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EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE-SUPPORTED ACADEMIC WRITING TOOLS WITH PEER FEEDBACK IN ENHANCING ESL STUDENTS' WRITTEN DISCOURSE: BASIS IN DESIGNING STUDENT-ORIENTED TRAINING PROGRAM

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Abstract

Academic writing remains a critical yet challenging skill for English as a Second Language (ESL) learners, particularly in producing well-organized and content-rich discourse. This study investigated the effectiveness of Artificial Intelligence-supported academic writing tools combined with peer feedback in enhancing the written discourse of third-year English major students at Isabela State University-Echague Campus during Academic Year 2025-2026. Employing a mixed-methods design, the study compared students' expository essays before and after the intervention using a validated rubric focusing on language, organization, and content, complemented by discourse analysis of writing development. Quantitative results revealed significant improvements across all writing domains after the integration of AI tools and peer feedback, regardless of sex. Qualitative findings further indicated enhanced coherence, linguistic accuracy, and content development. The study highlights the pedagogical value of integrating AI-assisted tools with structured peer feedback and serves as a basis for designing a student-oriented training program to support ethical, collaborative, and effective ESL academic instruction.

INTRODUCTION

Writing has long been recognized as a key indicator of language proficiency among English as a Second Language (ESL) learners. Medico and Raymundo (2025) stated that writing in a second language requires learners to clearly express their ideas in written form while correctly using grammar, syntax, vocabulary, and coherence, a combination of demands that makes writing both essential and challenging to master. In academic contexts, learners are expected to produce written works that are coherent, grammatically accurate, and well-structured. In the Philippine higher education setting, the importance of academic writing is strongly emphasized through policies issued by the Commission on Higher Education (CHED).

The CHED Memorandum Order (CMO) No. 20, series of 2013, which established the General Education Curriculum, highlights the critical and analytical skills closely linked to effective academic writing. Similarly, CMO No. 74 series of 2017 mandates the demonstration of competence in written discourse across various disciplines, particularly in the humanities, social sciences, and teacher education, which underscores the need for clear, organized, and persuasive written communication.

In the field of English Language Education, Prudenciano and Raymundo (2024) stated that the importance of being skilled in academic writing has increased as it plays a key role in achieving academic success and advancing professional development. The Philippine educational system places considerable importance on writing as part of English as a Second Language instruction, which aims to enhance learners' ability to use English effectively in academic contexts (Pablo & Lasaten, 2018). Writing instruction in ESL settings not only introduces students to academic conventions but also seeks to develop their grammatical accuracy and ability to express complex ideas clearly (Magno & Amarles, 2011). Furthermore, mastering syntactical structure competence in academic writing is essential for promoting clear communication and supporting intellectual development (Reforsado & Raymundo, 2024). Despite its importance, academic writing remains a challenging skill for many ESL learners.

Research has shown that ESL students continue to encounter persistent difficulties in written discourse, particularly in terms of language use, organization, vocabulary limitations, and content development. Urbano et al. (2021) reported that learners struggle with insufficient background knowledge, frequent grammatical errors, limited lexical resources, and inconsistent use of writing patterns, all of which negatively affect the quality of their academic writing.

Thus, feedback plays a crucial role in addressing these writing challenges. Traditionally, feedback in SL classrooms has been predominantly teacher-led. While teacher feedback provides expert guidance, it also presents several limitations, such as delayed responses, generalized comments, and insufficient individualized attention, especially in large classes (Alisoy, 2024). Due to teachers' workload and time constraints, feedback may become superficial and may fail to adequately address learners' specific writing needs (Alisoy, 2023). Although immediate oral feedback has been shown to improve students' writing performance, particularly for less proficient learners (Yi, 2021), providing such feedback consistently remains difficult in typical classroom settings.

