuses on the perceived benefits of AI for speaking, writing, reading, listening, and motivation, while the second examines perceived challenges related to critical thinking and literacy. These results represent students' perceptions and should not be interpreted as direct evidence of measurable learning outcomes.

Table 1. Perceived Benefits of AI for English Learning

Perceived Benefit	Positive n (%)	Neutral n (%)	Negative n (%)
Improves Speaking	25 (50%)	20 (40%)	5 (10%)
Improves Writing	27 (54%)	19 (38%)	4 (8%)
Improves Reading	35 (70%)	11 (22%)	4 (8%)
Improves Listening	16 (32%)	31 (62%)	3 (6%)
Increases Motivation	23 (46%)	25 (50%)	2 (4%)

Table 1 shows that students' perceptions differed considerably across language skills. Reading received the strongest cumulative agreement, with 35 of 50 students (70%) selecting Agree or Strongly Agree. Writing followed with 27 students (54%), while speaking received positive responses from 25 students (50%). Motivation produced 23 positive responses (46%), whereas listening received the lowest cumulative agreement at 16 students (32%). These percentages describe perceived usefulness and should not be interpreted as measured improvement in language proficiency.

Neutral responses were also prominent. Forty percent of students were neutral about speaking, 38% about writing, 50% about motivation, and 62% about listening. Reading showed the clearest positive pattern, with only 22% neutral and 8% disagreeing

to some extent. The comparatively high neutrality for listening and motivation indicates that students' experiences with AI were not uniformly positive and that perceived usefulness may depend on the type of language task, the AI tools used, and the way those tools are integrated into learning activities.

Table 2. Perceived Challenges of AI Use in English Learning

Perceived Challenges	Category	Frequency	Percentages (%)
Decrease Critical Thinking	Strongly Agree	12	24
	Agree	20	40
	Neutral	14	28
	Disagree	4	8
	Strongly Disagree	0	0
Total		50	100
Decrease Student Literacy	Strongly Agree	8	16
	Agree	20	40
	Neutral	18	36
	Disagree	3	6
	Strongly Disagree	1	2
Total		50	100

Table 2 presents students' perceptions of two possible academic risks. A total of 32 students (64%) agreed or strongly agreed that excessive AI use could reduce critical thinking, while 14 students (28%) were neutral and 4 students (8%) disagreed. For student literacy, 28 respondents (56%) expressed agreement with the risk statement, 18 students (36%) were neutral, and 4 students (8%) disagreed to some extent. These results indicate substantial concern among participants, but they represent perceived risks rather than direct evidence that critical thinking or literacy had actually declined.

Discussion

The results show a skill-specific pattern rather than a uniformly positive perception of AI. Reading received the strongest agreement (70%), which is particularly meaningful in a vocational engineering context. Electrical engineering students regularly encounter technical manuals, component specifications, datasheets, safety instructions, and specialized vocabulary in English. AI tools can make such text-heavy tasks more manageable by providing instant explanations, translation support, vocabulary clarification, and simplified summaries. This interpretation is consistent with Chea and Xiao (2024), who describe the value of AI-assisted tools for academic English reading, and with Kausar (2025), who emphasizes the importance of specialized English for engineering study and professional communication. Thus, the high reading score may reflect a close match between the affordances of text-based AI tools and the immediate ESP needs of

engineering students. Because the questionnaire did not record specific AI applications or frequency of use, however, this explanation should be treated as a contextual interpretation rather than a directly tested mechanism.

Writing and speaking received more moderate positive responses, at 54% and 50% respectively. The writing result is plausible because many AI tools provide immediate feedback on grammar, sentence structure, vocabulary, and organization, which can assist students when drafting reports or other technical texts (Kaharuddin et al., 2024). Speaking, by contrast, depends not only on linguistic form but also on real-time interaction, turn-taking, pronunciation, pragmatic adjustment, and confidence. Although AI-based conversational systems can support oral practice, they cannot fully reproduce the social dynamics of human communication. Jantakoon et al. (2025) found overall benefits of AI-supported speaking and listening instruction, but the current survey suggests that students in this particular vocational context were more cautious about the perceived value of AI for oral communication than for reading.

