

Generative AI in English Language Education: A PRISMA-Based Systematic Review and Implications for Technical English in Malaysian Polytechnics

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ABSTRACT

The rapid advancement of Generative Artificial Intelligence (GenAI) has created new opportunities for enhancing teaching and learning across educational contexts, including English language education. Tools such as ChatGPT, Gemini, Copilot, and NotebookLM have demonstrated considerable potential in supporting writing development, personalised learning, communication practice, and learner engagement. Despite growing interest in GenAI, limited research has specifically examined its implications for Technical English education within Malaysian Technical and Vocational Education and Training (TVET) institutions, particularly Malaysian Polytechnics. This study aims to synthesise current evidence regarding the applications, benefits, and challenges of GenAI in English language education and explore its potential relevance to Technical English instruction in Malaysian Polytechnics. Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework, a systematic review was conducted using studies published between 2021 and 2026. Relevant literature was retrieved from Scopus, Web of Science, ERIC, ScienceDirect, and Google Scholar. Following screening and eligibility procedures, 15 studies were included in the final synthesis. The findings revealed five major themes: academic and technical writing enhancement; personalised learning and learner autonomy; communication skills and vocational English development; learner engagement and motivation; and ethical, pedagogical, and institutional challenges. The review highlights the potential of GenAI to support Technical English learning while emphasising the importance of responsible implementation, AI literacy, and institutional preparedness. The findings provide useful insights for educators, curriculum developers, and policymakers seeking to integrate GenAI into Technical English education within Malaysian Polytechnics.

Keywords: Generative Artificial Intelligence, Technical English, Malaysian Polytechnic, TVET, English language education, PRISMA, systematic review

INTRODUCTION

The emergence of Generative Artificial Intelligence (GenAI) has significantly transformed educational practices worldwide. Recent developments in large language models and AI-powered tools, such as ChatGPT, Gemini, Copilot, and NotebookLM, have expanded opportunities for personalised learning, automated feedback, content generation, and learner support. In English language education, these technologies are increasingly being used to facilitate writing development, language practice, communication skills, and learner engagement (Chan & Hu, 2023; Crompton & Burke, 2023).

The growing adoption of GenAI is particularly relevant to Technical and Vocational Education and Training (TVET), where students are expected to develop both technical competencies and effective communication skills. Within Malaysian Polytechnics, Technical English courses play an important role in preparing students for workplace communication, technical report writing, presentations, meetings, and industry-related interactions. However, many students continue to face challenges in using English confidently and accurately, particularly when communicating technical information. Differences in language proficiency levels, limited

opportunities for authentic language practice, and communication anxiety may further affect students' learning experiences and performance.

Recent studies suggest that GenAI may help address some of these challenges by providing immediate feedback, personalised support, and opportunities for self-directed learning (Kohnke et al., 2025; Li et al., 2025). AI-powered tools can assist learners in generating ideas, improving writing quality, practising communication skills, and accessing learning support beyond the classroom. Nevertheless, the increasing use of GenAI has also raised concerns regarding academic integrity, over-reliance on AI-generated content, data privacy, and the readiness of educators and institutions to integrate these technologies effectively (Bond et al., 2024; Huang & Yan, 2025).

Although research on Generative Artificial Intelligence has expanded rapidly in recent years, relatively few studies have specifically examined its application in Technical English education or within Malaysian TVET institutions. Most existing studies have been conducted in general ESL, EFL, or higher education contexts. Nevertheless, many of the language-learning outcomes investigated in these studies, including writing proficiency, communication skills, learner autonomy, and learner engagement, are closely aligned with the objectives of Technical English courses offered at Malaysian Polytechnics. Given the important role of Technical English in preparing students for workplace communication and industry-related interactions, there is a need to synthesise current evidence on the educational applications of GenAI and examine its potential implications for this context. Therefore, this systematic review aims to synthesise existing research on the applications, benefits, and challenges of GenAI in English language education and explore how these findings may inform Technical English teaching and learning within Malaysian Polytechnics. Specifically, the review seeks to answer the following research questions:

1. How is GenAI currently being utilised in English language education?
2. What benefits do GenAI offer for language learning and teaching?
3. What challenges and concerns are associated with the use of GenAI in educational contexts?
4. What implications do the findings have for Technical English education within Malaysian Polytechnics?

