USING GEMINI AI FOR ESL WRITING FEEDBACK AMONG FORM 4 STUDENTS

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Abstract. This study explores the use of Gemini AI as a feedback tool to improve the writing skills of ESL Form 4 students at SMK Penambang. It focuses on four key aspects of writing: content, communicative achievement, organisation, and language. A quasi-experimental approach was used, where students received feedback from both Gemini and their teacher. Data were collected through pre- and post-writing tasks, as well as a questionnaire to understand students' perceptions of the tool. The findings show that Gemini feedback helped improve students' writing, especially in terms of organisation and language accuracy. Many students also found the feedback clear, immediate, and helpful for revising their work, which increased their motivation and confidence in writing. However, some limitations were noted, such as occasional inaccuracies in the feedback and the need for teacher support to guide students. Overall, the study suggests that Gemini AI can be a useful additional tool in ESL classrooms, supporting both students' writing development and their engagement in the learning process.
Keywords: *Gemini AI, ESL writing, feedback, secondary students, perception*

Introduction

In Malaysia, artificial intelligence (AI) applications are being applied within the school system to help students to study more efficiently and handle more complex tasks in any subject. Not only can schools be able to personalize learning using the AI algorithms but get instant data on how the students will perform, with which aspect of learning one can track progress in the students as time goes by. The transformation is supported by other efforts of the ministry of education within its platform DELIMA (Digital Educational Learning Initiative Malaysia) in Malaysia, which aims at increasing the attention given to digital learning in the classrooms. Each student who gets an email at school triggers a domino effect that enables the provision of access to Google workspace as well as other educational tools, including the Gemini AI assistant created by Google. Gemini facilitates the process in the classroom by availing flexible support during the classroom periods, specific feedback and planning during self study and live communication which is essential in learning a language. Bringing Gemini AI into Malaysian classrooms represents a timely and practical step forward. Unlike basic grammar checkers or static writing tools, Gemini offers an interactive experience where students can ask questions, get immediate explanations, and improve their writing step by step. For ESL (English as a Second Language) learners, especially those in Form 4, writing remains one of the hardest skills to master. This is a crucial stage in their schooling as they prepare for the Sijil Pelajaran Malaysia (SPM) exam in Form 5. Being able to write clearly, accurately, and effectively in English is not only important for doing well in the English paper but also helps boost students' overall confidence and proficiency in the language.

Writing is one of the most complex and demanding skills for ESL students to master, as it requires the integration of grammar, vocabulary, coherence, and critical thinking (Hyland, 2019). This challenge is further magnified in Malaysian secondary schools, particularly in rural or semi-rural settings where students often face additional socio-economic and educational barriers. At SMK Penambang, a majority of Form 4 students come from lower-income group (B40), where limited access to home literacy resources and low exposure to English outside the classroom contribute to poor writing performance. These students frequently struggle with generating ideas, structuring arguments, and applying correct grammar-all essential components assessed in the SPM English paper (MOE, 2015). Furthermore, despite the commitment of English teachers, the reality of large class sizes and heavy workloads often prevents them from providing timely and personalised feedback on student writing. Effective writing instruction demands continuous formative feedback, yet many teachers are constrained by time, limiting their ability to engage with each student's writing process in depth. As a result, students receive generalised or delayed feedback that may not address their specific learning needs, leading to slow progress and reduced motivation (Lee, 2017). In light of these issues, there is an urgent need to explore how digital tools-particularly those integrated into national platforms like DELIMA-can support more efficient and accessible feedback systems. The availability of Gemini AI, through the students' DELIMA accounts, presents a timely opportunity to examine how artificial intelligence can complement traditional instruction and bridge the feedback gap in ESL writing classrooms.

In addition, many students experience persistent difficulties in writing, particularly in grammar. Writing is one of the most challenging skills for ESL learners in Malaysian secondary schools. Despite years of formal English instruction, many Form 4 students continue to struggle with producing coherent, well-organised, and grammatically accurate writing. Among the most persistent issues are grammar-related errors, which significantly hinder their ability to communicate ideas effectively. These include challenges with subject-verb agreement, tense consistency, article usage, prepositions, and sentence structure, all of which are commonly observed in classroom writing tasks. Such errors not only affect sentence-level accuracy but also compromise the clarity, coherence, and overall quality of students' written work. The purpose of this study is to examine the effectiveness of Gemini AI, an automated writing feedback tool available through Malaysia's DELIMA platform, in improving the English writing skills of Form 4 ESL students at SMK Penambang. Specifically, the study aims to compare the impact of AI-generated feedback with that of traditional teacher feedback on students' writing performance in areas such as grammar and overall writing quality. Given the socio-economic background of many students, most of whom come from B40 with limited access to English language resources outside the classroom, this research seeks to determine whether AI tools like Gemini can offer timely, individualised, and accessible support to bridge learning gaps. The study also explores how the integration of Gemini into everyday classroom instruction can help alleviate common challenges faced by teachers, such as time constraints and the difficulty of providing consistent, detailed feedback to large groups of learners. By doing so, this research contributes to the broader understanding of how artificial intelligence can be effectively utilised to enhance second language writing instruction within the Malaysian secondary school context.

