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A Conceptual Framework for LLM-Based Digital Scaffolding in Academic Writing: Adaptive Support for EFL Learners

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ABSTRACT

Large language models (LLMs) are currently having an impact on English as a Foreign Language (EFL) learners' academic writing development and performance across planning, drafting, revision, feedback incorporation, and self-assessment processes. Although several recent studies have provided empirical findings on learners' perceptions of AI-assisted writing, the nature of LLM feedback, AI's impact on learners' academic honesty, etc., scant research has focused on explaining how LLM-based support can be sequenced and structured as digital scaffolding for learners' independent writing versus open-ended LLM text generation. To address this gap, the current article provides an explanatory framework for designing LLM-based digital scaffolding support specifically for EFL learners' academic writing development. Employing a conceptual–methodological approach to analysis, this study conceptually reviews and synthesizes relevant recent scholarship on digital scaffolding, sociocultural learning, cognitive load theory, self-regulated learning, prompt engineering, adaptive feedback design, teacher-mediated LLMs, and learners' ethical and effective use of AI. Due to the nature of the study's focus on conceptual framework development, no empirical sample of participants was surveyed or observed. The final proposed framework was built through a synthesis of the previous literature and a construction of novel pedagogical models. Specifically, the framework suggests integrating learner–task–stage profiling with three-layer scaffolding (pre-writing, during-writing, and post-writing), calibrated prompting, adaptive feedback, reflective revising, teacher mediation, and ethical safeguards. The proposed explanatory framework provides researchers and teachers with a theoretically based pedagogical model to use LLMs to empower learner agency, metacognitive monitoring, academic integrity, and gradual release of responsibility in EFL academic writing.

KEYWORDS

Large language models, digital scaffolding, EFL academic writing, adaptive feedback, prompt engineering, learner autonomy

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1. Introduction

English as a Foreign Language (EFL) student writer processes of planning, drafting, revising, and evaluating have been augmented by large language models (LLMs). Automated writing tools previously offered superficial grammar correction or feedback mechanisms at best. Large language models, however, can do more than check grammar. They can also explain, model academia speak, offer revisions, and converse with students during the writing process. This affordance is particularly salient for EFL academic writing because students must simultaneously consider linguistic accuracy, lexical complexity, rhetorical structure, cohesion, argumentative development, source use, and authorial voice. Recent research has shown that ChatGPT and other similar AI writing tools can contribute to language learning and writing development when they are applied with transparent pedagogical objectives and not as free text generators (Kohnke et al., 2023; Mahapatra, 2024; Meniado et al., 2024).

The increasing use of LLMs in writing classes develops a pedagogical issue. Most learn- ers apply LLMs through broad directives such as "improve this paragraph," "rewrite this essay," or "make this more academic," which may yield more fluent texts but not necessarily more competent writers. Research into AI-assisted and chatbot-supported writing has it that digital tools can support idea generation, argumentative development, feedback engagement, and revision; yet their educational value lies in how learners interpret, evaluate, and act on AI-generated support (Guo et al., 2022; Koltovskaia, 2020; Yan, 2023). In short, it is not better writer develop- ment that should be confused with better textual quality.

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Recent studies have started revealing that LLM-backed writing proves most efficient when combined with teacher instruction, prompt control, feedback interpretation, and self-regulated learning. For instance, ChatGPT was found effective as a formative feedback tool for ESL academic writing by Mahapatra (2024). Asadi et al. (2025) also found that ChatGPT feedback, when integrated with teacher feedback, enhanced EFL writing outcomes. In addition, Jin et al. (2025) showed that self-regulated learning strategies determine how students use AI in academic writing, implying that effective use of AI depends on whether the learners can plan, monitor, and evaluate their writing decisions.

Despite this progress, the area still lacks cohesive and well-defined theoretical understandings of how LLM assistance can function as digital scaffolding instead of merely AI assistance. Research has explored student perceptions, feedback quality, academic integrity and short-term writing performance. Much less has been conceptualized about how LLMs can assist EFL writers in the pre-writing, during-writing, and post-writing phases in ways that are adaptive, ethical, metacognitive, and developmentally-based. Scaffolding is neither providing answers nor drawing out error-free writing; it is instruction that is intentional, temporary, and adaptive slowly shifting responsibility onto the learner.

This study is grounded in the theoretical frameworks of digital scaffolding, self-regulated learning, prompt engineering, adaptive feedback, teacher mediation, and ethical AI. Prompt engineering is an academic literacy practice through which writers can learn to define their writing problems, limit AI participation, and retain authorial agency. Yet issues of authorship, dependency, transparency, and academic integrity suggest LLM use should be teacher-mediated and logged with reflective revision activities.

The primary purpose of the study is to propose a framework for conceptual LLM-based digital scaffolding that can support the academic writing development of EFL learners in planning, drafting, revising, and self-evaluation stages. There are specific research questions including how to conceptualize LLM-based scaffolding, pedagogical principles for its adaptive use to promote learner agency and metacognitive regulation, and how teacher mediation matters in this process. This research paper contributes to the literature by distinguishing between AI writing assistance versus pedagogical writing scaffolding and situating prompt engineering within the spectrum of metacognitive writing practice and adaptive feedback with ethical/logical and teacher-mediated revision. The literature review section will review related literature on LLM-supported writing instruction, digital scaffolding, self-regulated learning, prompt engineering, and ethical AI-mediated academic writing building on its empirical and theoretical foundations.

1.1 Research Questions

1. How can LLM-based digital scaffolding be conceptualized to support EFL learners' academic writing development across planning, drafting, revising, and self-evaluation stages?
2. What pedagogical principles should guide the adaptive use of LLMs in EFL academic writing instruction?
3. How can LLM-based scaffolding promote learner agency, metacognitive regulation, and authorial voice rather than dependency on AI-generated text?
4. What role should teachers play in mediating LLM-supported academic writing to ensure ethical, purposeful, and developmentally appropriate use?

With the research problem, gap, originality, and guiding questions set, the next section will review the conceptual and empirical foundations that inform the proposed framework.