LITERATURE REVIEW

Generative Artificial Intelligence refers to a category of artificial intelligence systems capable of producing human-like content, including text, images, audio, and other digital outputs. The emergence of large language models has accelerated the integration of GenAI into educational settings, enabling learners and educators to access sophisticated language-support tools previously unavailable. According to Crompton and Burke (2023), the rapid advancement of AI technologies has created new possibilities for enhancing teaching, learning, and assessment across higher education contexts.

Within English language education, GenAI has gained considerable attention due to its ability to support language development and facilitate personalised learning experiences. Research suggests that AI-powered tools can assist learners in generating ideas, improving writing quality, receiving immediate feedback, and practising language skills independently (Chan & Hu, 2023). Kohnke et al. (2025) further reported that GenAI has the potential to promote learner autonomy by providing adaptive support tailored to individual learning needs. Such features are particularly valuable in language learning environments where students often require additional guidance outside formal classroom hours.

One area where GenAI appears especially promising is academic writing. Several studies have found that tools such as ChatGPT can support learners in organising ideas, improving grammatical accuracy, and refining written expression (Alsaedi, 2024; Kim et al., 2024). Escalante et al. (2023) observed that AI-generated feedback can facilitate revision processes and help students improve the overall quality of their writing. These findings suggest that GenAI may be particularly useful in Technical English contexts, where students are

frequently required to produce reports, procedural descriptions, workplace correspondence, and other forms of technical documentation.

In addition to providing writing support, GenAI has demonstrated potential to enhance communication skills and learner engagement. Conversational AI tools and chatbots provide learners with opportunities to practise language in interactive environments and receive immediate responses, thereby creating more authentic communication experiences (Labadze et al., 2023). Karataş et al. (2024) reported that AI-assisted communication activities can increase learners' confidence and willingness to participate in language learning tasks. Such opportunities may be particularly beneficial for TVET students who need to develop workplace communication skills and professional interaction strategies.

Despite these benefits, researchers have also highlighted several challenges associated with GenAI integration. Concerns regarding academic integrity, plagiarism, over-reliance on AI-generated content, and the reliability of AI outputs have been widely discussed in the literature (Bond et al., 2024; Huang & Yan, 2025). Furthermore, the successful implementation of GenAI requires both educators and learners to possess sufficient AI literacy and critical evaluation skills. Without appropriate guidance and institutional support, the educational benefits of GenAI may be undermined by misuse or overreliance on technology.

Overall, the existing literature suggests that GenAI offers considerable potential to enhance language learning and teaching. However, the limited number of studies focusing specifically on Technical English and Malaysian TVET contexts highlights the need for further investigation. A systematic synthesis of current evidence is therefore necessary to better understand how GenAI can support Technical English education and inform future implementation within Malaysian Polytechnics.

Overall, the literature indicates that Generative Artificial Intelligence offers considerable potential to support language learning through writing assistance, personalised learning, communication practice, and increased learner engagement. At the same time, concerns relating to academic integrity, AI literacy, and responsible implementation remain significant challenges. While most existing studies have focused on general English language learning in higher education settings, the language skills investigated are also fundamental components of Technical English education. Consequently, synthesising findings from the broader literature provides a valuable foundation for understanding how GenAI can be integrated into Technical English classrooms and supports exploration of its potential relevance in Malaysian Polytechnics and TVET contexts. Therefore, a systematic review is needed to consolidate current evidence on the applications, benefits, and challenges of GenAI and to examine its implications for Technical English education within Malaysian Polytechnics.

METHODOLOGY

Research Design

This study employed a systematic review methodology guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework. PRISMA provides a transparent and rigorous approach for identifying, screening, evaluating, and synthesising relevant literature, thereby enhancing the reliability and replicability of review findings (Page et al., 2021).

A systematic review approach was considered appropriate because the study aimed to synthesise existing evidence regarding the applications, benefits, and challenges of Generative Artificial Intelligence (GenAI) in Technical English and vocational English education. Given the rapidly expanding body of literature on GenAI in education, a systematic review enables a comprehensive, structured examination of current knowledge and the identification of gaps for future research.

Search Strategy

A comprehensive literature search was conducted across five major academic databases:

- Scopus
- Web of Science
- ERIC
- ScienceDirect
- Google Scholar

The search focused on studies published between January 2021 and March 2026. This timeframe was selected because the emergence of large language models and Generative AI tools accelerated significantly after 2021, particularly following the public release of ChatGPT in late 2022.

The search strategy employed Boolean operators and keyword combinations related to Generative AI, English language learning, Technical English, and vocational education.

