

Improving The Methodology for Developing Future English Teachers' Writing Skills Through AI Integration

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Abstract. The rapid spread of artificial intelligence (AI) writing tools has created both new opportunities and new risks for foreign language teacher education, particularly in the development of academic writing competence. This article addresses the problem of how AI-based tools can be integrated into the professional training of pre-service English teachers so that they strengthen, rather than replace, learners' own writing ability. Drawing on process-writing theory, sociocultural scaffolding, self-regulated learning, and the technological pedagogical content knowledge (TPACK) framework, the study proposes a five-stage AI-integrated methodology: (1) orientation and digital literacy awareness, (2) AI-assisted drafting, (3) AI-mediated feedback and revision, (4) critical evaluation and pedagogical reflection, and (5) autonomous and reflective writing. AI support is deliberately reduced across the stages, moving learners from AI-dependent to AI-informed, self-regulated practice. The methodology was tested in a quasi-experimental pretest–posttest design with an experimental group and a control group, using an analytic rubric with five criteria. Both groups started from comparable baselines (mean pretest scores of 2.75 and 2.72 on a five-point scale). The experimental group's mean gain (1.27 points) was more than twice that of the control group (0.57 points), with normalized gains of 0.54–0.61 versus 0.23–0.27. The largest difference appeared in the critical evaluation of AI-generated text (+1.54 vs. +0.67). The results suggest that systematic, teacher-guided AI integration can improve organizational, lexical-grammatical, and rhetorical writing competence while building the critical AI literacy that future teachers will need in their own classrooms. Practical recommendations for English teacher education curricula are provided.

Keywords: Artificial Intelligence, Generative AI, Writing Skills, Pre-Service English teachers, AI Literacy

1 Introduction

As education undergoes digital transformation, the ability to write clearly, coherently, and purposefully in a foreign language has become a core professional competence for English language teachers. Future English teachers must not only master academic and pedagogical writing themselves but also be able to teach writing effectively to their own students, increasingly through the mediation of digital tools [1], [2]. Traditional approaches to writing instruction in teacher training programs, however, still rely heavily on manual drafting, peer correction, and delayed teacher feedback. Such approaches rarely provide the timely, individualized guidance that sustained improvement in second language (L2) writing requires [3].

The emergence of generative AI and AI-based writing assistants—grammar and style checkers, paraphrasing tools, and large language models (LLMs) that can both generate and evaluate text—has significantly changed the landscape of L2 writing instruction [4], [5]. These tools provide instant feedback, generate model texts, suggest lexical and syntactic alternatives, and can act as a virtual interlocutor during iterative drafting [6], [7]. At the same time, uncritical or unstructured use carries real risks: over-reliance, reduced independent thinking, superficial engagement with the writing process, and threats to academic integrity [8], [9]. This tension raises an urgent methodological question: *how can AI tools be integrated into writing instruction so that they develop, rather than substitute for, the writing competence of future English teachers?*

The purpose of this article is to propose and empirically test a methodology for developing pre-service English teachers' writing skills through the systematic, pedagogically controlled integration of AI technologies. The study pursues four objectives: (1) to analyze current research on AI-assisted writing instruction in foreign language teacher education; (2) to identify the didactic conditions under which AI integration supports, rather than undermines, independent writing competence; (3) to design a staged methodological model for AI-integrated

writing instruction; and (4) to evaluate the pedagogical effectiveness of the proposed model through a formative experiment. Accordingly, the study addresses two research questions:

- a. RQ1. What stage-based methodological model can integrate AI tools into the writing instruction of pre-service English teachers while preserving learner autonomy and critical engagement?
- b. RQ2. To what extent does instruction based on this model improve pre-service teachers' writing performance and their ability to critically evaluate AI-generated text compared with traditional instruction?

The remainder of the article is organized as follows. Section 2 reviews the relevant literature and theoretical foundations. Section 3 presents the proposed five-stage methodology. Section 4 describes the research design. Section 5 reports the results, Section 6 discusses them, and Section 7 concludes the article.

2 Literature Review

2.1 Process Writing and Feedback in L2 Writing

The process approach views writing as a recursive cycle of planning, drafting, revising, and editing rather than a single-step product [1], [10], [11]. This approach emphasizes learner autonomy, multiple drafts, and feedback as central drivers of writing development. Feedback in particular is widely regarded as essential to L2 writing growth, yet its effectiveness depends on whether learners understand it, engage with it, and act on it in subsequent drafts [3]. Because the process approach is iterative and feedback-rich by design, it provides a strong theoretical basis for integrating digital tools that can deliver feedback at every stage of the writing cycle.