2. Literature Review and Conceptual Background

2.1 LLMs and Digital Scaffolding in EFL Academic Writing

Online digital academic writing support for students writing in English as a foreign language has evolved with large language models to provide explanations and examples along with choices for revision and real-time interactive feedback as students compose writing. Previous automated digital writing tools provided mainly error correction feedback; large language models are able to support wider rhetorical and cognitive needs such as developing ideas, organizing paragraphs, coherence, argument, and academic formality. Their usefulness as educational tools will rely on students using them as writing scaffolds versus replacements for student decision making. Recent studies prove that generative AI can reshape the writing process by itself. In a research work done by Liu et al. (2024), it was observed that EFL learners applying generative AI in digital composing redistributed parts of the composing process between themselves and the tool. This finding matters because it suggests that LLMs may change how learners generate, organize, and evaluate ideas. A similar study by Strobl et al. (2024) showed that ChatGPT enhances advanced L2 writers' awareness of textual choices through comparison as a "writing buddy." These studies prove that LLMs can support writing development when learners remain critically involved. They also demonstrate that AI enabled writing needs to be well-designed to avoid promoting passive consumption of AI-produced text.

2.2 Scaffolding, Sociocultural Learning, and Writing Development

Scaffolding, fundamentally, is how LLMs can aid EFL academic writing. Through a sociocultural lens, scaffolding is defined as temporary and contingent assistance enabling a learner to complete a task above their current individual capability while developing competence. Scaffolding is especially important to writing instruction as learners need to simultaneously attend to linguistic accuracy, content generation, rhetorical organization, and revising techniques.

Evidence has consistently supported the positive impact of scaffolding on EFL writing. Mohammadzadeh et al. (2020) found variations in scaffolding patterns affected learners' writing accuracy, fluency, complexity, and attitude toward writing. After similar investigations, Hassen et al. (2024) concluded that teaching scaffolding strategies led to significant improvements in EFL learners' overall writing performance as well as sub-skills of writing, including content, vocabulary, grammar, and organization. Claims that structured support results in better writing are therefore well-founded. However, this also suggests that scaffolding must be intentional, incremental, and adaptable. Simply giving assistance does not foster learner independence. Learners need to be guided through scaffolding to independence in writing.

LLMs blur the lines of the scaffolding relationship as they can provide expert-level feedback without having teacher judgment, background knowledge, or emotional investment. According to Soyoof et al. (2026), learners who were given scaffolded corrective feedback by the teacher had better performance than learners who were given the same feedback by ChatGPT. This was because the teacher's feedback built more trust and was tailored to the learners.This evidence is especially relevant to the present framework: LLMs may function as mediational tools, but they cannot replace teacher mediation. Their pedagogical value depends on how teachers structure, monitor, and interpret AI-supported writing activities.

2.3 Cognitive Load, Self-Regulation, and Metacognitive Support

Writing academically in English can be mentally effortful for EFL learners. Cognitive load theory posits that learning is difficult when activities tap into linguistic form, meaning, discourse organization, evidence cohesion, and reader awareness all at once. Ideally, LLMs can reduce unnecessary cognitive load by clarifying task instructions, explaining feedback, and demonstrating academic conventions. Conversely, if learners are able to achieve their writing objectives with too much assistance, they will be unmotivated to exert productive effort. Therefore, researchers should not only strive to make writing less effortful with AI, but appropriately dialed down. Jiang and Kalyuga (2022) proposed that EFL writing instruction could be informed by cognitive load theory. Because working memory has limited space, it can easily become overwhelmed by the simultaneous demands of language and composition. While this perspective validates the efficacy of LLMs (especially for planning and revising essays), it also warns teachers about over-assisting students. If learners avoid the mental effort required to generate ideas, organize arguments, or express themselves clearly by having the AI "do the work" for them, they will not learn.

As a result, teachers should supplement LLM support with metacognitive instruction. Students should ask themselves if a particular recommendation will allow them to achieve their goal (why?), whether it matches their intended meaning (does it fit?), and how they can modify the language without relinquishing ownership (how?). Therefore, we predict that effective uses of LLMs will involve activities such as reflective writing, journaling writing questions, and paraphrasing teacher comments. These strategies can help students learn not to simply accept AI edits.

2.4 Prompt Engineering and Adaptive Feedback

Prompt engineering is currently the primary method of translating interaction with LLMs into pedagogical scaffolding. An open-ended prompt, such as "rewrite my paragraph," gives the model too much agency and may produce elegant nonsense that benefits no learner. Constraining the prompt to ask the model to identify an issue, explain inadequacy, offer limited revisions, or generate reflective questions can help. As a result, effective prompting is part technical skill and part academic literacy practice. The quality of prompts had strong impacts on quality of feedback generated by LLMs, Jacobsen and Weber found in 2025. This finding has direct relevance to EFL writing instruction. If learners do not know how to ask for focused, limited, and developmentally appropriate support, then they cannot be expected to benefit from LLM feedback. Thus, prompt training should be a component of academic writing pedagogy.

Adaptive feedback should also be connected to the writing stage. Task interpretation, thesis development, and outlining receive feedback during pre-writing. Paragraph unity, coherence, and argument structure can be commented on during drafting, while in post-writing, support revision priorities, editing, and self-evaluation. Such a staged view would prevent LLM use from being reduced to final proofreading and would position AI feedback as part of a developmental writing process.

2.5 Ethical Use, Teacher Mediation, and Academic Integrity

The core concerns in LLM-supported writing are ethical. These embrace hidden authorship, overreliance, fabricated information, privacy, academic misconduct, and the weakening of independent writing ability. ChatGPT use in academia, as per Bin-Nashwan et al. (2023), is motivated by time-saving factors, academic self-efficacy, and stress and integrity concerns. Bittle and El-Gayar (2025) also argue that generative AI brings both opportunities and risks for academic integrity in higher education.

In EFL settings, this is particularly problematic since the fluency generated by AI may mask the learners' real developmental level. In other words, a learner may be able to produce a fluent text without being able to explain the ideas, rhetorical choices, or revisions in it. Therefore, ethical LLM use should not only be about prohibiting or detecting but rather supporting transparent pedagogy, including disclosure of AI use in the classroom, prompt documentation, revision notes, and reflective explanations.

Teacher mediation remains essential. Hence, it is important for the teacher to define acceptable AI use, model effective prompts, guide interpretation of feedback, and evaluate both the writing product and the writing process. So rather than diminishing teacher effectiveness, LLMs increase the value of teacher guidance. Learners still need significant support to productively use AI critically, ethically, and developmentally.