The primary search string was:

("Generative AI" OR "ChatGPT" OR "Large Language Model" OR "LLM" OR "NotebookLM" OR "Google Gemini" OR "Microsoft Copilot")

AND

("Technical English" OR "English for Specific Purposes" OR "ESP" OR "Vocational English" OR "English Language Learning")

AND

("TVET" OR "Polytechnic" OR "Vocational Education" OR "Higher Education")

To ensure comprehensive coverage, additional searches were conducted using alternative keyword combinations such as:

"AI in English Language Teaching"

"Generative AI and Academic Writing"

"ChatGPT in EFL"

"AI-assisted Writing"

"AI in Vocational Education"

Reference lists of selected studies were also manually examined to identify additional relevant publications.

Eligibility Criteria

The eligibility criteria were developed based on the study objectives and research questions.

Inclusion Criteria

Studies were included if they:

1. Focused on Generative AI or Large Language Models in education;
2. Examined English language learning, English language teaching, ESP, Technical English, or vocational English;
3. Involved higher education, TVET, polytechnic, or vocational education contexts;
4. Reported empirical findings or systematic review findings;
5. Were published in peer-reviewed journals or referred conference proceedings;
6. Were published in English between 2021 and 2026.

Exclusion Criteria

Studies were excluded if they:

1. Focused on AI applications unrelated to education;
2. Examined AI in non-language disciplines without English language learning implications;
3. Were editorials, opinion papers, book reviews, or news articles?
4. Were duplicate publications.
5. Lacked sufficient methodological information;
6. Originated from questionable or predatory publication sources.

Study Selection Process

The study selection process followed the four stages recommended by PRISMA 2020:

Identification

The initial database search yielded 312 records. These records were exported and compiled into a single database for screening.

Screening

Following the removal of 64 duplicate records, 248 studies remained. Titles and abstracts were reviewed to determine relevance to Generative AI, English language learning, and vocational or higher education contexts.

At this stage, 170 records were excluded because they:

- focused on non-language subjects,
- discussed general AI without educational application,
- lacked relevance to English language teaching and learning.

Eligibility

Seventy-eight full-text articles were retrieved and assessed against the inclusion and exclusion criteria.

Thirty-six articles were excluded due to:

- insufficient relevance to English language learning,

- inadequate methodological reporting,
- lack of empirical evidence,
- duplication of findings reported elsewhere.

Inclusion

A final total of 42 studies met the eligibility criteria and were included in the systematic review.

PRISMA Flow of Studies

The PRISMA screening process is summarised in Figure 1.

Stage	Number of Records
Records identified through database searching	312
Duplicate records removed	64
Records screened	248
Records excluded	170
Full-text articles assessed for eligibility	78
Full-text articles excluded	36
Studies included in the final synthesis	42