2.2 From CALL and Automated Writing Evaluation to Generative AI

Research in computer-assisted language learning (CALL) has long demonstrated the potential of digital tools to support L2 writing [2], [12]. Early work focused on automated writing evaluation (AWE) systems, which provide scores and corrective feedback. Reviews and empirical studies show that such feedback can improve the quality of revised texts, but its effects depend on feedback accuracy and specificity, learner engagement, and how teachers integrate the feedback into instruction [13]–[15]. Studies of learner engagement further show that students may accept automated suggestions without deep cognitive processing, which underlines the need for teacher mediation [16], [17].

The arrival of LLM-based chatbots such as ChatGPT has extended these possibilities from error correction to idea generation, outlining, rewriting, and dialogic feedback [4], [6]. Recent studies report that generative AI can support argumentative writing, increase writing efficiency, and produce feedback that learners find useful [7], [18], [19]. Comparative work suggests that AI-generated feedback approaches, but does not fully match, the quality of feedback from well-trained human evaluators [20]. At the same time, scholars warn that generative AI may encourage over-reliance, homogenized texts, and academic misconduct unless its use is explicitly framed and assessed [8], [9], [21]. Table 1 summarizes representative empirical studies and their implications for the present study.

Table 1. Representative Studies on Automated and AI-Assisted Feedback in L2 Writing

Study	Context / tool	Key finding	Implication for this study
Stevenson and Phakiti [13]	Review of AWE research	Computer-generated feedback improved revised texts, but evidence of transfer to overall writing proficiency was limited.	Automated feedback should be combined with instruction that targets transfer.
Ranalli [14]	University ESL; automated corrective feedback	Learners could act on automated feedback with moderate success; outcomes depended on feedback specificity and accuracy.	Learners need training to judge the accuracy of AI suggestions.
Zhang and Hyland [16]	Chinese EFL; teacher and AWE feedback	Deeper behavioral, cognitive, and affective engagement with feedback was linked to greater improvement.	Integrate AI and teacher feedback rather than use either alone.
Koltovskaia [17]	ESL; Grammarly	Students' cognitive engagement with Grammarly feedback was often limited, and some accepted suggestions uncritically.	Require justification of each accepted or rejected AI suggestion.

Link et al. [15]	EFL classes; AWE plus teacher feedback	AWE allowed teachers to shift attention to higher-level concerns; accuracy gains in revisions were less durable over time.	Assign the teacher a higher-order role while AI handles surface-level feedback.
Su et al. [7]	Argumentative writing; ChatGPT	ChatGPT can support outlining, revising, and proofreading, but its output requires critical scrutiny.	Use AI in drafting and revision stages under explicit criteria.
Yan [18]	L2 writing practicum; ChatGPT	ChatGPT increased writing efficiency, but learners raised concerns about academic honesty and fairness.	Address integrity explicitly in the orientation stage.
Escalante et al. [19]	University ENL learners; GPT-4 vs. human tutor	No significant difference in learning outcomes between AI and human feedback; preferences were mixed.	AI feedback can complement, not replace, human feedback.
Steiss et al. [20]	Secondary students; ChatGPT vs. human raters	Human feedback was rated higher on most quality dimensions, although ChatGPT feedback was produced far more efficiently.	Triangulate AI, teacher, and peer feedback.

2.3 AI Literacy and Teacher Knowledge in Pre-Service Teacher Education

In pre-service English teacher education, the integration of AI raises a dual requirement. Future teachers must develop their own writing competence, and they must also acquire the professional capacity to evaluate AI-generated content critically and repurpose it for their future classrooms. The technological pedagogical content knowledge (TPACK) framework conceptualizes this capacity as the integration of technological, pedagogical, and content knowledge [22]. Research on AI literacy adds that users need to understand what AI can and cannot do, evaluate its output, and use it ethically [23], [24]. International guidance similarly calls for human-centered, age-appropriate, and critically framed use of generative AI in education [25]. Nevertheless, systematic reviews have noted that educators’ perspectives and pedagogical frameworks remain underrepresented in research on AI in higher education [26]. This dual requirement—competence as a writer and competence as a future teacher of writing—distinguishes teacher education from general EFL writing instruction and justifies a specialized methodology rather than the direct transfer of general AI-assisted writing practices.