Literature review

The sociocultural theory by Vygotsky

According to Vygotsky Sociocultural Theory (1978), the most important contribution to development of higher-order thinking was the role of social interaction, language and cultural context. Among the key concepts of this theory, one can mention the Zone of Proximal Development (ZPD) that is considered as the difference between what a learner is able to achieve on their own and what the learner can do with the guidance of a person with a higher level of knowledge, commonly called the More Knowledgeable Other (MKO). The MKO in a classroom context is usually the teacher, although it also may consist of other students, mentors, and even technological devices like AI. The kind of aid given in this zone is called scaffolding where step-by-step aid is given to the learners and they are made to carry out tasks independently over a period of time. The meaning of ZPD is specifically true in the context of language learning, as a learner is always creating a skill in the field of grammar, coherence, vocabulary, and organisation. When learners operate within their zone of proximal development they are pushed beyond their own capabilities, but not so much that the task becomes unreasonable. This is where meaningful learning happens, as the support they receive helps them gradually build the confidence and ability to handle the task independently.

Without adequate scaffolding, learners may either stay within their comfort zone-where little progress occurs-or become overwhelmed by tasks that are too difficult. The right level of support helps bridge this gap effectively. In the context of this study, tools like Gemini AI can function as a form of scaffolding, offering instant feedback that guides students in correcting grammar, improving sentence structure, and enhancing the overall quality of their writing. In this way, the AI acts as a supplementary MKO, complementing teacher support and helping students advance their writing skills more effectively. Furthermore, scaffolding is a framework that is used to provide support for a student while they complete a task that falls within their Zone of Proximal Development (ZPD), which was identified by Wood et al. (1976) as a "temporary, supportive structure" created by an adult to help students overcome challenges. Scaffolding provides support to help students reach desired learning outcomes by using strategies such as providing hints, feedback, explanations, examples, or breaking down large tasks into smaller tasks. The amount of support provided through scaffolding is reduced as students gain competency with completing specific tasks; ultimately, it should be completely eliminated to allow students to develop independence and mastery.

In educational contexts, scaffolding is typically provided by teachers who tailor their assistance based on the learners' immediate needs. However, with the advent of educational technologies, tools such as AI can serve as digital scaffolds. For instance, Gemini AI offers automated feedback on grammar, sentence structure, coherence, and vocabulary. This immediate feedback functions as scaffolding by helping learners identify errors, understand corrections, and improve their writing iteratively. The process of scaffolding aligns closely with the learner's ZPD because it provides just enough support to enable progress without taking over the task entirely. Effective scaffolding should challenge the learner while avoiding overwhelming them, thus promoting meaningful learning and skill development. In this study, the concepts of Zone of Proximal Development (ZPD) and scaffolding, help researchers understand how Gemini AI will assist ESL learners in developing their writing abilities through

providing AI generated feedback. Learners who receive AI generated feedback, are receiving the opportunity to learn about errors and enhance other areas of their writing from their current Zone of Proximal Development (ZPD), where they are currently unable to do these things independently. Gemini provides a type of technological scaffolding for the learner, by generating consistently formatted, immediate, and structured feedback on the learner's written work. It is anticipated that this scaffolding will aid learners in increasing the likelihood that the corrections and improvements they make will become a part of their own knowledge base, which should lead to improved accuracy, fluency, and quality of their writing. In addition, this study investigates whether the AI-based scaffolding provided by Gemini is as effective-or potentially more efficient-in terms of timeliness and consistency compared to traditional teacher feedback. It also explores how this form of support affects learners' motivation, confidence, and perception of the usefulness of AI as a writing aid, which are critical affective factors within the socio-cultural framework of learning.

Feedback model by Hattie and Timperly

Hattie and Timperley (2007) developed a comprehensive model of feedback that focuses on three critical questions learners need answers to in order to progress effectively: (1) Where am I going? (Goals); (2) How am I going? (Progress); (3) Where to next? (Next Steps). These questions correspond to three levels of feedback: (1) Task-level feedback: Is the work correct? (2) Process-level feedback: What strategies were used? (3) Self-regulation-level feedback: How can the learner monitor and direct their own learning? Task-focused feedback is used to determine whether a task was completed appropriately; it generally addresses surface-level characteristics of student writing (e.g., grammar, syntax, vocabulary, punctuation, factual information). The primary focus of this type of feedback is to identify mechanical errors and provide corrections to assist students in producing accurate and clear writing, thus improving language use and content quality. In this study, the primary function of Gemini AI is to generate this type of feedback, which includes identifying mechanical errors and suggesting correctives. This function of feedback is aligned with the objectives and research question of this study, which investigates how AI-generated feedback can influence critical writing components (i.e., content, communicative achievement, organization and language accuracy).