Figure 1: PRISMA 2020 Flow Diagram of Study Selection

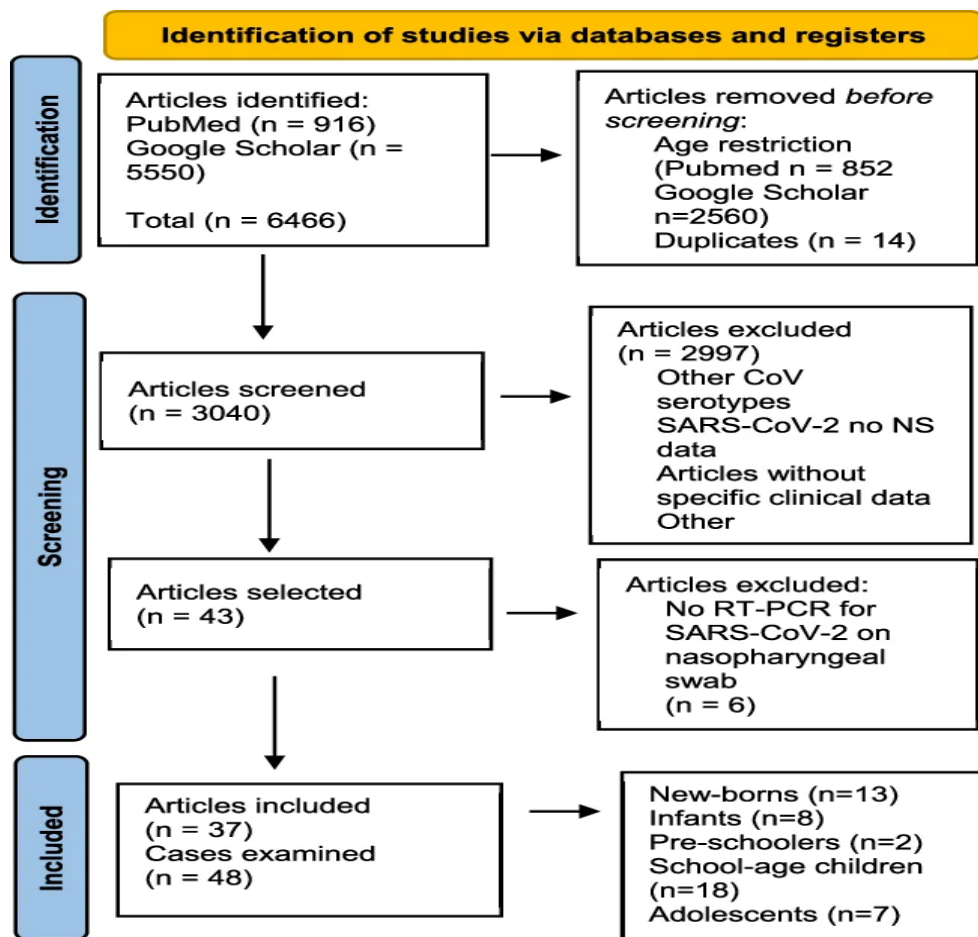


Figure 2 : PRISMA 2020 Flow Diagram

PRISMA 2020 flow diagram for new systematic reviews, which included searches of databases and registers only. From Page et al. (1). For more information, visit <http://www.prisma-statement.org/>. 1. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021 Mar 29; n71.

Quality Appraisal

To enhance the credibility and trustworthiness of the review findings, the methodological quality of the included studies was systematically evaluated using the Mixed Methods Appraisal Tool (MMAT) 2018. The MMAT was selected because it is specifically designed to assess studies employing diverse research methodologies, making it particularly suitable for this review, which included qualitative, quantitative, mixed-method, and review-based studies. The use of a single appraisal framework enabled consistent evaluation of methodological quality across studies with different research designs.

The appraisal process focused on several key aspects of research quality, including the clarity and relevance of the research objectives, the appropriateness of the research design for addressing the study aims, the adequacy of data collection procedures, the transparency of data analysis, and the validity of the researchers' conclusions. Particular attention was given to whether the studies provided sufficient methodological detail and demonstrated a clear alignment between their research questions, methods, and findings.

The quality appraisal process played a critical role in ensuring the robustness of the review. By systematically evaluating methodological strengths and weaknesses, the review minimised the inclusion of low-quality evidence and enhanced the reliability of the resulting synthesis. Only studies that demonstrated acceptable methodological rigour and direct relevance to the research questions were retained for analysis. Consequently, the findings presented in this review are grounded in evidence that meets recognised standards of scholarly quality and contribute meaningfully to current understanding of Generative AI in Technical English and TVET education.

Data Extraction

A standardised data extraction matrix was used to ensure consistency across the selected studies. Information extracted included publication details, educational context, participants, GenAI tools, research design, key findings, limitations, and relevance to Technical English and TVET education. The extracted data were compiled into an evidence matrix (Table 1), which formed the basis for the subsequent thematic synthesis and analysis.

Data Synthesis

The selected studies were analysed using thematic synthesis as proposed by Thomas and Harden (2008). The process involved three stages. First, key findings from the included studies were coded line-by-line to identify recurring concepts related to the use of Generative Artificial Intelligence (GenAI) in English language education. Second, similar codes were grouped into descriptive categories based on shared meanings and patterns across the studies. Finally, the descriptive categories were further synthesised into higher-order analytical themes that captured the major applications, benefits, and challenges of GenAI in language learning and teaching. This process resulted in five overarching themes: (1) GenAI for Academic and Technical Writing Enhancement, (2) Personalised Learning and Learner Autonomy, (3) Communication Skills and Vocational English Development, (4) Learner Engagement and Motivation, and (5) Ethical, Pedagogical, and Institutional Challenges.

Stage	Description
Stage 1	Coding of key findings from included studies
Stage 2	Grouping codes into descriptive categories
Stage 3	Synthesising categories into analytical themes

Figure 3 : Thematic Synthesis Proposed by Thomas and Harden (2008).

FINDINGS AND DISCUSSION

Although relatively few studies have focused specifically on Technical English education within Malaysian polytechnics, the reviewed literature offers valuable insights that can inform this context. Across the selected studies, researchers examined language learning outcomes that closely align with the objectives of Technical English courses, including writing development, communication skills, learner autonomy, and learner engagement. Consequently, findings from broader English language education contexts provide a useful foundation for understanding how Generative Artificial Intelligence (GenAI) may support Technical English teaching and learning within Malaysian TVET institutions.