2.4 Theoretical Foundations and Research Gap

The proposed methodology rests on three complementary theoretical foundations. First, sociocultural theory holds that learners can perform beyond their independent level when supported by a more capable other within the zone of proximal development [27]. AI tools can serve as one source of such scaffolding, provided the support is gradually withdrawn. Second, the gradual release of responsibility model describes how instructional support should shift from teacher-led modeling to guided and then independent practice [28]. Third, self-regulated learning theory emphasizes goal setting, self-monitoring, and self-reflection as the processes that make learners independent [29].

A review of the literature reveals a clear research gap. Numerous studies describe isolated uses of AI tools—grammar checkers, paraphrasing tools, or chatbot-based feedback—in writing instruction, but few comprehensive, stage-based methodologies have been designed specifically for the professional training of future English teachers. Such a methodology should balance AI assistance with the deliberate development of independent, reflective writing and of pedagogical competence in using AI. The present study addresses this gap.

3 The Proposed AI-Integrated Methodology

Building on the theoretical analysis above, this study proposes a five-stage methodological model for developing the writing skills of future English teachers through AI integration (Figure 1). The model moves learners progressively from guided, AI-supported writing toward independent, self-regulated, and pedagogically reflective writing. Two design principles operate across all stages. First, AI support is *faded*: it is greatest in the

early stages and minimal in the final stage. Second, feedback is *triangulated*: AI feedback is always compared with teacher and peer feedback, so that learners treat AI output as one source of evidence rather than an authority.

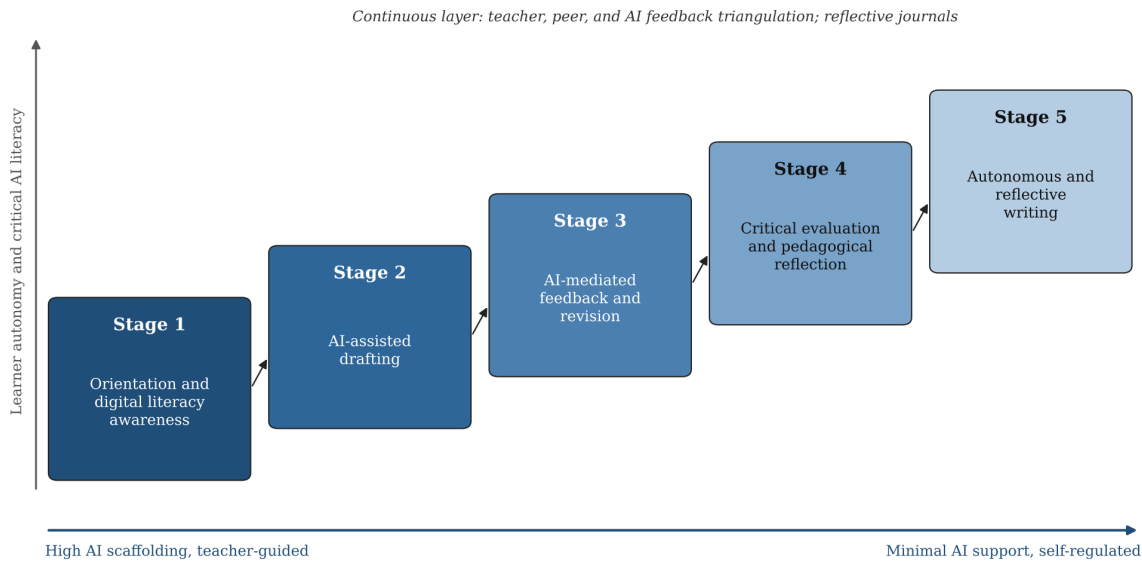


Figure 1. Five-Stage Model for Ai-Integrated Writing Instruction in Pre-Service English Teacher Education