Listening produced the highest level of uncertainty, with 62% of respondents selecting Neutral and only 32% expressing agreement. One possible explanation is that students may use AI more often for text-based tasks than for sustained audio practice, or that available speech systems do not always match the accents, speed, technical terminology, and communicative situations required in engineering contexts. The study did not collect tool-use logs, so this interpretation requires further investigation. Motivation showed a similar pattern of caution: 46% agreed that AI increased motivation, but 50% remained neutral. This suggests that access to AI does not automatically generate stronger motivation. Prior research indicates that motivational benefits depend on how AI is integrated, the relevance of the task, students' familiarity with the technology, and the degree of teacher guidance (Moybeka et al., 2023; Purnomo et al., 2025).

The perceived risks are equally important. Sixty-four percent of respondents agreed that AI use could reduce critical thinking, and 56% perceived a possible decline in literacy. These concerns are consistent with discussions of cognitive offloading and overreliance in AI-assisted education (Chea & Xiao, 2024; Davar et al., 2025; Vashishth et al., 2024). When students accept generated explanations, translations, summaries, or answers without checking evidence, they may reduce opportunities for independent analysis and language processing. Nevertheless, the present data do not demonstrate an actual decline in critical thinking or literacy; they show that students themselves recognize these risks. This distinction is important because the pedagogical problem is not AI use per se, but uncritical dependence on AI output.

For vocational ESP instruction, these findings support a balanced integration model. English instructors can use AI for technical-text comprehension, vocabulary support, guided drafting, and feedback while requiring students to verify terminology,

compare AI output with original sources, explain reasoning, and revise work independently. Curriculum developers can align AI-assisted tasks with authentic engineering communication, such as interpreting manuals, writing short technical reports, explaining troubleshooting procedures, and presenting laboratory findings. Vocational institutions should complement this curricular integration with AI-use guidelines, data-privacy awareness, and staff development so that AI functions as a teaching assistant rather than an intellectual replacement (Chanda et al., 2025; Parab, 2020). Theoretically, the skill-specific pattern in this study suggests that perceived usefulness of AI in ESP is task-dependent: students may value AI most when its affordances closely match disciplinary language demands, while remaining more uncertain when learning requires sustained human interaction or independent cognitive effort.

CONCLUSION

This study examined the perceived benefits and challenges of AI use in English language learning among electrical engineering students at Sriwijaya State Polytechnic. Reading emerged as the clearest perceived benefit, with 70% cumulative agreement, followed by writing (54%) and speaking (50%). Perceptions were less decisive for motivation, where 46% agreed and 50% were neutral, and especially for listening, where 62% selected Neutral. The most prominent perceived challenge was the possible reduction of critical thinking (64% agreement), followed by concern about declining student literacy (56%). These findings indicate that students do not view AI as equally useful across all English skills and that they simultaneously recognize important cognitive risks.

Theoretically, the study contributes to AI-assisted language learning and ESP by showing that perceived usefulness is skill- and task-dependent within a vocational engineering context. The strong response for reading suggests that AI may be perceived as most useful when it supports disciplinary literacy demands such as technical-text comprehension, terminology clarification, and information access. At the same time, the critical-thinking and literacy concerns reinforce the need to conceptualize AI as a scaffold that supports, rather than replaces, independent language processing and reasoning.

Practically, English instructors should combine AI-supported reading and writing assistance with source verification, reflective questioning, process-based assessment, and human interaction. Curriculum developers can integrate AI literacy into ESP outcomes by requiring students to evaluate generated content, justify technical terminology, and communicate engineering information independently. Vocational education institutions should establish clear guidelines for responsible AI use, provide teacher development, and protect data privacy and academic integrity. The study is limited by its single-institution setting, non-probability sample of 50

students, self-reported responses, and seven single-item indicators. Future research should use larger and more diverse samples, record the specific AI tools and frequency of use, employ validated multi-item measures, and combine perception data with direct assessments of English proficiency, critical thinking, and literacy.

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