As an alternative approach, peer feedback has gained increasing recognition as an effective pedagogical strategy in ESL writing instruction. Peer feedback fosters collaborative learning, learner autonomy, and awareness of multiple audiences by engaging students in identifying problems, analyzing their causes, and suggesting revisions (Huisman et al., 2018). Studies have shown that peer feedback can enhance students' linguistic knowledge and writing accuracy when implemented effectively (Hyland, 2015; Kim & Emeliyanova, 2021). Additionally, peer feedback promotes critical judgment, self-assessment, and social interaction, contributing to a more engaging and learner-centered writing environment (Popta et al., 2017).

Furthermore, in recent years, the emergence of artificial intelligence (AI)-based academic writing tools has further transformed ESL learners' writing practices. These tools provide instant feedback on grammar, structure, coherence, and style, allowing learners to identify and correct errors immediately. Research indicates that AI-assisted writing tools can improve writing productivity, grammatical accuracy, organization, and idea generation, while also reducing writing anxiety (Zawacki-Richter et al., 2019, Rudoplh et al., 2023). Nazari et al. (2021) further suggested that AI applications can be effectively used to support non-native learners in English academic writing. However, concerns have been raised regarding students' potential overreliance on AI tools, which may reduce meaningful human interaction and hinder the development of critical thinking and independent writing skills. (Dangin & Hikmah, 2024).

Despite extensive research on feedback and writing technologies, there remains a limited understanding of how AI-supported academic writing tools and peer feedback function together to improve ESL learners' written discourse. Much of the existing research focuses on teacher-led feedback, often overlooking student engagement and collaborative learning processes. Moreover, several studies involve small sample sizes, limiting the generalizability of their findings (Landsberg et al., 2010). Hence, addressing these gaps is essential to developing a more balanced learner-centered approach to feedback in ESL writing instruction.

Therefore, this study investigated the effectiveness of artificial intelligence-supported academic writing tools with peer feedback in improving the written discourse of third-year English major students at Isabela State University-Echague Campus. Specifically, the study aims to examine how the integration of AI-assisted writing tools and structured peer feedback can enhance students' academic writing while fostering learner autonomy, collaboration, and responsible use of digital technologies in ESL learning contexts.

METHODS

Research Design

This study employed a mixed-method research design, integrating both quantitative and qualitative approaches to obtain a comprehensive understanding of the effectiveness of AI-supported academic writing tools combined with peer feedback in enhancing ESL students' written discourse in short essay writing.

The quantitative component utilized a descriptive-comparative pre-writing and post-writing design, which involved comparing the quality of students' written discourse before and after the implementation of AI-supported academic writing tools with peer feedback. This design allowed for the systematic measurement of changes in students' writing performance in terms of language, organization, and content.

To complement the quantitative findings, a qualitative approach was also employed through discourse analysis. This approach enabled an in-depth examination of students' written outputs across different stages of the writing process. Changes and patterns in language use, organization, and content development were analyzed to better understand how the combined use of AI tools and peer feedback influenced students' writing development.

Respondents and Locale of the Study

The study was conducted at Isabela State University-Echague Campus (ISU-E), specifically in the College of Education. This locale was selected because it offers teacher education programs that emphasize academic writing and language development, making it a suitable setting for investigating instructional innovations in ESL writing.

The respondents of the study were third-year students enrolled in the Bachelor of Secondary Education major in English during the Academic Year 2025–2026. These students had previously completed foundational writing courses, including Purposive Communication, and were expected to demonstrate a higher level of academic writing proficiency. A total of 34 third-year English major students participated in the study.

Sampling Method

The study employed total enumeration sampling, wherein all students who met the inclusion criteria were selected as respondents. This sampling method was appropriate because the target population was clearly defined and relatively small. Including the entire population ensured comprehensive data collection and provided deeper insights into students' writing experiences when AI-supported academic writing tools and peer feedback were integrated.

Research Instrument

The primary research instrument used in the study was a written discourse activity, specifically expository essay writing, which served as both the pre-writing and post-writing assessment. The essays were evaluated based on three criteria: language, organization, and content, which included the introduction, body, and conclusion.

A scoring rubric was developed by the researchers to assess the students' written discourse in both assessment phases. The rubric aligned with the objectives of the study and was subjected to expert validation by a research adviser from the English Department to ensure content validity. Revisions were made based on the adviser's feedback to enhance the clarity, relevance, and appropriateness of the rubric for tertiary-level expository writing.