- a. Stage 1: Orientation and digital literacy awareness
Learners are introduced to the capabilities and limitations of AI writing tools, the principles of academic integrity, and criteria for evaluating AI-generated text, such as accuracy, relevance, register, and the risk of fabricated sources [9], [25]. This stage establishes the critical stance that underlies all subsequent activities.
- b. Stage 2: AI-assisted drafting
Learners use AI tools to generate outlines, brainstorm ideas, and produce initial drafts on assigned academic or pedagogical topics. They must justify and modify AI suggestions rather than accept them uncritically, for example by keeping a log of accepted, modified, and rejected suggestions.
- c. Stage 3: AI-mediated feedback and revision
Drafts are analyzed with AI-based grammar, coherence, and style-checking tools. Learners compare AI feedback with teacher and peer feedback, identify discrepancies, and revise their texts based on a synthesis of all three sources [15], [16].
- d. Stage 4: Critical evaluation and pedagogical reflection
Future teachers analyze sample AI-generated texts from a pedagogical perspective. They discuss how such tools and texts could be used, adapted, or critiqued in their own classrooms, thereby linking personal writing development to professional teaching competence [22].
- e. Stage 5: Autonomous and reflective writing
Learners complete extended writing tasks with minimal AI support, relying primarily on strategies internalized in earlier stages. They then reflect in writing on their growth as writers and as future teachers of writing [29].

Table 2 specifies the aim, the role of AI, the role of the teacher, and typical learning tasks at each stage.

Table 2. Operationalization of the Five-Stage Ai-Integrated Methodology

Stage	Pedagogical aim	Role of AI	Role of teacher	Typical tasks
1. Orientation	Build critical AI literacy and integrity awareness	Object of analysis	Explains, models, and sets rules of use	Comparing AI and human texts; drafting an AI-use agreement
2. AI-assisted drafting	Generate and organize ideas	Brainstorming partner and outline generator (high support)	Sets tasks and checks justification logs	Prompting for outlines; annotating accepted, modified, and rejected suggestions

3. Feedback and revision	Improve accuracy, cohesion, and style	Source of automated feedback (moderate support)	Provides higher-order feedback; mediates discrepancies	Triangulating AI, peer, and teacher feedback; revision with a change log
4. Critical evaluation	Link writing to teaching competence	Producer of sample texts for critique	Facilitates pedagogical discussion	Error analysis of AI texts; designing a classroom activity using AI
5. Autonomous writing	Transfer strategies to independent work	Minimal or none	Assesses and gives summative feedback	Timed or extended essay; reflective writing journal

4 Research Design and Methods

4.1 Design

The study combined theoretical and empirical methods. At the theoretical level, analysis, synthesis, comparison, and generalization of the literature on process writing, CALL, and AI in education were used to construct the conceptual basis of the methodology (Sections 2 and 3). At the empirical level, the study used pedagogical observation, a diagnostic questionnaire, and a formative pedagogical experiment with a quasi-experimental, nonequivalent-groups pretest–posttest design.

4.2 Participants and Setting

Participants were pre-service English teachers enrolled in degree program and year of study at Urgench State Pedagogical Institute, Uzbekistan, during semester and academic year. Intact groups were assigned to an experimental group.

4.3 Instruments

Writing performance in both groups was assessed before and after the intervention with an analytic rubric adapted from established L2 writing assessment practice [30]. Each criterion was scored on a five-point scale (1 = very weak, 5 = excellent). The rubric included four general writing criteria and one criterion targeting the critical evaluation of AI-generated text, which was applied to both groups to allow comparison (Table 3). A diagnostic questionnaire was also administered to collect participants’ self-reported confidence in using and evaluating AI tools for writing and teaching.

Table 3. Analytic Rubric Criteria Used in the Pretest and Posttest

Criterion	Focus of assessment
Task achievement	Relevance to the prompt, development of ideas, and fulfillment of genre requirements
Organization and coherence	Logical structure, paragraphing, cohesive devices, and progression of ideas
Lexical resource	Range, precision, and appropriateness of vocabulary and academic register
Grammatical accuracy	Range and accuracy of grammatical structures, punctuation, and mechanics
Critical evaluation of AI text	Ability to identify factual, linguistic, rhetorical, and ethical weaknesses in an AI-generated text and to propose justified revisions

4.4 Data Analysis

For each criterion, group means were calculated for the pretest and posttest, along with the absolute gain (posttest minus pretest) and the difference in gains between the groups. Because the two groups started from slightly different baselines, the normalized gain, $g = (\text{posttest} - \text{pretest}) / (5 - \text{pretest})$, was also computed to express each gain as a proportion of the maximum possible improvement [31].

5 Results and Discussion

5.1 Results

Table 4 presents the pretest and posttest means for both groups. At pretest, the two groups were closely matched: differences on every criterion were no greater than 0.03 points, and the overall pretest means were 2.75 (EG) and 2.72 (CG). Both groups improved by the posttest, which is expected after a semester of writing instruction. However, the experimental group improved substantially more on every criterion.