The PRISMA screening process resulted in the inclusion of 15 studies for the final synthesis. These studies were conducted across higher education, ESL/EFL, and vocational education contexts and investigated various applications of GenAI in language learning and teaching. The characteristics of the included studies are presented in Table 1.

Characteristics of Included Studies

Insert Table 1 here

Table 1. Final Evidence Matrix of Included Studies:

No.	Author (s)	Context	GenAI Tool / Focus	Research Design	Key Findings	Relevance to Technical English in Malaysian Politekniks
1	Chan and Hu	Higher education	ChatGPT and GenAI	Empirical study	Students perceived GenAI positively for writing support, idea generation, and language learning assistance.	Supports AI-assisted writing and content organisation in Technical English tasks.
2	Escalante et al.	Higher education writing contexts	AI-assisted feedback	Empirical study	Immediate AI-generated feedback improved writing revision and learner confidence.	Relevant for technical reports, procedural writing, and workplace documentation.
3	Karataş et al.	Foreign language learning	ChatGPT	Experimental study	ChatGPT enhanced communication practice and learner confidence but raised ethical concerns.	Applicable to oral presentations and workplace communication in Technical English.
4	Kim et al.	Academic writing	GenAI writing tools	Qualitative study	Students valued AI support for organisation, coherence, and revision.	Directly relevant to technical writing and report preparation.
5	Kohnke et al.	English language learning	GenAI tools	Mixed-method study	GenAI promoted personalised learning and learner autonomy.	Useful for supporting students with diverse English proficiency levels.
6	Huang and Yan	ESL/EFL education	GenAI in language learning	Review study	Highlighted opportunities, challenges, ethics, and future directions of GenAI	Important for policy and implementation discussions in Malaysian

					integration.	Politekniks.
7	Li et al.	Language learning and teaching	GenAI innovations	Systematic review	Identified emerging applications of GenAI in language education.	Provides broad evidence supporting GenAI adoption in Technical English.
8	Alpar	English writing classrooms	ChatGPT, Gemini, Copilot	Comparative study	GenAI tools improved writing quality and language accuracy.	Relevant for technical reports and procedural writing tasks.
9	Alsaedi	ESL/EFL writing	ChatGPT	Systematic review	ChatGPT enhanced grammar, vocabulary, and idea development while raising ethical concerns.	Useful for discussing both benefits and risks in Technical English writing.
10	Qu and Wu	English learning	ChatGPT	Quantitative study	Motivation and perceived usefulness influenced AI adoption.	Supports discussion using the Technology Acceptance Model (TAM).
11	Chan and Lee	Higher education	ChatGPT	Survey study	Students demonstrated stronger readiness to adopt GenAI than educators.	Relevant to lecturer readiness and student acceptance in Polytechnics.
12	Labadze et al.	Education	AI chatbots	Systematic review	Chatbots enhanced engagement, interaction, and feedback.	Relevant for simulated workplace communication and speaking practice.
13	Bond et al.	Higher education	AI and GenAI	Meta-systematic review	Emphasised ethics, collaboration, and research rigour in AI-enhanced education.	Supports recommendations for responsible AI implementation.
14	Crompton and Burke	Higher education	Artificial intelligence	Review study	Mapped developments, opportunities, and gaps in AI use in higher education.	Provides contextual background for AI adoption in TVET institutions.
15	Sharadgah and Sa'di	English language teaching and learning	Artificial intelligence	Systematic review	Reported growing AI integration in ELT while identifying limitations and research gaps.	Serves as foundational evidence for AI use in English language education.

Table 1 presents the characteristics of the 15 studies included in the final synthesis. The selected studies were conducted across higher education, ESL/EFL, and vocational education contexts, with most focusing on the use of Generative AI tools such as ChatGPT, Gemini, Copilot, and AI-powered chatbots. The studies employed diverse research designs, including empirical investigations, surveys, experimental studies, and

systematic reviews. Collectively, the evidence highlights the growing interest in GenAI as a tool for supporting language learning, academic writing, learner engagement, and personalised learning.

Thematic Synthesis of Findings

Following the analysis of the included studies, a thematic synthesis was conducted using the approach proposed by Thomas and Harden (2008). The synthesis revealed five major themes that reflect the current applications, benefits, and challenges of Generative Artificial Intelligence in English language education. These themes provide a structured understanding of how GenAI is being utilised to support language learning and offer valuable insights into its potential implications for Technical English education within Malaysian polytechnic settings. The identified themes and their associated findings are presented in Table 2.