Process-level feedback goes beyond surface-level corrections by focusing on how learners approach the writing task as a whole. It provides information on how to organise ideas, write coherently, build logic arguments and develop ideas. As such, in this work, the Gemini AI provides process feedback with the proposed improvements that include reordering, editing sentence order and leveling out paragraphs, improving clarity, and creating sentence variety to create more coherence and interest in the writing directions and flow. Such feedback is crucial in not only improving the overall quality of writing in the students but also contributing to the moral of deeper learning and development of effective writing practices. Self-regulation feedback motivates learners to self-monitor, self-assess and self-correct. Although AI may not completely replace the empathetic scaffolding issued by a human instructor, it encourages students to self-regulate through providing valuable, immediate, usable feedback so that students could revise their efforts iteratively. The availability of such feedback may enhance learners' confidence and motivation, aligning directly with the research question, which

investigates students' perceptions of usefulness, motivation, and confidence when using Gemini for writing revisions.

In the context of this study, Gemini AI is designed to offer feedback that addresses all three levels. It helps students identify grammatical errors (task level), offers suggestions for improving organisation or style (process level), and encourages multiple revisions (self-regulation level). This model supports the notion that quality feedback is one of the most powerful influences on student achievement-a particularly important factor in ESL writing where learners benefit from immediate, focused, and actionable suggestions. Furthermore, in busy school environments where teachers often lack time to provide detailed feedback for every student, AI tools like Gemini help close the feedback gap. This is especially beneficial for Form 4 students preparing for the high-stakes SPM examination, where mastery of writing is critical.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), seeks to explain and predict user behaviour towards technology adoption. This theory is one of the most influential theories for explaining and predicting how users come to accept and use a new technology. The model is widely applied in educational technology research, especially in understanding how students adopt digital tools, online platforms, and AI-powered applications for learning. According to TAM, two primary factors influence a person's decision to accept and use a new technology.

Perceived Usefulness (PU)

Perceived Usefulness (PU) is defined as the degree to which an individual believes that using a particular system will enhance their task performance (Davis, 1989). In educational contexts, PU reflects whether students believe that a technology-such as an AI feedback tool like Gemini-helps them perform better in their learning tasks, in this case, writing. When students believe they have achieved greater success with their writing by utilizing Gemini (better organization, more accurate grammar, better communication, etc.) their view of the utility of the tool will be increased. The feedback from Gemini on how to correct errors in their writing and assist them in developing their writing skills, provides the utility of Gemini as a helpful learning tool. A high level of perceived usefulness is likely to positively influence students' motivation to use the technology regularly, as it aligns with their goal of improving writing performance. This directly relates to Research Objective 3 (RO3) and Research Question 3 (RQ3), which focus on understanding students' perceptions regarding the usefulness of Gemini for writing revisions.

Perceived Ease of Use (PEOU)

Perceived Ease of Use (PEOU) refers to the extent to which an individual believes that using a particular system is free from effort (Davis, 1989). In other words, if a technology is intuitive, simple to navigate, and user-friendly, users are more likely to adopt it. In the context of this study, if students find the Gemini interface easy to understand-such as receiving clear, actionable feedback, simple error highlights, and straightforward suggestions-they are more likely to use it consistently. On the other hand, if the tool is complicated, confusing, or produces unclear feedback, it may discourage usage, even if it is perceived as useful. PEOU also influences PU; when a

system is easier to use, users are more likely to perceive it as useful because they can focus on learning rather than struggling with the tool itself. In this study, students' acceptance and consistent use of Gemini AI depend on their perception of its usefulness (e.g., improving their writing scores) and its ease of use (e.g., navigating it via the DELIMA platform). If students view Gemini as helpful and user-friendly, they are more likely to engage with it voluntarily, leading to more writing practice and better outcomes. This theory is especially relevant for Malaysian secondary students, who may have varied levels of exposure to educational technology. At SMK Penambang, where many students come from fishing families and have limited internet access at home, school-based exposure through DELIMA becomes critical. Teachers also play a role in influencing students' perceptions of the tool. If they integrate Gemini smoothly into lessons and highlight its benefits, it can enhance students' confidence and motivation in using the tool regularly (*Figure 1*).

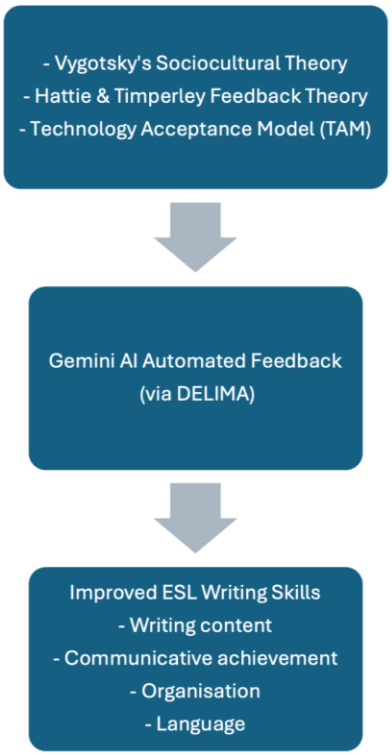

Figure 1. *Theories connected to the study.*

Past studies on writing skills among secondary school students

Empirical studies with the AI-assisted writing feedback have demonstrated a promising growth in the area of improving the writing performance of ESL students. As an example, Li (2022) experimental study of automated feedback systems revealed that these tools had a considerable impact on the improvement of grammar accuracy, especially in the aspects of verb tense, subject-verb agreement, and article usage as core problem areas among the students of ESL. They also came to a conclusion through their findings that AI feedback encouraged an active culture of revision as students became more open to making multiple drafts and corrections. This directly relates to RO1 and RQ1 of the current study, i.e., the quest to explore the effect of Gemini AI feedback on writing components, i.e., content, communicative achievement, organisation and