In addition, a peer review checklist adapted from *Academic College Writing* by Lee et al. (2007) was used during the peer feedback phase. This checklist guided students in providing structured and constructive feedback aligned with the same criteria used in the scoring rubric.

Data Gathering Procedures and Analysis

Prior to data collection, a formal request was submitted to the College of Education for approval to conduct the study. Upon approval, coordination with the subject instructor was undertaken to finalize the data gathering schedule.

Data collection involved three structured phases:

Phase 1: Initial Writing (Pre-writing). Participants wrote an expository essay of at least 300 words without the use of AI tools or peer feedback. They were given one hour to complete the task using their laptops. Screen recording was activated to ensure that no external

assistance was used. The essays were evaluated using the validated scoring rubric by the researchers and two trained research assistants.

Phase 2: Peer Feedback. Students exchanged essays with their seatmates and provided feedback using the peer review checklist. This activity lasted forty minutes and focused on language, organization, and content.

Phase 3: Revision with Peer Feedback and AI Tools (Post-writing). Participants revised their essays based on peer feedback and subsequently used AI writing tools such as ChatGPT and QuillBot to refine their work. Screen recording was again required during this phase. The final drafts were submitted electronically and evaluated using the same scoring rubric.

Quantitative data were analyzed using descriptive statistics, including means and standard deviations, to describe students' writing performance before and after the intervention. To determine whether the observed differences in writing performance were statistically significant, the Dependent Samples t-test was employed, as the same group of respondents was assessed at two points in time.

Qualitative data were analyzed through thematic discourse analysis, which involved coding students' written outputs and identifying recurring patterns related to improvements in language use, organization, and content. These qualitative findings supported and explained the quantitative results.

Ethical Considerations

Ethical standards were strictly observed throughout the conduct of the study. Participants were informed of the purpose, procedures, and voluntary nature of the research. Informed consent was obtained prior to participation, and students were assured that their responses would remain confidential. No personal identifying information was collected, and all data were handled with utmost confidentiality to protect the participants' rights and welfare.

RESULTS AND DISCUSSION

Figure 1. Profile of the participants in terms of sex

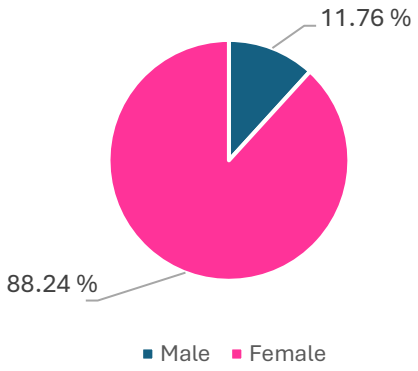

Figure 1 shows the distribution of participants according to sex. As reflected, out of 34 respondents, 4 (11.76%) were male, while 30 (88.24%) were female. The demographic profile reveals that female students outnumbered male students among the participants.

Table 1. Quality level of ESL students' written discourse before the implementation of AI-supported academic writing tools with peer feedback

Written Discourse (Pre)	Mean	Qualitative Description
Language	2.94	Satisfactory
Organization	2.82	Satisfactory
Content	2.51	Needs Improvement

Table 1 reveals that before the implementation of AI-supported academic writing tools with peer feedback, ESL students demonstrated satisfactory performance in language and organization but needed improvement in content development. This suggests that while students possess basic grammatical and structural competence, they struggle with higher-order writing skills, such as idea development and coherence. This pattern aligns with the research, indicating that L2 writers typically develop surface-level writing skills earlier than higher-order discourse abilities (Mahapatra, 2024; Kurt & Kurt, 2024).

Under the Language domain, lexical limitations are illustrated in the writing of Participant 4, who wrote: *"Public speaking is hard if you have not confidence you cannot really express what you want to say."* Although the intended meaning is clear, the nonstandard phrase "have not confidence reflects inaccurate word choice and incomplete mastery of English collocations, such as "lack confidence". Research shows that lexical inaccuracies and limited vocabulary range negatively affect clarity and rhetorical effectiveness in ESL writing (Alharbi, 2023).