Table 2. Themes, Synthesis of Findings, and Implications for Technical English in Malaysian Polytechnics:

Theme	Description	Supporting Studies	Synthesis of Findings	Implications for Technical English in Malaysian Polytechnics
Theme 1: GenAI for Academic and Technical Writing Enhancement	Use of GenAI to support writing development, organisation of ideas, language accuracy, and content refinement.	Escalante et al. (2023); Kim et al. (2024); Alsaedi (2024); Alpar (2025); Chan & Hu (2023)	The studies consistently reported that GenAI tools assist learners in generating ideas, organising information, improving grammar, and enhancing writing quality. Immediate feedback and language support were identified as key advantages that help students revise and refine their work more effectively.	GenAI can support Malaysian polytechnic students in preparing technical reports, procedural descriptions, workplace documents, complaint-response emails, and infographic poster content commonly required in Technical English courses.
Theme 2: Personalised Learning and Learner Autonomy	GenAI provides adaptive support and facilitates self-directed learning.	Kohnke et al. (2025); Li et al. (2026); Chan & Hu (2023); Qu & Wu (2024)	Learners perceived GenAI as an accessible learning companion that provides immediate assistance and personalised feedback. The availability of on-demand support encouraged independent learning and allowed students to practise beyond classroom hours.	GenAI can provide additional language support for Malaysian polytechnic students with diverse English proficiency levels, promoting learner autonomy and self-regulated learning.
Theme 3: Communication Skills and Vocational English Development	GenAI supports communication practice and vocationally oriented language use.	Karataş et al. (2024); Labadze et al. (2023); Sharadgah & Sa'di (2022); Crompton & Burke (2023)	Conversational AI tools and chatbots provide opportunities for interactive communication, language practice, and simulated workplace interactions. Such tools may help learners build confidence and improve communicative competence in authentic contexts.	This finding is highly relevant to Technical English courses that require students to participate in meetings, oral presentations, workplace discussions, customer interactions, and professional communication tasks.

Theme 4: Learner Engagement and Motivation	GenAI enhances student interest, participation, and willingness to engage in language learning activities.	Qu & Wu (2024); Chan & Lee (2023); Kohnke et al. (2025); Chan & Hu (2023)	Students generally expressed positive attitudes towards GenAI due to its ease of use, accessibility, and interactive nature. Increased engagement and motivation were frequently associated with learners' perceptions of usefulness and convenience.	Increased engagement may encourage more active participation in Technical English learning activities, particularly among students who lack confidence in using English.
Theme 5: Ethical, Pedagogical, and Institutional Challenges	Concerns related to responsible AI use, academic integrity, and institutional readiness.	Huang & Yan (2025); Bond et al. (2024); Alsaedi (2024); Chan & Lee (2023); Sharadgah & Sa'di (2022)	Although GenAI offers substantial educational benefits, the literature highlights concerns regarding plagiarism, over-reliance on AI-generated content, AI literacy, data privacy, and ethical use. Several studies emphasised the need for clear institutional policies and educator training.	Malaysian Polytechnics should develop AI usage guidelines, provide professional development opportunities for lecturers, and redesign assessment practices to promote responsible and ethical AI integration.

As shown in Table 2, the reviewed literature suggests that GenAI contributes to language learning in multiple ways, ranging from enhancing writing and personalised learning to developing communication skills and learner engagement. At the same time, the studies highlight important ethical and institutional considerations that must be addressed to ensure responsible implementation. The following sections discuss each theme in greater detail and consider its relevance to Technical English teaching and learning within Malaysian polytechnics.

DISCUSSION

GenAI for Academic and Technical Writing Enhancement

The findings indicate that the most widely reported application of Generative Artificial Intelligence (GenAI) in English language education is its ability to support academic and technical writing. Across the reviewed studies, GenAI tools such as ChatGPT, Gemini, Copilot, and other AI-powered writing assistants were found to assist learners in generating ideas, organising content, improving grammatical accuracy, and refining written texts (Alsaedi, 2024; Alpar, 2025; Escalante et al., 2023; Kim et al., 2024). The availability of immediate feedback and language support enables students to revise their work more efficiently and develop greater confidence in the writing process.