Table 4. Pretest and Posttest Mean Scores of the Control and Experimental Groups (Five-Point Scale)

Writing criterion	CG pre	CG post	CG gain	EG pre	EG post	EG gain	Difference in gains (EG – CG)
Task achievement	2.85	3.35	+0.50	2.88	4.05	+1.17	+0.67
Organization and coherence	2.72	3.28	+0.56	2.75	3.98	+1.23	+0.67
Lexical resource	2.90	3.42	+0.52	2.93	4.08	+1.15	+0.63
Grammatical accuracy	2.68	3.30	+0.62	2.70	3.95	+1.25	+0.63
Critical evaluation of AI text	2.45	3.12	+0.67	2.48	4.02	+1.54	+0.87
Overall mean	2.72	3.29	+0.57	2.75	4.02	+1.27	+0.69

Note. CG = control group; EG = experimental group. Gain = posttest – pretest. Difference in gains = EG gain – CG gain.

Across the five criteria, the experimental group's mean gain (+1.27) was more than twice that of the control group (+0.57). The difference in gains was similar for the four general writing criteria (+0.63 to +0.67) and largest for the critical evaluation of AI-generated text (+0.87). Figure 2 visualizes these gains.

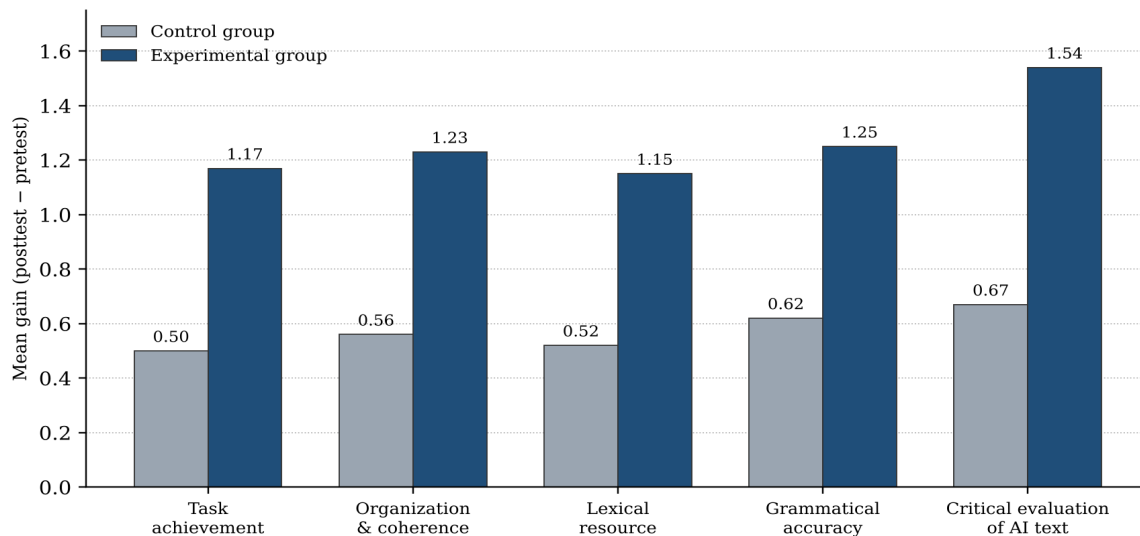


Figure 2. Mean Gains (Posttest – Pretest) by Writing Criterion for the Control and Experimental Groups

Table 5 reports the normalized gains and the relative improvement from the pretest. The experimental group achieved normalized gains between 0.54 and 0.61, meaning it closed more than half of the gap between its starting level and the maximum score. The control group's normalized gains ranged from 0.23 to 0.27. The largest relative improvement occurred in the critical evaluation of AI text, where the experimental group's mean rose by 62.1% compared with 27.3% in the control group.

Table 5. Normalized Gain and Relative Improvement by Criterion

Writing criterion	CG normalized gain (g)	EG normalized gain (g)	CG relative improvement	EG relative improvement
Task achievement	0.23	0.55	17.5%	40.6%
Organization and coherence	0.25	0.55	20.6%	44.7%

Lexical resource	0.25	0.56	17.9%	39.2%
Grammatical accuracy	0.27	0.54	23.1%	46.3%
Critical evaluation of AI text	0.26	0.61	27.3%	62.1%

Note. Normalized gain $g = (\text{post} - \text{pre}) / (5 - \text{pre})$ [31]. Relative improvement = $(\text{post} - \text{pre}) / \text{pre} \times 100$.