language accuracy. Likewise, Jianmei et al. (2025) observed that AI-related tools improved students writing not only through the surface-related aspects such as grammar but also by increasing the lexical sophistication of the student, who is now able to choose better and more contextually specific words. In addition, better organisation of the text in terms of the better structure of paragraphs and logics was brought out in the study. This correlates well with the attention of RO1/RQ1 that studies whether the comments provided by Gemini AI can contribute to an increase in both organisation and communicative achievement, which are include as distinctive features in the rubric of the SPM English Paper 2.

The implementation of such a digital platform in the case of DELIMA in the Malaysian context is a huge step in bringing technology into the classroom (Mohd Salim et al., 2025). DELIMA gives students access to a wide range of digital tools, such as Gemini AI, to assist their learning. Nevertheless, although such tools are widely available, a certain lack of research studies that specifically test the effectiveness of Gemini AI as an aid to writing feedback among ESL secondary students can be noted. Addressing this gap forms the core motivation for the present study and is directly connected to RO2 and RQ2, which aim to compare the quality and timeliness of AI-generated feedback with traditional teacher feedback. Further insights come from comparative studies between AI feedback and conventional teacher feedback. Bitchener and Ferris (2012) emphasise that while teacher feedback offers context-sensitive, personalised guidance especially in developing ideas and communicative achievement that is AI tools provide consistent, immediate feedback that can significantly aid surface-level accuracy and timely corrections. This is crucial in large classrooms where teachers may not have the capacity to provide instant feedback. The results have great implications to RO2 and RQ2 that focus on whether the AI feedback is better in quality and speed than the teacher feedback.

Also, the overall quality of writing of the students increased considerably under the influence of AI-generated feedback in the framework of a combined approach to the range and form of feedback provided by a teacher. The students also saved time because the AI was quick to highlight mechanical errors, but they turned to the teachers to provide them with more sophisticated feedback which was connected to the development of content, argumentation and the tone. This understanding enhances the argument in support of the consideration of AI as a scaffolding tool, which relates back to the Sociocultural Theory due to Vygotsky whereby the AI plays a role of a More Knowledgeable Other (MKO) in the Zone of Proximal Development (ZPD). This theoretical relationship is the basis of the design of this study and the assumptions of RO1 and RO2 regarding the consequences of AI on writing outcomes, complementarity of AI and teacher feedback. Although there have been such positive results, there are also some major challenges which are brought out in the literature. The issues of technical barrier, which include the inability to access the internet, low digital literacy rates, and the attitude of learning to adopt the technology are still a barrier that schools in rural Malaysia face. This may be a limitation to the effectiveness of AI tools such as Gemini AI, especially to students in SMK Penambang where they are affected by the socio-economic parameters in the opportunities they have with technology. This fact is related to Research Objective 3 (RO3) and Research Question 3 (RQ3), which addresses the notion of how useful and easy to use Gemini AI could be perceived by students. It is important to understand such perceptions because they embody the main premises of the

Technology Acceptance Model (TAM), according to which the acceptance of technology by the users depends on their perceived usefulness and ease of use.

Materials and Methods

Research design, sample and instrument

This study adopted a quasi-experimental pre-test/post-test control group design. This approach was chosen because the researcher did not have full control over the assignment of participants to groups; instead, intact classrooms were used. This design allowed for the comparison of writing improvements between students who receive AI-generated feedback and those who receive traditional teacher feedback. The participants in this study consisted of two Form 4 classes from SMK Penambang, selected using purposive sampling. One class was assigned as the experimental group (using Gemini AI for feedback), and the other as the control group (receiving traditional teacher feedback). The total number of participants was 30 students, with approximately 15 per group. The participants were selected based on their English proficiency where they are in the intermediate level of proficiency. The instrument for the study was the writing task in the form of an SPM English Paper 2 Part 1 email style; the same or similar writing prompts were given at both the pre- and post-tests. Writing tasks completed by students were evaluated using the official SPM English Paper 2 rubric which assesses the three areas of Content, Communicative Achievement, Organisation and Language. Additionally, qualitative data were obtained using student reflective journals, examples of teacher and Gemini AI feedback as well as teacher observation records. An adaptation of a Student Perception Questionnaire of the Technology Acceptance Model (Davis, 1989) was distributed to determine perceptions of usefulness and perceptions of ease of use.