2.6 Synthesis and Research Gap

The literature surveyed suggests that LLMs may be able to support L2 academic writing instruction with feedback, modelling, explanation, and revision support. It also highlights that scaffolding, cognitive load, prompt engineering, teacher mediation, and academic integrity converge on the topic of responsible AI-enabled writing instruction as each of these areas have been examined independently from one another. Research has yet to adequately describe how support from LLMs may be sequenced into pedagogical scaffolding across pre-writing, during-writing, and post-writing activities.

There is a gap here, then, which this study hopes to address. The question is less about whether LLMs can help learners generate better texts, and more about how they can be sequenced to develop better writers.

Thus, the framework to be proposed integrates staged scaffolding, controlled prompting, adaptive feedback, reflective revision, teacher mediation, and ethical safeguards. The subsequent section details the conceptual-methodological design used in developing this framework and clarifying its pedagogical logic.

3. Methodology

3.1 Design and Methodological Approach

This article features conceptual–methodological research design, the purpose of which is to propose a theoretically informed framework for digital scaffolding through LLM use in EFL academic writing. The study does not involve experimental treatments, samples of participants, survey research, interviews, classroom observations, or statistical analyses. Instead, it proposes an integrative framework for understanding how LLM use can be pedagogically organized to provide scaffolded digital support to EFL learners during the academic writing process.

The choice of a conceptual–methodological design was informed by recent discussion of writing with AI tools. While various studies have examined dimensions such as AI-enabled feedback, learner perceptions of AI assistance, writing performance, teacher attitudes, academic integrity, and self-regulated learning with AI tools, this discussion has lacked an integrated framework that brings these dimensions together under an instructional scheme. LLM-supported writing remains a nascent area within applied linguistics research, EFL pedagogy, educational technology innovation, and AI-facilitated learning. The present study advances a scaffolded framework for this purpose.

Methodologically, this study does not attempt to provide empirical evidence regarding the effectiveness of LLM scaffolding. Rather, it explicates a set of assumptions, constructs, and logic about how LLM-supported writing can be pedagogically orchestrated.

3.2 Procedure for Developing the Framework

The framework emerged from cycles of reading research literature, synthesizing information, and distilling this into and across the following areas of related research: (a) LLM writing support, (b) pedagogy of EFL college-level writing, (c) online scaffolding, (d) automated writing evaluation, (e) cognitive load, (f) self-regulated writing processes, (g) prompt engineering/interrogation, (h) teacher mediation, and (i) ethical considerations for LLM use. Although this study is grounded in existing research literature, it does not aim to provide a systematic review. Instead, the review was conducted with the purpose of developing a coherent framework.

The procedure was comprised of five iterative steps. First, prior theoretical and empirical studies related to AI-supported writing were reviewed to identify common problems associated with tools like LLMs in academic writing. Based on this, problematic dimensions such as generic feedback, overreliance, diminished learner agency, obscured authorship, threats to academic integrity, and lack of teacher oversight were identified. Second, common constructs across empirical and theoretical publications were grouped into pedagogical categories necessary for the framework. Categories included learner–task–stage profiling, three-stage writing support, learner-controlled prompting, adaptive feedback, reflective revision, and ethical safeluards. Third, individual categories were mapped onto stages or subprocesses of academic writing; most commonly pre-writing, during-writing, and post-writing. Fourth, links between categories were developed to arrive at principles regarding how learners could appropriately draw upon LLM assistance within instructed writing contexts. Doing so required re-conceptualizing how LLM assistance could either count as pedagogical scaffolding (vs.) independent text generation. Finally, resulting principles were revisited and revised such that they explicitly emphasized learner independence (gradual release of responsibility), learner responsibility for revising texts, teacher supervision, appropriately documented and disclosed AI usage, and developmentally appropriate levels of support.

The product of this methodology allowed us to take emerging research surrounding AI-supported student writing and translate it into a comprehensive pedagogical framework for scaffolding LLM-supported EFL writing.

3.3 Foundations and Definition of Variables

At the heart of the framework is a differentiation between AI assistance and pedagogical scaffolding. AI assistance can be defined as just-in-time support offered through the LLM. If students, for example, request an LLM to assist them with writing, the AI may assist by helping them brainstorm ideas, grammar check, offer vocabulary, paraphrase sentences, explain writing issues, and increase coherence. Pedagogical scaffolding is instructional support that is structured, temporary, contingent on student need, and developmentally relevant. Scaffolding provides learners with support to complete writing tasks that they would not be able to do on their own given their current skill level. Scaffolds are slowly taken away in instruction as students gain independence.

Hence, the framework conceptualizes LLM supported digital scaffolding as structured and pedagogically-informed AI assistance that supports learners to improve their writing, but does not assume responsibility for authorship, decision-making, and revision.

Components of this construct include five interrelated dimensions of instruction: learner–task–stage input profiling, layer-wise writing support, controlled prompting, adaptive feedback, and reflective revision for autonomy.

Learner–task–stage input profiling refers to activation conditions that ensure learner and writing task are considered before LLM support is provided. Layered writing support refers to instructional support organized around different stages of the writing process. Controlled prompting refers to techniques that learners can use to organize their interactions with LLMs and avoid excessive reliance or overgeneration. Adaptive feedback refers to how learners can interpret feedback from LLMs to achieve stage-appropriate and personalized revision. Reflective revision refers to processes by which learners can revise their writing texts using AI feedback while developing autonomy.

3.4 Profiling Inputs for Adaptive Writing Support

LLM-supported digital scaffolding begins with learner–task–stage profiling. This upfront step is vital because the utility and specificity of LLM feedback depend largely on the specificity and clarity of input provided. For example, when learners provide highly-generic input such as "make this better," or "make this sound more academic," LLMs tend to return over-edited, generalized, or undifferentiated support. Although this is helpful for editing or fluency assistance, students require more scaffolding when receiving support from LLMs throughout the entire writing process. Therefore, our proposed framework first requires profiling of the learner, their writing task, and stage of the writing process before consulting any LLM support.