A similar pattern is observed in the Organization domain, as seen in the writing of Particiapnt 10, who produced the following excerpt: "*Communication is very prominent in our daily life everyday we communicate, everywhere you go, we communicate, buying something, asking for a direction, and taking to someone that is how communication move to our life it is our life to communicate with others so as a speaker, we should possess this characteristics to have an effective but also impactful oral communication."* The excerpt presents an accumulation of ideas in a single, lengthy sentence without clear boundaries, transitions, or logical sequencing. Similar organizational difficulties, particularly in the use of transitional signals, have been reported among senior high school students, who often struggle to structure ideas cohesively in written discourse (Reforsado & Raymundo, 2025).

Finally, under the Content domain, unclear topic sentence formulation is evident in the writing of Participant 29, who wrote: "*Having someone to listen to your thoughts is an accomplishment cause not everybody will be willing to listen."* While the sentence conveys a meaningful idea, it does not clearly introduce the main point to be developed in the paragraph. Research emphasizes that ineffective topic sentences weaken paragraph structure and overall coherence in ESL writing (Bitchener & Basturkmen, 2006; Folse et al., 2010).

Altogether, the discourse features evident in the students' pre-intervention essays are consistent with empirical findings, showing that ESL writers often display partial control of linguistic accuracy and organization while struggling significantly with content elaboration and idea development (Mahapatra, 2024).

Table 2. Quality level of ESL students' written discourse after the implementation of AI-supported academic writing tools with peer feedback

Written Discourse (Post)	Mean	Qualitative Description
Language	4.32	Excellent
Organization	4.12	Good
Content	3.88	Satisfactory

After the implementation of AI-supported academic writing tools with peer feedback, students' written discourse improved across all domains. The improvement in content from Needs Improvement to Satisfactory suggests an enhanced ability to frame topics, elaborate ideas, and present clearer arguments.

Discourse evidence illustrates how the integration of AI prompts and peer feedback facilitated these improvements. For example, vocabulary competency development under the Language domain is evident in the writing of Participant 4. Prior to the intervention, the participant wrote, *"Public speaking is hard if you have not confidence, you cannot really express what you want to say,"* which shows that while the intended meaning was understandable, the student relied on basic vocabulary and demonstrated limited control over word choice and collocation. The phrase "have not confidence" reflects inappropriate lexical selection, and the repeated use of simple words such as "hard" and "really" indicates a restricted vocabulary range that weakens clarity and precision. After receiving the AI prompt *"Refine my essay but keep my writing style"* and peer feedback stating, *"You use simple words but few words do not match the sentence meaning,"* the participant revised the sentence to *"Public speaking can be difficult if you lack confidence, as it becomes challenging to express what you want to say clearly,"* The revised excerpt demonstrates improved lexical accuracy and appropriateness, as the incorrect collocation was replaced with "lack confidence" and vague informal words were substituted with more precise and academically suitable terms such as "difficult" and "challenging". This lexical refinement enhanced clarity, formality, and coherence while preserving the original idea. Vocabulary refinement has been shown to improve text readability and perceived writing quality, as essays using accurate and academically appropriate vocabulary receive higher evaluations (Crossley & McNamara, 2010). This supports the improvement in clarity and academic tone observed through AI-assisted revision. Ferris (2011) further emphasizes that both peer and automated feedback guide learners toward better lexical choices by making them aware of unclear phrasing and providing accurate alternatives. Together, these findings suggest that AI-supported refinement combined with targeted feedback facilitates vocabulary development by directing learners toward more appropriate lexical choices, a conclusion consistent with research identifying, identifying limited vocabulary range and inaccurate word choice as persistent challenges in ESL writing (Alharbi, 2023; Nation, 2013; Hyland, 2004).