These findings are particularly significant for Technical English education, where students are expected to produce clear and accurate technical reports, procedural descriptions, workplace correspondence, and project documentation. Unlike general academic writing, Technical English requires precision, logical sequencing, and the appropriate use of technical terminology. The reviewed literature suggests that GenAI can support these requirements by helping learners structure information coherently and improve linguistic accuracy. Similar observations have been reported in broader higher education contexts, where AI-assisted writing tools have been shown to facilitate writing development and enhance students' productivity (Crompton & Burke, 2023).

Nevertheless, the findings also suggest that GenAI should be used as a learning aid rather than a substitute for

writing development. While AI-generated suggestions can improve the quality of written work, excessive reliance on these tools may limit students' opportunities to develop critical thinking, problem-solving, and independent writing skills (Alsaedi, 2024; Huang & Yan, 2025). Therefore, educators should encourage students to critically evaluate AI-generated outputs and integrate them into the writing process responsibly.

Personalised Learning and Learner Autonomy

A second major theme emerging from the review is the role of GenAI in supporting personalised learning and learner autonomy. Several studies reported that students valued the ability to access immediate assistance, personalised explanations, and adaptive feedback whenever needed (Chan & Hu, 2023; Kohnke et al., 2025; Li et al., 2026). Unlike traditional classroom settings, where learning support is often constrained by time and instructor availability, GenAI tools provide continuous access to guidance and learning resources.

The findings suggest that GenAI has the potential to promote self-regulated learning by enabling students to identify their learning needs and independently seek targeted support. This is particularly relevant in Malaysian polytechnic settings, where students often enter Technical English courses with varying levels of English proficiency. The flexibility afforded by GenAI allows learners to engage with language learning at their own pace, revisit difficult concepts, and receive additional practice outside formal classroom hours.

From a pedagogical perspective, these findings align with learner-centred approaches that emphasise active participation and independent learning. However, learner autonomy should not be equated with learner dependence on technology. Students must also develop the ability to evaluate the accuracy and appropriateness of AI-generated responses. Consequently, AI literacy should be incorporated into Technical English instruction to ensure that learners can use GenAI tools critically and effectively.

Communication Skills and Vocational English Development

The review also highlights the potential of GenAI to support communication skills and the development of vocational English. Studies on conversational AI and chatbot technologies have found that these tools offer opportunities for interactive communication, language practice, and simulated workplace interactions (Karataş et al., 2024; Labadze et al., 2023; Sharadgah & Sa'di, 2022). Such environments allow learners to engage in authentic communication without the anxiety often associated with speaking in front of peers or instructors.

This finding is particularly relevant to Technical English courses offered in Malaysian polytechnics, where students are expected to communicate effectively in workplace contexts. Communication tasks commonly include oral presentations, technical briefings, meetings, customer interactions, and professional discussions. AI-powered conversational tools can provide realistic practice opportunities by simulating workplace scenarios and facilitating English-language interaction.

Furthermore, vocational education places considerable emphasis on employability skills and workplace readiness. The ability to communicate technical information clearly and confidently is increasingly recognised as an essential graduate attribute. The reviewed studies suggest that GenAI can complement traditional language instruction by providing learners with additional opportunities to practise communication skills in meaningful and contextually relevant situations.

Learner Engagement and Motivation

Another important finding concerns the positive influence of GenAI on learner engagement and motivation. Students generally reported favourable attitudes towards AI-assisted learning due to its accessibility, interactivity, and ease of use (Chan & Hu, 2023; Chan & Lee, 2023; Qu & Wu, 2024). The ability to receive immediate responses and personalised support appears to contribute to increased participation and sustained interest in language-learning activities.

These findings can be interpreted through the lens of the Technology Acceptance Model (TAM), which proposes that users are more likely to adopt a technology when they perceive it as useful and easy to use (Davis, 1989). Across the reviewed studies, learners frequently highlighted the usefulness of GenAI in

completing language tasks, improving writing, and obtaining explanations. Such perceptions contributed to positive attitudes towards the technology and increased willingness to engage with English language learning.

In the context of Malaysian polytechnics, learner engagement is particularly important because many students may perceive English as challenging or less relevant than their technical disciplines. The integration of GenAI into Technical English lessons may therefore help create more interactive and engaging learning experiences, encouraging students to participate more actively and confidently in language-related activities.

Ethical, Pedagogical, and Institutional Challenges

Despite the considerable benefits identified in the literature, the review also revealed several ethical, pedagogical, and institutional challenges associated with integrating GenAI. Academic integrity emerged as one of the most frequently discussed concerns. Researchers cautioned that excessive reliance on AI-generated content may reduce opportunities for students to develop original ideas, critical thinking skills, and independent problem-solving abilities (Bond et al., 2024; Huang & Yan, 2025).