The learner profile consists of (as shown in Figure 2) the learner's English proficiency level, language strengths and needs, prior experience with academic writing, learner confidence and independence, understanding of academic integrity guidelines, and familiarity with LLMs. The writing task profile elements include the writing genre, assignment instructions, purpose, audience, assessment criteria, academic level, citation requirements, and discipline-specific conventions. Profiling the writing stage includes determining whether the learner is currently planning, drafting, revising, editing, or engaging in self-evaluation. Profiling support needs include determining the type of support needed (e.g., brainstorming ideas, generating a thesis statement, developing paragraph coherence, integrating sources, explaining feedback, or planning revision strategies). Profiling ethical boundaries refers to delineating what degree of support is permitted by the learner (e.g., AI-generated feedback only, limited rewording suggestions, no rewrites allowed, required documentation of AI use, and restriction of LLM use to certain stages of writing).

After these parameters are considered, learners may customize their search query or input in ways that customize the support they receive from the LLM. Profiling ensures that learners customize their inputs in ways that consider context, customize support to their current stage of writing, and set limits for acceptable AI assistance.

3.5 Architecture of Instructional Support

Following input profiling, learners receive scaffolded support at different stages of academic writing. The framework therefore adopts a process-oriented architecture that segments LLM-based support into three primary stages of EFL academic writing: (a) pre-writing, (b) during-writing, and (c) post-writing. Prefacing the discussion of each stage is a brief overview of the theoretical motivation for scaffolded support. Furthermore, because the framework is intended to reduce dependency on LLMs for purposes of entire essays or unbudgeted proofreading, post-writing support includes activities designed to promote reflection on AI support and self-regulated development of writing skills.

Overall, this scaffolding architecture recognizes that EFL academic writing involves multidirectional processes of planning, drafting, monitoring, revising, and editing.

3.6 Support Before Writing (The Planning Stage)

Support given prior to planned drafting constitutes the pre-writing layer. The primary purpose of this layer is to allow learners to prepare for the writing task. LLM-supported activities in the pre-writing phase should reduce unnecessary cognitive load, confirm learners understand expectations, and set learners up to successfully write their first draft.

Activities to consider when supporting pre-writing include having the LLM assist learners with: analyzing assignment instructions, selecting a topic or stance, listing important ideas related to the topic, formulating a thesis statement, deciding the order of paragraphs, identifying where to include evidence, or writing introduction/end sentences. Essentially, learners should take support from the LLM to plan how they will write their essay, not have the LLM write the essay for them.

3.7 Support During Writing (The Composing Stage)

During writing support is support while the learner is physically writing their paper. Support during writing should center around helping students generate ideas, organize their ideas, integrate sources, develop coherence, and use language appropriately. Examples of during-writing support: prompting the LLM to find problems with a claim, explain why something is incoherent, recommend combining ideas, show learners when they haven't provided enough evidence, or encourage learners to provide more explanation. Generally, LLM should not rewrite passages of text during support. Learners can, if necessary, have the LLM rewrite sentences, but not paragraphs. If support is limited to helping students diagnose writing issues, explaining writing concepts, and

brainstorming options, then learners keep ownership of their writing strings and LLM support will become a mediated writing development exercise.

3.8 Support After Writing (The Revision Stage)

Support after writing refers to scaffolding activities related to revision, self-evaluation, and editing. Activities related to this stage may include asking the LLM to: provide holistic feedback on writing problems, prioritize revision opportunities, check discourse coherence, improve academic language use, help assess strength of the argument, and/or record reflective notes on revision decisions. This stage of scaffolded support is critical because it requires learners to interpret and apply AI-generated feedback.

This layer makes the connection between providing and receiving feedback. Students should not simply accept all suggested revisions from the LLM. Instead, learners are encouraged to reflect on AI suggestions by asking: is this feedback accurate?, does the suggested revision match what I want to say?, will this revision improve my writing?, and can I still identify my own voice if I make this change?. Ideally, students will take notes on their revision decisions and rationale for accepting/rejecting AI support. Students can look back on these notes over time to track their writing improvement.

3.9 Prompting Techniques to Control Output

Prompting means search queries that come from users of these LLM tools. Remember that within our pedagogical model, prompting matters because it determines how specific, correct, how much detail, and what kind of output the learner will get back from the LLM. Have learners consider prompt engineering as a type of academic writing literacy skill.

Figure 3 outlines five prompting functions. Learners can ask the LLM to diagnose writing problems. Learners can ask the LLM to explain why a problem requires revision. Learners can ask the LLM to suggest possible revision options. Reflective questions can be posed to the LLM to generate self-evaluation prompts. Learners can control the level of assistance by restricting the LLM from rewording sentences or completing sentences.

By embedding these strategies into their interactions with the LLM, learners are effectively taking greater control of their writing development rather than receiving unrestricted support from the tool.

3.10 Logic of Adaptive Feedback

Building on learner-, task-, and stage-profiling, the logic of adaptive feedback is informed by four guiding principles: (a) adapt to learners' needs, (b) adapt to the writing task, (c) adapt to the writing stage, and (d) adapt to learners' agency needs. Adaptive feedback is learner-sensitive when it accounts for students' English proficiency level, confidence with writing tasks, experienced language needs, and readiness for self-regulated revision. Adaptive feedback is task-sensitive when it addresses the genre of writing, assignment instructions, purpose, audience, assessment criteria, academic level, citation practices, and discipline-specific conventions. Adaptive feedback is stage-sensitive when it complements learners' current stage of the writing process. Adaptive feedback is agency-sensitive when allows learners to remain in control of their writing.

Adaptive feedback does not seek to make learners' writing perfect. Rather, through adaptive support learners can come to understand (a) what their writing problems are, (b) how they can be addressed, and (c) how to address them independently in the future. Adaptive feedback should therefore be explanatory, corrective rather than directive, and should empower learners to make their own decisions about their writing.

3.11 Validation Plan for Future Research

Although not empirically validated in this article, future research is needed to test the proposed framework. Possible avenues for validating different aspects of the framework include collecting evidence of: (a) pedagogical validity or instructional value, (b) usability or practicality, (c) learner engagement, (d) impact on learner writing development, (e) ethical implementation practices, and (f) teacher mediation.