Data collection and analysis

The scores will be carried out in a pre-test and after-test way to measure the gains in writing performance. Performance of both the experimental and control groups will be summarised by descriptive statistics such as the mean, standard deviation, and the percentage improvement. In a bid to measure the improvement in each group, a paired-sample t-test will be done to compare the pre-test and post-test scores. An independent-sample t-test will be employed to establish any gap between experimental and the control group. Where there are major disparities concerning the pre-test scores across the groups, then an analysis of covariance (ANCOVA) is to be employed. It will eliminate initial differences and give a more realistic comparison of the post-test results. In addition to test scores, qualitative data will be collected form student reflection logs- These will be analysed using thematic analysis to identify recurring themes related to students' perceptions of the feedback process, their learning experience, and challenges faced when using Gemini AI or traditional feedback. Second, samples from both Gemini AI and teacher feedback will be compared through content analysis. The analysis will focus on the types of feedback provided (e.g., grammar correction, organisation, vocabulary suggestions, content relevance) and their depth, clarity, and timeliness. This comparison will help assess how AI feedback aligns with or differs from teacher feedback. Third, observations recorded during the intervention will be coded and categorised to capture teacher insights on student engagement,

responsiveness to feedback, digital literacy challenges, and any noticeable behavioural changes during writing tasks. The findings from both quantitative and qualitative analyses will be triangulated to provide a deeper understanding of how Gemini AI influences writing performance and student attitudes. This mixed-methods approach allows the study to capture both measurable outcomes and rich, contextual insights.

Results and Discussion

To provide a clearer overview of the similarities and differences between Gemini-generated feedback and teacher feedback, the findings are first summarised in *Table 1*. The table presents the observed feedback patterns across the four CEFR writing criteria based on the analysis of 30 student samples, serving as a reference for the detailed discussion that follows. Based on the analysis of 30 student samples, Gemini feedback consistently focused on improving the naturalness and appropriateness of students' expressions. Gemini often rephrased awkward sentences to enhance clarity while maintaining the original meaning. In contrast, teacher feedback mainly identified unclear expressions without providing alternative phrasing. This suggests that Gemini feedback placed greater emphasis on supporting students in achieving effective communication.

Table 1. *Comparison of Gemini and teacher feedback characteristics.*

SPM Rubric	Gemini Feedback Characteristics	Teacher Feedback Characteristics
Content	Highlighted clarity of ideas and relevance	Focused on task fulfilment and idea relevance
Communicative Achievement	Suggested more natural phrasing	Pointed out unclear sentences
Organisation	Commented on flow and sentence connection	Limited comments on organisation
Language	Detailed grammar and vocabulary corrections	Selective correction of errors

Content

Based on an analysis of the feedback that was generated by Gemini for 30 pieces of student writing as well as feedback that was given by their teachers, both types of feedback identified the extent to which students' ideas related to the task they had been assigned. While Gemini's feedback helped preserve students' original written content and provide some elaboration to help clarify what students wanted to say, it helped do so in a way that made their original intent clearer than the typical teacher feedback that was primarily based on the degree to which each piece of writing met the task requirements with little to no focus on expanding upon or providing further clarification of the ideas that students wrote about. Therefore, although both Gemini and teacher feedback were able to support task fulfillment, Gemini feedback gave more emphasis to the clarity of the written content rather than changing the original meaning of students' writing. In terms of communicative achievement, clear differences were observed between Gemini and teacher feedback. Gemini frequently improved students' ability to communicate their message effectively by rephrasing awkward or unnatural expressions into more appropriate and natural language. This helped ensure that the tone and purpose of the writing, particularly informal email tasks, were achieved more successfully. Teacher feedback, on the other hand, tended to point out unclear or inappropriate expressions without consistently offering alternative phrasing. As a result,

Gemini feedback appeared to provide more direct support in helping students achieve effective communication for the intended audience.

Organisation and language

Gemini has provided students with a better organised writing style through its feedback as it supported students' organisational skills to improve their overall readability, and clarity of thought within their writing. Teachers did provide some organisational support for the students but the majority of their feedback focused on the students' use of correct grammar and spelling and providing them with appropriate content. Therefore, Gemini provided more explicit organisational support than teachers to support students to write in an organised manner. The difference between teacher and Gemini feedback was primarily with regard to the feedback about language. Gemini gave many details regarding correction of grammatical correctness, correct usage of vocabulary, and mechanics; as well as grammar related mistakes (such as using a wrong preposition, plural forms, articles, etc., and/or selecting the incorrect word). Gemini also offered example sentences that corrected student sentences and provided examples of how the student's own sentences could be rewritten to make them clearer and more accurate. Teacher feedback was generally focused on identifying and correcting some of the more significant language errors (as opposed to detailing all errors) and therefore, overall, the language specific feedback from Gemini could potentially assist students in producing better quality written communication.