Under the organization domain, improvement in logical flow is evident in the writing of Participant 18. Prior to the intervention, the participant wrote, *"Lastly, a speaker becomes impactful one when he knows when will be the right time to speak and when is the time to stop,"* where the main idea is present but the logical flow is weakened by awkward word order and repetitive phrasing. Expressions such as "becomes impactful one" and the repeated use of "when" disrupt the smooth progression of ideas, resulting in uneven coherence. To address

this issue, the student used the AI prompt *"Check my essay and make it clearer and easier to read but maintain my original ideas"* and received peer feedback stating, *"I can understand your thoughts but few parts are out of order."* After revision, the sentence became *"Lastly, a speaker becomes more impactful when he knows the right moment to speak and the appropriate time to pause or stop, allowing the message to flow naturally and resonate with the audience."* This shows that the revised excerpt demonstrates clearer sequencing and stronger logical connections, as unnecessary repetition was removed and ideas were ordered more naturally from condition to outcome. The AI tool supported reorganization and clarity, while peer feedback drew attention to ordering issues, resulting in a more coherent and readable sentence. Moreover, writing resources emphasize that effective flow transforms scattered ideas into a unified narrative by making relationships between ideas explicit, thereby reducing confusion and helping readers follow the progression of an argument across sentences and paragraphs (UAGC Writing Center, n.d.). This improvement aligns with writing research highlighting the importance of logical sequencing, transitions, and cohesive devices in guiding readers smoothly through written discourse (Purdue OWL, n.d.).

Evidence of improved paragraph development competency under the Content domain can be observed in the writing of Participant 7. In the original version, the participant wrote, *"First, is to be good at spontaneous communication that's according to the book I've read, they must be good at communicating with others and have a knowledge on how to start and end a communication,*" where the main idea is present but underdeveloped. The sentence attempts to introduce the topic, cite a source, and explain the idea simultaneously, resulting in a loosely structured and unclear paragraph opening with weak connections among ideas. To address this issue, the student used the AI prompt *"Revise my essay but maintain my ideas and thoughts"* and received peer feedback stating, *"Your ideas are presented and understandable but some ideas need clearer connection."* After revision, the paragraph was expanded into the following form: *"First, a speaker must be good at spontaneous communication. According to the book I have read, speakers should know not only how to talk to others but also how to properly start and end a conversation. For example, in our Sociolinguistics subject, we learned that a good speaker knows how to end a conversation naturally, without offending or hurting the listener."* This illustrates that the revised version demonstrates clearer paragraph development through the separation of the topic sentence, explanation, and example into logically connected sentences. This progression strengthens coherence and depth, allowing the reader to follow and understand the point more effectively. The combined use of AI-supported restructuring and descriptive peer feedback facilitated this improvement by modeling how ideas can be elaborated and connected, a process that aligns with Hyland's (2004) assertion that effective paragraphs move from a controlling idea to supporting details that clarify and strengthen meaning. Uru et al. (2021) also pointed out that a text or essay consists of paragraphs that focus on a single unifying idea, expressing related concepts, rather than a collection of sentences that each introduce a different topic. Furthermore, Connor and Farmer (1990), in their study, highlight that L2 writers benefit from explicit modeling of paragraph expansion strategies, such as adding clarifying information and concrete examples, which parallels how the revision transforms a single unclear sentence into a more developed and instructive paragraph.

Table 3. Difference in the level of written discourse before and after using AI-supported academic writing tools with peer feedback in terms of sex

Written Discourse	Male				Female			
	Pre-	Post-	t-value	p-value	Pre-	Post-	t-value	p-value
Language	3.17	4.33	-5.43	0.01	2.91	4.32	-20.45	0.01
Organization	3.25	4.75	-6.96	0.01	2.77	4.03	-14.59	0.01
Content	2.81	4.45	-4.80	0.02	2.47	3.81	-22.76	0.01

Table 3 indicates a statistically significant improvement in ESL students' written discourse before and after the use of AI-supported academic writing tools with peer feedback when grouped according to sex. All p-values (.01-.02) were below the 0.05 level of significance, indicating meaningful improvement for both male and female participants and supporting the acceptance of the null hypothesis as stated. Mean scores increased across all domains for both groups: males improved from 3.17 to 4.33 in Language, 3.25 to 4.75 in Organization, and 2.81 to 4.45 in Content, while females increased from 2.91 to 4.32 in Language, 2.77 to 4.03 in Organization, and 2.47 to 3.81 in Content. These results show that both sexes benefited from the intervention, with only slight differences in the magnitude of improvement across writing competencies.