Studies may ask teachers for their opinions about how instructionally sound the scaffolding framework is, how useful the prompt functions are, how high-quality the AI feedback is, and what ethical norms they want students to follow when using AI writing tools. Studies conducted in classrooms may include experimental or observational research that assesses whether learners produce higher-quality writing, more effective revision behaviors and skills, greater understanding of their writing problems, greater metacognitive knowledge about academic writing, and greater awareness of their use of AI writing tools for learning when they use the framework. Learners' prompts, reflections on feedback, and edits to their writing may be collected through logs and used as evidence of learners' use of LLM support. Comparative studies may include experiments that compare learners' responses to the current framework with learners' uninstructed responses to LLM prompts, teacher feedback only, or traditional writing instruction without technology. Validation studies may include different age groups and levels of language learners and may assign learners writing tasks that are appropriate for their grade level/proficiency. Validation may also compare learners who are familiar with these LLM writing tools with learners who have not used them before. This is important to consider as how learners interact with LLM-supported writing may look different across age, proficiency, familiarity with LLMs, and other factors.

3.12 Ethical Considerations and Recommendations

The framework includes ethics as a core methodological consideration. As described in the article, ethics are integral because they address issues related to dependency on LLM tools, hidden authorship, inaccurate feedback, information literacy, privacy, bias, and autonomy.

To mitigate these risks, teachers and learners should: (a) be transparent about the ways they use LLM tools for educational purposes; (b) document and review prompts, AI-generated output, revision decisions, and copies of final revised texts; (c) disclose the extent and nature of LLM use in accordance with school policies; (d) enforce expectations about the types of support that are acceptable and those that will not be tolerated; and (e) use AI feedback for learning and personal development rather than making automatic changes to their writing texts. When these steps are taken, teachers will remain the mediators of AI writing tools in the classroom.

Empowering learners to use LLM tools does not mean allowing students to become reliant on the tools or blindly trust their suggestions. Student authorship and teacher mediation should remain integral features of LLM use in education.

3.13 Discussion of Methodology

The methodological limitation of this article is that it was designed to achieve specific aims. The study does not suggest that LLM-supported digital scaffolding improves EFL learners' performance on academic writing tasks, quality of revision, or autonomy. Instead, it advances a theoretical foundation and framework that may be evaluated for effectiveness in instructional contexts through future research.

Despite rapid advances in LLM technology and AI-assisted writing, there is still a need for pedagogical models that can inform how these tools should be used by teachers and learners. While it would have been unethical to test the framework using inexperienced learners, future validation is possible using experimental, mixed-method, longitudinal, and design-based research methodologies. Quasi-experimental studies may be employed to investigate improvements in writing quality. Case studies could investigate how students acquire early literacy behaviors. Mixed methods research could triangulate data on writing development and student perceptions of AI writing feedback. Action research or design-based research could assess behaviors and strategies around revision. Longitudinal studies may capture how learners internalize processes related to asking diagnostic questions, explaining writing problems, documenting revision changes, and managing their own writing development over time.

While the framework can be applied with any commercial LLM writing tool, implementation of the framework is not immune to contextual factors. Teachers and learners may experience barriers when applying the framework across diverse proficiency levels, learning tasks, institutional contexts, and levels of AI literacy. By clearly articulating its methodology, future researchers can build upon this foundation to validate, refine, and adapt this instructional framework.

4. Proposed LLM-Based Digital Scaffolding Framework for Academic Writing

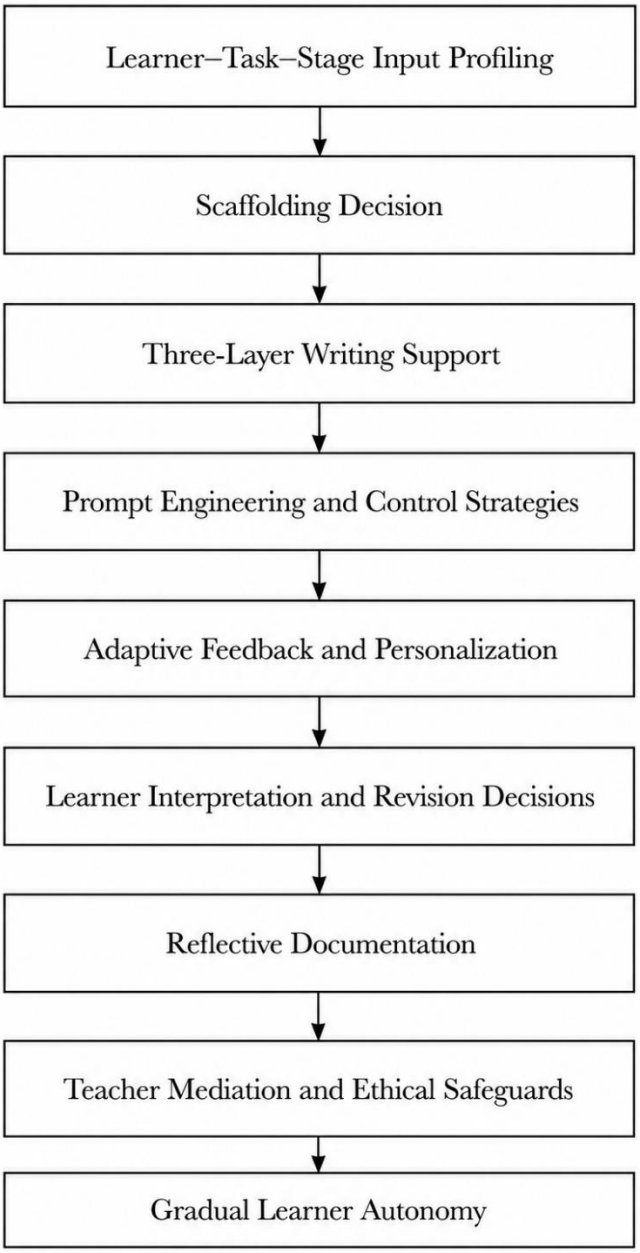
4.1 Overview of the Proposed Framework

The proposed LLM-based digital scaffolding framework presents large language models as adaptive pedagogical tools that can assist EFL learners in the entire process of academic writing. It does not consider LLMs as independent authors, automated producers of essays, or replacements for teacher feedback; rather, it places them as tools of mediation whose educational value comes from the guidance given by learner needs, requirements of different stages of writing, control over the prompt, mediation by the teacher, ethical safeguards, and reflective revision.