Student's perceptions of Gemini as a writing feedback tool

The questionnaire was administered to examine students' perceptions of using Gemini as a writing feedback tool, focusing on perceived usefulness and perceived ease of use. Descriptive statistics, including mean scores and standard deviations, were used to summarise students' responses. The results for perceived usefulness indicate generally positive perceptions among the students. As shown in *Table 2* the mean scores for all items ranged from 3.07 to 3.67, suggesting that most students agreed that Gemini was useful in supporting their writing tasks. The highest mean score was recorded for the item "Using Gemini would make it easier to do my writing" (M = 3.67, SD = 0.48), indicating that students felt Gemini helped simplify the writing process. Similarly, students agreed that using Gemini would improve their writing performance (M = 3.50, SD = 0.51) and that they would find Gemini useful in writing (M = 3.50, SD = 0.51). Students also had moderately high means for items that dealt with completion of tasks and performance on those tasks. Most notably, students stated that they thought Gemini would enable them to complete their writing tasks more quickly (Mean = 3.33; SD = .48), and that Gemini would help their overall writing effectiveness (Mean = 3.33; SD = .48). The lowest mean was associated with productivity (Mean = 3.07; SD = .45); however, the mean is still very positive. These data suggest that students perceive Gemini as an effective writing tool. *Table 2* presents the results for perceived ease of use. The mean scores for this construct ranged from 3.27 to 3.57, indicating that students generally found Gemini easy to use for writing purposes. The highest mean score was obtained for the item "I would find Gemini easy to use for writing" (M = 3.57, SD = 0.50), suggesting a high level of comfort among students when using Gemini.

***Table 2**. The descriptive analysis.*

Item statement	Mean	Standard deviation
Perceived usefulness		
Using Gemini in my writing email would enable me to accomplish tasks more quickly.	3.33	0.48
Using Gemini would improve my writing performance.	3.50	0.51
Using Gemini in my writing would increase my productivity.	3.07	0.45
Using Gemini would enhance my effectiveness in writing.	3.33	0.48
Using Gemini would make it easier to do my writing.	3.67	0.48
I would find Gemini useful in writing.	3.50	0.51
Perceived ease of use		
Learning to operate Gemini would be easy for me.	3.27	0.45
I would find it easy to get Gemini to do what I want it to do.	3.37	0.49
My interaction with Gemini would be clear and understandable.	3.33	0.48
I would find Gemini would be clear and understandable.	3.33	0.48
It would be easy for me to become skillful at using Gemini for writing.	3.43	0.50
I would find Gemini easy to use for writing.	3.57	0.50

Students also agreed that it would be easy for them to become skillful at using Gemini for writing (M = 3.43, SD = 0.50) and that they could easily get Gemini to do what they wanted it to do (M = 3.37, SD = 0.49). In addition, students perceived their interaction with Gemini to be clear and understandable (M = 3.33, SD = 0.48). Although the item "Learning to operate Gemini would be easy for me" recorded a slightly lower mean score (M = 3.27, SD = 0.45), the result still indicates a positive perception. Overall, the findings show that students viewed Gemini as a user-friendly tool that is easy to learn and use in writing activities. Next, *Table 3* shows the students' perceptions of using Gemini for writing across 12 statements related to usefulness, ease of use, productivity, and clarity. Overall, the findings indicate a positive perception towards the use of Gemini in writing activities. In terms of perceived usefulness, the majority of respondents agreed that using Gemini would enable them to accomplish writing tasks more quickly (66.7% agreed, 33.3% strongly agreed). Similarly, half of the respondents agreed and strongly agreed that Gemini would improve their writing performance (50% each). A high percentage of respondents also agreed that Gemini would increase their productivity, with 80% agreeing and 13.3% strongly agreeing. Next, for writing effectiveness and ease, 66.7% of respondents agreed and 33.3% strongly agreed that Gemini would enhance their effectiveness in writing. Furthermore, 66.7% strongly agreed that Gemini would make writing easier, while 33.3% agreed. All respondents indicated positive perceptions towards the usefulness of Gemini, with 50% agreeing and 50% strongly agreeing that Gemini would be useful for writing. Besides, for ease of use and interaction, most respondents perceived Gemini as user-friendly. A total of 73.3% agreed and 26.7% strongly agreed that learning to operate Gemini would be easy. Additionally, 63.3% agreed and 36.7% strongly agreed that they could easily get Gemini to do what they wanted. Most respondents also agreed that their interaction with Gemini would be clear and understandable (66.7% agreed, 33.3% strongly agreed). Finally, in terms of overall usability, more than half of the respondents strongly agreed that it would be easy to become skilful at using Gemini for writing (43.3%), while 56.7% agreed. Similarly, 56.7% strongly agreed and 43.3% agreed that Gemini would be easy to use for writing.