Observation and questionnaire data were consistent with these scores. Participants in the experimental group reported greater confidence in evaluating AI output and in adapting AI tools for future classroom use. During revision, they more often questioned or rejected AI suggestions rather than accepting them wholesale.

5.2 Discussion

5.2.1 Interpretation of the Findings

With regard to RQ1, the study proposed a five-stage model in which AI support is gradually faded and AI feedback is always triangulated with teacher and peer feedback. With regard to RQ2, the experimental results indicate that this model was associated with greater improvement than traditional instruction on all five criteria. These findings are consistent with the CALL literature, which suggests that structured, critically framed AI integration enhances rather than diminishes learner engagement with the writing process [2], [4]. They also align with evidence that automated feedback is most effective when it is combined with teacher feedback and when learners engage with it cognitively rather than mechanically [15], [16].

The largest gain appeared in the critical evaluation of AI-generated text. This is plausibly a direct effect of Stages 1, 3, and 4, which require learners to justify, compare, and critique AI output. The result is important because previous studies have documented a tendency among learners to accept automated suggestions uncritically [8], [17]. By making critical evaluation an explicit and assessed learning outcome, the staged model appears to address the risk of over-reliance identified in the literature. The comparable gains on the general writing criteria suggest that AI support did not simply improve surface accuracy but also contributed to organization, lexical range, and task achievement—areas in which AI feedback can model alternatives that learners then adapt [7], [19].

5.2.2 Implications for English Teacher Education

Three practical recommendations follow from the study. First, AI literacy and academic integrity should be taught explicitly at the start of writing courses rather than assumed [23], [25]. Second, AI tools should be positioned as one feedback source among several; requiring learners to reconcile AI, peer, and teacher feedback promotes deeper engagement and helps them recognize AI errors [20]. Third, teacher education programs should treat AI-integrated writing pedagogy as part of future teachers’ TPACK, giving pre-service teachers opportunities to design and critique AI-supported writing activities for their own future learners [22], [24].

5.2.3 Limitations

Several limitations should be acknowledged. The study used intact groups within a single institution, which limits generalizability and does not rule out group-level differences. The current report presents descriptive statistics only; inferential tests and effect sizes are needed to confirm that the observed differences are statistically reliable. The control group was not explicitly taught to evaluate AI text, so part of the difference on that criterion may reflect differential exposure to the task format. In addition, the study measured short-term outcomes; it remains unknown whether the gains persist once AI support is fully withdrawn. Finally, the rapid evolution of AI tools means that specific tool features may change, although the pedagogical principles of fading and triangulation are intended to remain tool-independent.

6 Conclusion

Integrating AI into writing instruction offers substantial potential for improving the professional training of future English teachers, provided that the integration is systematically staged and pedagogically controlled. The five-stage methodology proposed in this article—orientation, AI-assisted drafting, AI-mediated feedback and revision, critical evaluation, and autonomous writing—offers a practical framework for achieving this balance. In a formative experiment, pre-service teachers taught with this methodology achieved more than twice the mean gain of a control group, with the largest advantage in their ability to evaluate AI-generated text critically. The methodology thus contributes simultaneously to learners’ personal writing competence and to their professional capacity to use AI tools critically and creatively in their future classrooms. Further research should verify the long-term effects of the methodology across different proficiency levels and institutions, use randomized or

matched designs with inferential statistics, and develop validated assessment instruments specifically adapted to AI-integrated writing instruction.

Declarations

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the author used Claude (Anthropic) to improve language and readability in US English, restructure sections, prepare tables and figures from the author's data, and format references in IEEE style. After using this tool, the author reviewed, verified, and edited the content as needed and takes full responsibility for the content of the publication. AI tools were not used to generate or alter research data, and no AI tool is listed as an author.

Conflict of Interest

The author declares no conflict of interest. The author has no financial or personal relationship with the developers of the AI tools used in this study.

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Ethics Statement

All participants were informed about the purpose and procedures of the study, participated voluntarily, and gave informed consent. Participation or nonparticipation had no effect on course grades, and all data were anonymized before analysis.

Data Availability Statement

The anonymized data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

The author was solely responsible for conceptualization, methodology, investigation, data analysis, and writing of the manuscript.

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