The framework assumes that academic writing is a process of development rather than a product at one point. EFL writers require support with not only language accuracy but also interpreting the task, brainstorming ideas, rhetorical organization, source integration, coherence and cohesion, making an argument, using an academic tone, revision, and self-assessment. Therefore, the framework accounts for distributing LLM scaffolds during three main stages of the writing process: pre-writing, during-writing, and post-writing. Grounding LLM use in a process-based framework also ensures we do not utilize these tools for merely surface-level proofreading at the end stage of writing or full-on task rewriting. By thinking of LLMs as one tool to support students in the scaffolds we provide across stages of writing development…

As shown in Figure 1, the five integrated parts of this writing framework include learner–task–stage input profiling, three-layer scaffolding, prompt engineering and control strategies, adaptive feedback and personalization, and reflective revision for learner autonomy. Teacher mediation and ethical considerations will be included throughout each component to support responsible usage of LLMs that are transparent, accountable, and developmentally fair.

Figure 1 Overall Architecture of the LLM-Based Digital Scaffolding Framework



Note. Figure 1. Overview logic of proposed framework. LLM support begins with contextual profiling, proceeds through staged scaffolding and calibrated prompting, and concludes with reflection, revision, teacher mediation, and progressive learner independence.

Figure 1 illustrates that the framework goes beyond simple learner-input AI-response interaction. The framework is a pedagogical sequence where learners establish writing goals, receive developmentally-appropriate support, interpret feedback and make revision decisions, and record their writing journey. By this design, application of the framework moves LLM use beyond indiscriminate text generation toward scaffolded writing growth.

4.2 Learner–Task–Stage Input Model

The learner–task–stage input model provides the initial input into the framework. The goal of this component is to ensure learner–LLM support is situation-specific, rather than generic. Learners often ask broad questions of LLMs ("Improve my essay" or "Make this sound more academic"), and while these queries can produce fluent responses, many actually constrain learner agency because the LLM needs to assume responsibility for most revision decisions. The proposed model shall address this issue by asking the learner to define five forms of input prior to receiving support: learner profile, task profile, writing stage, support need, and ethical boundary.

The learner profile includes proficiency level, strengths and weaknesses in language, academic writing experience, confidence as a writer, metacognitive awareness, and degree of independence. The task profile is the genre and requirements of the academic

writing assignment in terms of audience, purpose, rubric criteria, expectations on citations, and disciplinary conventions. The writing-stage profile indicates whether the learner is planning, drafting, revising, editing, or self-evaluating. The support-need profile specifies the type of assistance required, while the ethical-boundary profile defines the allowed level of AI involvement.

This input model allows LLM support to be aligned with learner development, task demands, writing stage, support need, and ethical constraints, as shown in Table 1.

Table 1 Learner–Task–Stage Input Model for LLM-Based Digital Scaffolding

Input dimension	Information required	Main focus	Pedagogical function
Learner profile	Proficiency level, grammar control, vocabulary range, writing confidence, academic writing experience, metacognitive awareness	Learner's current writing ability and support needs	Personalizes support according to learner development
Task profile	Genre, assignment instructions, rubric, audience, purpose, citation expectations, disciplinary conventions	Nature and requirements of the academic writing task	Aligns LLM support with task demands
Writing stage	Planning, drafting, revising, editing, or self-evaluating	Learner's current point in the writing process	Ensures stage-appropriate scaffolding
Support need	Idea generation, thesis development, paragraph coherence, source integration, grammar clarification, feedback explanation	Type of assistance requested	Prevents generic or excessive AI assistance
Ethical boundary	Feedback only, limited examples, no rewriting, required disclosure, prompt documentation	Permitted level of AI involvement	Protects learner authorship and academic integrity

The table indicates that LLM scaffolding should begin with a diagnosis phase, rather than jumping straight into text generation. By forcing the learner to identify their profile, task, stage of writing, support need, and ethical limit; learners develop metacognitive awareness prior to interacting with the AI. In this way, the input model acts as both a personalization and learner-training tool.

4.3 Three-Layer Scaffolding Model

The other main feature is the three-layer scaffolding structure. The structure arranges various kinds of LLM support around the writing process: pre-writing, writing, and post-writing. Each layer serves a unique pedagogical role while remaining interconnected with the others. Across the three layers, learners go through a cycle of development—from planning with support to drafting with guidance to revision with reflection. The pre-writing layer has to do with task interpretation, idea generation, topic narrowing, thesis development, outlining, and planning. At this stage, LLMs can assist learners in understanding the writing prompt, identify the key concepts, generate possible directions, and organize initial ideas. The LLM should not, however, produce a full essay or ready-made argument at this stage; rather, it should serve to stimulate thinking and aid the learner in making informed planning decisions.

The during-writing layer aids learners in their drafting. It covers paragraph development and topic sentences; coherence and logical progression; an academic tone; source integration; and rhetorical organization. At this stage, LLMs may help learners identify weak claims, unclear transitions, unsupported ideas, or problems in paragraph unity. Its goal is not to replace the learner's writing but to flag problems in the text that need attention and consider revision options with the learner.

The post-writing layer covers revision, reflection, self-evaluation, and final editing. At this point, LLMs support learners in assessing the overall quality of the draft, making coherence the main priority for revision, refining language, and preparing notes on the planned changes to be made. It is through this layer that the reflection of the learner connects the AI feedback.

Figure 2 illustrates the three-layer scaffolding model.