***Table 3**. Students' perceptions of using Gemini for writing.*

No	Statements	Scale/No. of respondents/{ercentage (%)			
		1	2	3	4
1	Using Gemini in my writing would enable me to accomplish tasks more quickly.	0 (0)	0 (0)	20 (66.7)	10 (33.3)
2	Using Gemini would improve my writing performance.	0 (0)	0 (0)	15 (50)	15 (50)

3	Using Gemini in my writing would increase my productivity.	0 (0)	2 (6.7)	24 (80)	4 (13.3)
4	Using Gemini would enhance my effectiveness in writing.	0 (0)	0 (0)	20 (66.7)	10 (33.3)
5	Using Gemini would make it easier to do my writing.	0 (0)	0 (0)	10 (33.3)	20 (66.7)
6	I would find Gemini useful in writing.	0 (0)	0 (0)	15 (50)	15 (50)
7	Learning to operate Gemini would be easy for me.	0 (0)	0 (0)	22 (73.3)	8 (26.7)
8	I would find it easy to get Gemini to do what I want it to do.	0 (0)	0 (0)	19 (63.3)	11 (36.7)
9	My interaction with Gemini would be clear and understandable.	0 (0)	0 (0)	20 (66.7)	10 (33.3)
10	I would find Gemini would be clear and understandable.	0 (0)	0 (0)	20 (66.7)	10 (33.3)
11	It would be easy for me to become skillful at using Gemini for writing.	0 (0)	0 (0)	17 (56.7)	13 (43.3)
12	I would find Gemini easy to use for writing.	0 (0)	0 (0)	13 (43.3)	17 (56.7)

Note: Scale 1=Strongly disagree; Scale 2=Disagree; Scale 3=Agree; Scale 4=Strongly Agree.

What are the characteristics of Gemini-generated feedback in supporting ESL students' writing based on the CEFR writing criteria?

The results show that Gemini-produced feedback exhibited significant variations along all four CEFR writing criterion categories (content, communicative achievement, organisation, and language) relative to student writing. With respect to content, it is evident that Gemini feedback provided consistent preservation of students' original ideas, and improvement in clarity of expression. Thus, Gemini appears to be an enabling resource to help students develop their ideas, but also preserve the original intent behind them, which is particularly important for ESL learners that may have difficulty expressing their ideas in English. The nature of the feedback from Gemini was very focused on achieving communicative success, i.e. making the student's expressions as naturally occurring and appropriate as possible, through providing a variety of ways to express ideas in order to enable the students to better present their idea or message to the intended reader, with an emphasis on informal forms of writing (e.g., email) rather than formal ones. As for organization, Gemini demonstrated far greater concern for both clarity and continuity within the writing process than any other form of feedback; Gemini commonly clarified how well the student's sentences were connected to one another so that the overall writing would have improved readability. In terms of language, Gemini generated the most comments regarding language, including but not limited to grammar, word choice and mechanics; often, these comments included example revisions of sentences that illustrated the revision. In summary, the results of this study demonstrate that Gemini has the capacity to provide total and explicit assistance to students on multiple aspects of the writing process.

How does Gemini-generated feedback compare with teacher feedback in terms of content, communicative achievement, organisation, and language?

When compared with teacher feedback, clear differences were observed in the focus and level of detail provided. Teacher feedback primarily concentrated on task fulfilment and key errors, particularly in relation to content relevance and major language issues. This approach reflects common classroom practices, where teachers often prioritise essential aspects of writing due to time constraints and workload considerations.

Gemini-produced feedback was much more detailed and specific in its evaluations of each of the CEFR's four criteria than were the evaluations produced through teacher feedback. Where teacher feedback would typically identify areas of concern, Gemini feedback often included suggestions for how the student could improve their wording as well as provide a model of appropriate wording for both communicative achievement and language use. Similarly, where teacher feedback focused almost exclusively on content, Gemini feedback emphasized organizational characteristics such as coherence and flow. The results indicate that while Gemini feedback and teacher feedback have different uses, they can be used together to help students with their language and clarity needs.

What are students' perceptions of using Gemini as a writing feedback tool?

The questionnaire findings revealed that students generally held positive perceptions of using Gemini as a writing feedback tool. Students reported that Gemini was useful in helping them complete writing tasks and felt that it made the writing process easier. The relatively high mean scores for perceived usefulness indicate that students recognised the practical value of Gemini feedback in supporting their writing. Students perceived Gemini as being relatively easy to utilize; they stated that interactions with Gemini were clear and understandable. Additionally, students believed that they were capable of utilizing Gemini efficiently during writing assignments. These perceptions are consistent with the observed characteristics of Gemini feedback (clarity & explicitness) and provide evidence that students reacted favorably to feedback that provided details and was easily followed. Overall, the data suggest that students viewed Gemini as an assistive and accessible resource during the writing process. Taken together, the discussion of the findings demonstrates that Gemini-generated feedback provided detailed and comprehensive support across CEFR writing criteria, differed in focus from teacher feedback, and was generally well received by students. These findings suggest that Gemini has the potential to complement teacher feedback in ESL writing instruction, particularly by offering additional support in language accuracy, clarity, and communicative effectiveness.