In the Language domain, improvements were observed for both female and male participants following the integration of AI-supported writing tools and peer feedback. For Female Participant 6, the pre-writing excerpt *"Is it okay to fail; practice it always"* revealed grammatical inaccuracy and unclear meaning. Using the AI prompt *"Polish my essay. Improve grammar and clarity without changing my ideas*" and peer feedback noting *"grammar errors and unclear transitions,"* her revised output showed improved grammatical accuracy, clearer meaning, and greater linguistic precision. It indicates that AI-assisted refinement supported surface-level accuracy, while peer feedback enhanced clarity, reflecting patterns reported among female learners who tend to engage more effectively with feedback for grammatical improvement (Reilly et al., 2019). Similarly, Male Participant 12 demonstrated gains in vocabulary and sentence structure. His original writing included incorrect lexical usage (e.g., "a confidence") and awkward, run-on sentence construction. After applying the AI *prompt "Fix my grammar, sentence structure, and improve my vocabulary"* and peer feedback stating *"Sentences are unclear, awkward phrasing,"* his revised excerpt exhibited clearer diction, improved sentence variety, and stronger rhetorical emphasis. This suggests that explicit AI guidance combined with diagnostic peer feedback facilitated these improvements, aligning with studies highlighting the effectiveness of AI tools in refining lexical accuracy and syntactic clarity and noting that male learners often respond well to direct, tool-guided linguistic support (Ngo et al., 2022; Geçkin, 2020).

In the Organization domain, both female and male participants demonstrated improved coherence and logical flow following the integration of AI-supported writing tools and peer feedback. Female Participant 34, who used the AI prompt *"Enhance my essay and arrange my ideas"* and received peer feedback highlighting a *"lack of flow and sequencing,"* showed notable improvement in coherence and structural clarity. Her revised writing exhibited more controlled syntax, improved punctuation use, and clearer logical sequencing, addressing

the disorganization observed in the original draft. It suggests that peer feedback helped her recognize reader expectations, while AI support facilitated the restructuring and sequencing of ideas. This finding aligns with research indicating that peer feedback enhances coherence by making organizational expectations more explicit (Berg, 1999) and that female learners often engage more deeply with feedback, resulting in more coherent revisions (Noroozi et al., 2022). Similarly, Male Participant 33 showed marked improvement in logical flow and topic sentence development. His initial writing lacked a clear guiding idea and contained repetitive structures, which affected paragraph unity. After applying the AI prompt *"Improve my essay and use transitional devices if needed"* and receiving peer feedback stating *"Your ideas are a bit confusing,"* his revised output demonstrated clearer topic sentence placement and a more unified progression of ideas. It indicates that explicit AI guidance combined with diagnostic peer feedback supported structural reorganization, a pattern consistent with findings that male learners often show sharper gains in organizational coherence when provided with analytic and explicit revision cues (Mežek et al., 2021). This qualitative evidence reflects the substantial increase in male students' Organization mean scores from 3.25 to 4.75.