Figure 2 Three-Layer LLM-Based Scaffolding Model for Academic Writing

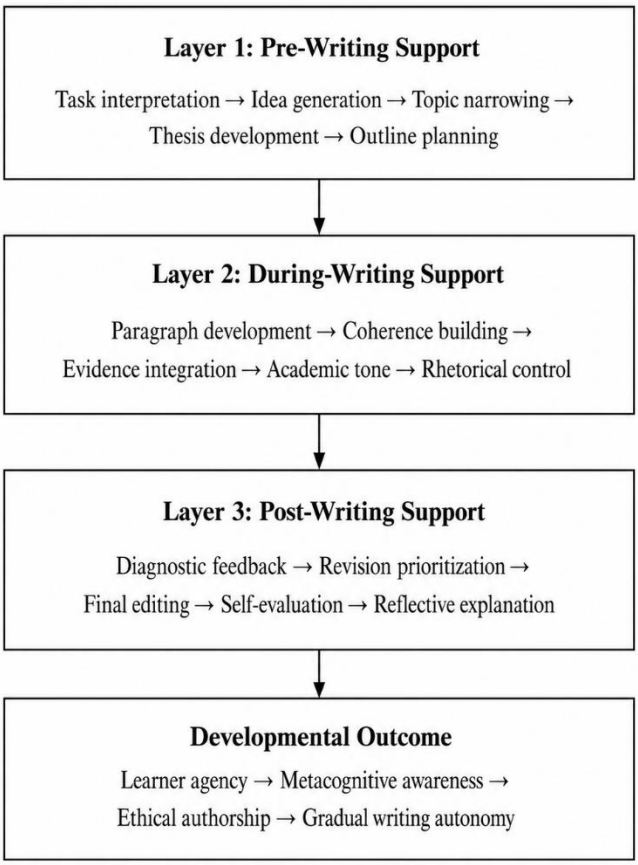


Figure 2 makes the point that scaffolding with LLMs should extend across the entire writing process. This is a process-oriented framework. I chose this because most students these days are only using AI in the last stage to fix their mistakes or make final tweaks. Here is how I see the model extending beyond that.

Table 2 summarizes the specific pedagogical function of each scaffolding layer.

Table 2 Functions of the Three Scaffolding Layers

Scaffolding layer	Writing focus	Possible LLM support	Learner responsibility	Developmental aim
Pre-writing	Planning and conceptual preparation	Clarifying task instructions, generating possible angles, comparing thesis statements, suggesting outline options	Selecting, modifying, and justifying ideas	Developing planning ability and rhetorical awareness
During-writing	Draft development and rhetorical control	Identifying unclear claims, checking paragraph unity, explaining coherence problems, suggesting transition strategies	Revising the draft while maintaining authorial voice	Strengthening monitoring and text-development skills
Post-writing	Revision, reflection, and self-evaluation	Providing diagnostic feedback, prioritizing revisions, checking clarity, supporting revision notes	Accepting, rejecting, or modifying feedback and documenting decisions	Developing metacognitive regulation and independent revision competence

Table 2 clarifies that scaffolding is not the same as text generation. Scaffolding supports the development of the learner, whereas unrestricted text generation may bypass it. Therefore, each layer maintains learner responsibility while using LLM support in planning, monitoring, revision, and autonomy.

4.4 Prompt Engineering and Adaptive Support Mechanism

Prompt engineering is the working means through which adaptive support can be provided in the framework proposed. Since LLMs respond according to the quality and specificity of user input, this prompts an essential academic literacy skill. A vague prompt tends to lead to very broad, polished, or overly interventionist feedback. In contrast, a controlled prompt can lead the LLM to provide focused, limited, and educationally useful support.

In this framework, prompt engineering serves two key goals. First, it guides learners to request suitable support for a particular writing need. Second, it stops the LLM from taking the reins of the writing process. Therefore, learners are advised to use prompts that ask for diagnosis, explanation, suggestions, and reflection — not prompts that ask for full rewriting.

For instance, the prompt "Rewrite this paragraph academically" gives the LLM too much control. A stronger pedagogical prompt would be: "Identify two weaknesses in the coherence of this paragraph and explain how I can revise them without rewriting the paragraph for me." The second prompt keeps the learner responsible for making changes and turns feedback into a learning opportunity.

The adaptive support mechanism operates using five kinds of prompts, as summarized in Table 3.

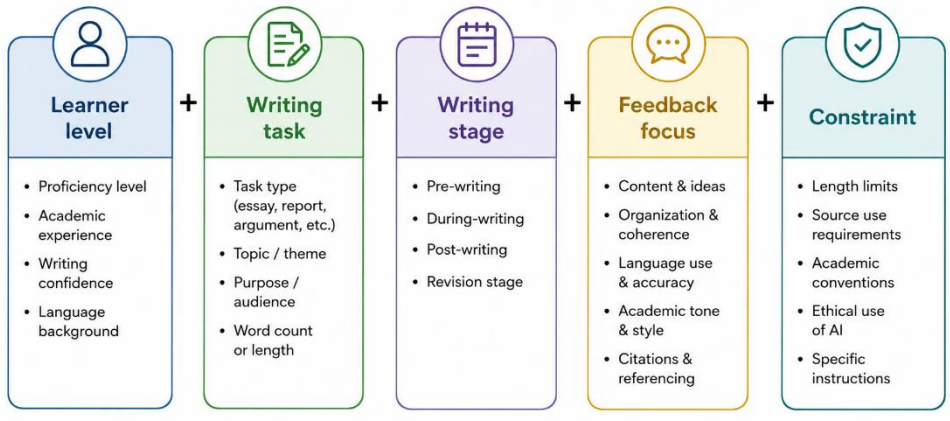
Table 3 Prompt Types for Adaptive LLM-Supported Academic Writing

Prompt type	Purpose	Example prompt	Expected learning outcome
Diagnostic prompt	To identify a specific writing problem	"Identify the main weakness in my thesis statement."	Learner notices targeted areas for improvement
Explanatory prompt	To understand why revision is needed	"Explain why this paragraph lacks coherence."	Learner understands the reason behind feedback
Strategic prompt	To receive revision options without losing control	"Suggest three ways to improve the organization without rewriting the paragraph."	Learner evaluates possible revision strategies
Reflective prompt	To support self-evaluation	"Ask me three questions to help me evaluate the strength of my argument."	Learner develops metacognitive awareness
Constraint-based prompt	To limit AI intervention	"Do not rewrite my text; only provide feedback on clarity and coherence."	Learner maintains authorship and decision-making control

Table 3 shows that prompt engineering can function as scaffolded academic literacy practice. In this case, the learners do not use prompts to get better text generated by AI but to define their writing problem, control the level of support, ask for explanation, and be in charge of the revision.

A complete, controlled academic writing prompt may include five elements, as shown in Figure 3.

Figure 3 Structure of Controlled Academic Writing Prompt



Examples:

I am an EFL student at an intermediate level.

I am writing an argumentative essay.

I am revising my introduction.