Implications

This research study finds the impact of using a computer program to assist in providing English Second Language (ESL) writing instruction to middle and high school students. There are increasing pressures on ESL teachers in the secondary schools due to time and resource limitations. Because the feedback provided to students by the Gemini program was so explicit and detailed, these findings suggest that ESL teachers can utilize AI-based programs to aid the use of written feedback to support their students' ESL writing development and use of feedback as an additional tool instead of taking the place of traditional methods of using written feedback. Studies have shown that feedback will positively affect student motivation to revise if it is delivered in a timely manner, clearly and specifically (Koltovskaia, 2022; Zhang and Hyland, 2022). Additionally, many examples of the feedback provided through the Gemini program were direct corrections or alternative ways of phrasing similar to those found in grammar guides, which would help students identify and address the errors they made while writing. The comparison between Gemini-generated feedback and teacher feedback also highlights the potential role of AI in supporting teachers'

feedback practices. Research has indicated that teachers will commonly give high priority to major components of students' writing because of their heavy workloads; therefore, the degree to which they are able to provide detailed feedback for each piece of students' writing is limited. This research study's results indicate that Gemini can serve as an adjunct to a teacher's feedback by providing supplemental assistance to students in many of the same ways that a teacher would assist them with the other aspects of the writing process (i.e., grammar, organization/clarity of thought, etc.) thus freeing up the teacher to use his/her time to focus on instructional guidance and content development when interacting with students in the classroom.

In addition, the positive student perceptions of Gemini in terms of usefulness and ease of use have important pedagogical implications. Recent research on AI-supported learning tools indicates that students are more likely to engage with feedback when they perceive it as accessible, understandable, and easy to apply (Ma et al., 2026). When students feel confident using a feedback tool, they may take a more active role in revising their writing, which supports learner autonomy in the writing process. Overall, this study indicates that, when combined as a means of providing student writers with guidance for their writing, the use of Gemini as an instant feedback tool could enhance the balance of ESL writing instruction. The use of Gemini should be seen as supporting the use of teacher feedback, rather than replacing it. Teacher feedback can continue to serve to provide the student writer with the information needed to understand both the requirements of a specific assignment/task and how they are developing their ideas and concepts, whereas Gemini will assist the student writer by immediately providing them with the necessary language support to complete the task successfully. Thus, the proposed model is consistent with recent recommendations regarding the implementation of artificial intelligence in educational contexts, specifically, the need to ensure the pedagogical appropriateness and ethical considerations of the inclusion of AI-based tools in the daily classroom practices of educators (Holmes et al., 2019).

Suggestions for future studies

Based on the findings and scope of this project, several suggestions can be made for future studies on the use of AI-generated feedback in ESL writing. First, future research could employ an experimental or quasi-experimental design, such as pre- and post-writing assessments, to examine the impact of AI-generated feedback on students' writing performance over time. This would allow researchers to make stronger claims regarding changes in students' writing development across different CEFR criteria (Zhang and Hyland, 2022). Second, future studies might want to include an even bigger group of participants with a variety of students at different schools and proficiency levels. The researchers can use this bigger and more varied group to get a better picture of how well AI-generated feedback works for students with different strengths and weaknesses in terms of their learning needs. Additionally, researchers can study if different proficiency levels will be helped by the same type of AI-supported feedback (Koltovskaia, 2022). Furthermore, additional study could also be conducted on the long-term implications for students' ability to write autonomously and develop independent revision strategies when given AI generated feedback. This study was concerned with characteristics of feedback and student perception, whereas an additional study focusing on how students assimilate and apply the feedback they receive will assist in providing a better understanding of longer-term learning outcomes (Ma et al., 2026). Additionally, potential study areas include how teachers perceive and experience the inclusion of AI

tools, such as Gemini, in their teaching of writing. A study of teachers' views, anxieties and educational practice when using AI in writing instruction will assist in informing a more practical and ethical approach to the introduction of AI in the classroom (Holmes et al., 2019)-a study area that is becoming increasingly important due to the need for educators to make pedagogically informed decisions regarding the appropriate role of AI in supporting learning experiences.

Conclusion

This study examined the effectiveness of AI-assisted feedback, specifically through Gemini AI, in improving ESL students' writing performance among Form 4 learners at SMK Penambang. The findings indicate that the use of AI-generated feedback contributed to measurable improvements across key writing components, namely content, communicative achievement, organisation, and language. In addition, the results demonstrate that AI feedback was delivered in a more timely and consistent manner compared to conventional teacher feedback, thereby facilitating more efficient revision processes. Furthermore, students' perceptions of AI-assisted feedback were generally positive. Participants reported increased motivation, confidence, and engagement in the writing process, suggesting that AI tools can support the development of learner autonomy. Despite these benefits, the findings also underscore the continued importance of teacher involvement in mediating and validating AI-generated feedback to ensure its pedagogical appropriateness and accuracy. In conclusion, this study provides empirical support for the integration of AI tools in ESL writing instruction. The results highlight the complementary role of AI in enhancing feedback practices while reinforcing the indispensable role of teachers. Future research is recommended to investigate the long-term impact of AI-assisted feedback, its applicability across varying proficiency levels, and its potential integration into other language skill domains.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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