In addition, concerns about data privacy, transparency, and the accuracy of AI-generated information were highlighted in several studies. While GenAI tools can produce sophisticated responses, they are not always accurate and may generate misleading or fabricated information. Consequently, students need to develop the skills required to verify information and critically evaluate AI-generated outputs before using them for academic purposes.

The findings also point to the importance of institutional readiness. Many educators remain uncertain about how to integrate GenAI into teaching, learning, and assessment practices (Chan & Lee, 2023; Huang & Yan, 2025). Without clear guidelines, there is a risk of inconsistent implementation and confusion among lecturers and students alike. Malaysian polytechnics, therefore, need to establish appropriate policies, provide professional development opportunities for lecturers, and redesign assessment practices to promote the ethical and responsible use of AI.

Research Gaps and Future Directions

The present review identified several important gaps in the existing literature on Generative Artificial Intelligence (GenAI) in English language education. First, although research on GenAI has expanded rapidly since the emergence of large language models such as ChatGPT, relatively few studies have focused specifically on Technical English or English for Specific Purposes (ESP) contexts. Most of the reviewed studies were conducted in general English as a Second Language (ESL) or English as a Foreign Language (EFL) settings, limiting the extent to which their findings can be directly applied to Technical English instruction.

Second, there remains a notable lack of empirical research conducted within Malaysian polytechnics and other Malaysian TVET institutions. While the reviewed studies provide valuable insights into the educational potential of GenAI, contextual factors such as curriculum requirements, learner characteristics, institutional policies, and workplace communication demands may influence the effectiveness of AI integration in Technical English classrooms. Consequently, there is a need for context-specific studies examining how GenAI can support Technical English learning in Malaysian TVET settings.

Third, most existing studies have focused on learners' perceptions, attitudes, and short-term experiences with GenAI. Although these findings provide useful initial evidence, there is limited understanding of the long-term impact of GenAI on language proficiency, communicative competence, learner autonomy, and workplace readiness. Longitudinal studies are therefore needed to determine whether the benefits reported in current research can be sustained over time.

Finally, relatively little attention has been given to lecturers' readiness, AI literacy, and institutional governance. As educators play a critical role in shaping how technology is integrated into teaching and assessment, future research should explore lecturers' professional development needs and investigate effective

strategies for the responsible and ethical implementation of AI. Addressing these research gaps would contribute to a more comprehensive understanding of GenAI in Technical English education and support evidence-based decision-making within Malaysian polytechnics.

CONCLUSION

Limitations of the Review

Several limitations should be acknowledged when interpreting the findings of this review. First, the review focused on English-language studies published between 2021 and 2026, potentially excluding relevant studies in other languages or outside the selected timeframe. Second, despite searching multiple academic databases, some relevant publications may not have been captured due to variations in indexing and search terminology. Third, the rapidly evolving nature of GenAI means new evidence may emerge shortly after the review is completed. Finally, relatively few studies have specifically examined Technical English or Malaysian polytechnic contexts, so the review draws on evidence from broader ESL, EFL, higher education, and vocational education settings. As a result, caution should be exercised when generalising the findings directly to all Malaysian TVET institutions.

Conclusion and Implications

This PRISMA-based systematic review synthesised current evidence regarding the applications, benefits, and challenges of Generative Artificial Intelligence in English language education and explored its potential relevance to Technical English instruction within Malaysian polytechnics. The findings indicate that GenAI offers considerable opportunities to enhance academic and technical writing, support personalised learning, strengthen communication skills, and increase learner engagement. These benefits suggest that GenAI has the potential to be a valuable pedagogical tool in Technical English classrooms, particularly for supporting students with diverse language proficiency levels and preparing them for the demands of workplace communication.

At the same time, the review highlights important ethical, pedagogical, and institutional challenges, including concerns about academic integrity, overreliance on AI-generated content, data privacy, and AI literacy. These challenges emphasise the need for responsible implementation, supported by appropriate policies, lecturer training, and assessment practices that promote critical thinking and ethical use of technology.

For Malaysian polytechnics, the findings provide a foundation for exploring the strategic integration of GenAI into Technical English curricula. Rather than replacing traditional teaching approaches, GenAI should be viewed as a complementary tool that enhances learning experiences and supports the development of workplace-relevant communication skills. As AI technologies continue to evolve, ongoing research, professional development, and institutional preparedness will be essential to ensure that the educational benefits of GenAI can be realised while maintaining academic quality and integrity.

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