In the Content domain, both male and female participants demonstrated notable improvement in the development of the body paragraphs of their essays following the intervention. Male Participant 13, whose initial draft lacked elaboration, showed improvement after using the AI prompt *"Help me elaborate my ideas but do not change my meaning"* and receiving peer feedback stating *"Your content lacks depth."* His revised version demonstrated clearer explanation and greater detail sufficiency by providing definition, context, and conceptual elaboration, indicating strengthened content development. It implies that AI support facilitated structural expansion, while peer feedback encouraged deeper idea elaboration, a pattern consistent with studies noting that AI enhances lower-order accuracy while peer feedback supports higher-order idea development (Wulandari, 2024; Escalante et al., 2023; Sharmithashini & Hashim, 2025). Similarly, Female Participant 31 exhibited improvement aligned with paragraph development and example relevance. Her original draft was overly general and lacked concrete illustration; however, after using the AI prompt *"Check the flow of my ideas and improve clarity without changing my point"* and receiving peer feedback stating *"Ideas are too general,"* her revised paragraph presented a clearer topic idea, an elaborated explanation, and relevant examples supporting the main point. It highlights that reflective engagement with feedback enabled more expanded and cohesive revisions, aligning with findings that female learners often produce more elaborated revisions when provided with feedback (Noroozi et al., 2022).

The quantitative results and excerpt-based discourse analyses confirm that AI-supported academic writing tools combined with peer feedback significantly enhanced students' written discourse across Language, Organization, and Content. The consistently low p-values and increased mean scores across domains underscore the effectiveness of the intervention. Differences in improvement patterns further reflect prior findings that female learners tend to excel in linguistic accuracy and meaning clarity (Reilly et al., 2019), while male learners often benefit more from structured and analytic revision support, particularly in Organization and Content (Geçkin, 2020; Mežek et al., 2021). Collectively, these results indicate that the combined use of AI feedback and peer feedback offers an equitable and effective instructional approach for improving ESL students' written discourse regardless of sex.

Altogether, the results across Tables 1–3 indicate that AI-supported academic writing tools integrated with peer feedback significantly improved ESL students' written discourse in Language, Organization, and Content. Prior to the intervention, students demonstrated

adequate control of surface-level features but struggled with higher-order skills such as coherence and content development. Post-intervention findings showed consistent quantitative gains and qualitative improvements in vocabulary accuracy, logical flow, and paragraph development, reflecting the complementary roles of AI-assisted refinement and peer feedback. The sex-based analysis further revealed significant improvement for both male and female students, with no significant difference between groups, supporting the acceptance of the null hypothesis and indicating that the intervention was equitable across sexes. Minor variations in improvement patterns aligned with previous research; however, both groups benefited meaningfully from the combined approach. These findings support the use of AI-supported writing tools with structured peer feedback as an effective instructional strategy for enhancing ESL students' written discourse.

CONCLUSION AND FUTURE WORKS

This study examined the effectiveness of AI-supported academic writing tools integrated with peer feedback in enhancing the written discourse of third-year English major ESL students. The findings indicate that the combined approach led to significant improvements across the domains of Language, Organization, and Content, demonstrating that writing instruction benefits from pedagogical models that address both lower-order linguistic accuracy and higher-order discourse development. While students initially showed satisfactory control of surface-level features, post-intervention results revealed clearer vocabulary use, improved logical flow, and more developed and coherent content.

The results further highlight important instructional implications. The comparable improvement observed among male and female students suggests that the intervention is equitable and supportive of diverse learners. The study also underscores that AI-supported tools are most effective when used as pedagogical scaffolds rather than stand-alone correctors. When combined with structured peer feedback, AI tools promote reflective revision, collaborative meaning-making, and responsible engagement with writing tasks. The proposed student-oriented training program reinforces the need for intentional and ethical integration of AI to support sustainable writing development.

Despite these contributions, the study is limited by its small sample size, single-institution context, and focus on only three writing domains. Future research may involve larger and more diverse populations, explore additional writing dimensions such as style and critical reasoning, and adopt longitudinal designs to examine long-term effects. Further studies may also evaluate the implementation and scalability of the proposed training program and investigate learners' perceptions and ethical awareness in using AI-supported writing tools.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

DISCLOSURE OF AI ASSISTANCE

This section provides a transparent account of any artificial intelligence (AI) tools used during the conduct of the study or the preparation of the manuscript. ChatGPT was used to assist with paraphrasing selected portions of the text to improve clarity and coherence, while Grammarly was used for grammar checking and language correction. These tools were applied only for language refinement purposes and did not contribute to the methods and interpretation of results. All intellectual content and final decisions remain the responsibility of the researchers.

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