Please check that the thesis statement is clear.

Do not rewrite it.

Give three suggestions with explanations.

Note. The figure provides a controlled prompt structure that limits AI intervention while supporting focused feedback and learner decision-making.

As can be seen in Figure 3, effective prompting is not just asking the LLM for help. It requires the learners to specify who they are as writers, what task they are doing, where they are in the writing process, what feedback they need, and how much intervention is permitted. This structure will help transform the AI interaction into pedagogically manageable scaffolding.

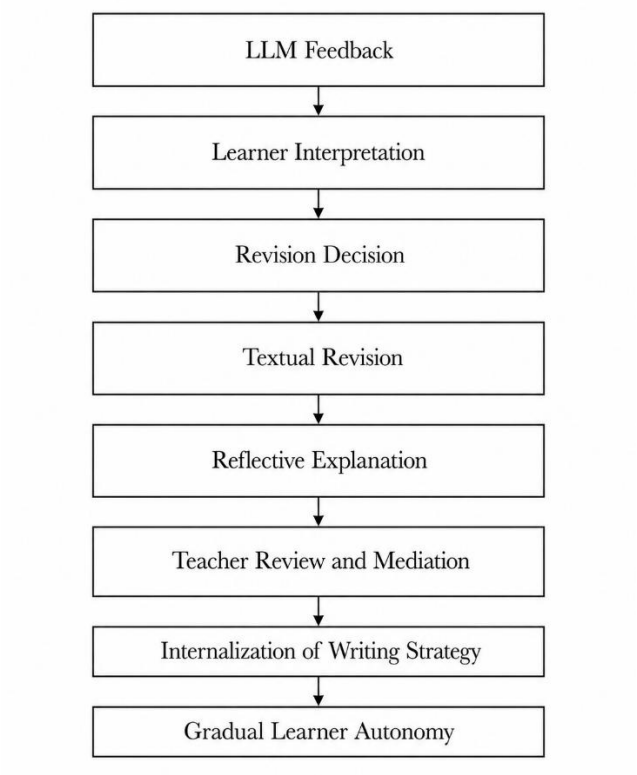
4.5 Feedback, Metacognition, and Learner Autonomy

Feedback is likely the single most important component of LLM-powered academic writing assistance. Feedback, however, only becomes educationally valuable when learners react critically towards it. While real-time AI feedback can speed up error detection, learners should not simply accept suggested edits. Learners can become lazy by simply copy-pasting suggested corrections they don't understand. For this reason, the framework couples feedback with metacognition and learner autonomy.

Metacognition is the learner's ability to plan, monitor, assess, and adjust the writing process. Learners can build metacognitive knowledge during LLM-assisted writing by asking themselves questions before accepting feedback. Three questions learners should ask themselves are: (1) What error is the feedback addressing? (2) Does this suggestion fix my intended meaning? (3) Is this edit suitable for the task? Additional questions can include: What can I learn from this piece of feedback? Can I recognize and apply this rule-edit pair myself next time?

To summarize, the framework suggests that learners undergo the following feedback cycle. They first receive feedback from the LLM. They then interpret the feedback. They consider whether they should accept, reject, or alter the suggestion. They apply the chosen edit(s) to revise their text. Lastly, they should write a short reflection to justify their decision. Figure 4 visualizes the reflective feedback cycle.

Figure 4 Reflective Feedback Cycle in LLM-Supported Academic Writing



Note. This graphic represents how feedback from the AI can be transformed into pedagogically valuable information as students interpret, judge, revise, and reflect on AI feedback rather than simply implementing edits.

Figure 4. Learner choice is core to this framework. This framework does not view AI feedback as inherently correct/valid nor does it have the learner simply implement edits. Learners must judge the quality of AI feedback, decide which feedback to act on, and

note why changes were made. In this way, the process proposed supports metacognitive regulation and, therefore, also protects authorial control.

Table 4 shows how feedback can be connected to metacognitive development and learner autonomy.

Table 4 Feedback, Metacognition, and Autonomy Development

Feedback stage	Learner action	Metacognitive function	Autonomy outcome
Receiving feedback	Reads LLM comments carefully	Awareness of writing problems	Learner notices areas for improvement
Interpreting feedback	Identifies the reason for the suggestion	Monitoring understanding	Learner evaluates feedback relevance
Making decisions	Accepts, rejects, or modifies suggestions	Strategic regulation	Learner maintains control over revision
Revising text	Applies selected changes	Performance regulation	Learner improves writing through informed choice
Reflecting	Explains revision decisions	Self-evaluation	Learner internalizes writing strategies
Transferring	Applies learned strategies to a new task	Independent regulation	Learner develops greater academic writing autonomy

As shown in Table 4, feedback should not simply be assessed by its impact on a single draft. Its primary pedagogical value is in whether it assists learners in becoming more reflective, strategic, and independent academic writers or not.

4.6 Alignment of the Framework with the Research Questions

The proposed framework directly addresses the research questions that guide this study. As shown in Table 5, each research question is aligned with one component of the framework and the pedagogical response. This demonstration of alignment shows that the framework does not describe LLM use in general, but it is a model driven by the research question for digital scaffolding with LLM in EFL academic writing.

Table 5 Alignment Between Research Questions and Framework Components

Research question	Framework component	Framework response
RQ1: How can LLM-based digital scaffolding support EFL learners across writing stages?	Three-layer scaffolding model	Organizes support across pre-writing, during-writing, and post-writing stages
RQ2: What pedagogical principles should guide adaptive LLM use?	Prompt engineering and adaptive support mechanism	Ensures support is specific, constrained, staged, and developmentally appropriate
RQ3: How can LLM scaffolding promote agency, metacognition, and authorial voice?	Reflective feedback cycle	Requires learners to interpret feedback, make revision decisions, justify changes, and maintain authorship
RQ4: What roles should teachers play in LLM-supported writing?	Teacher mediation and ethical safeguards	Positions teachers as guides for prompt design, feedback interpretation, process documentation, and academic integrity
RQ5: How can the framework integrate technology, theory, and writing pedagogy?	Overall framework architecture	Combines AI affordances, sociocultural scaffolding, self-regulated learning, process-based writing pedagogy, and ethical AI use

Table 5 confirms that the framework offers a coherent response to the main gap found in the literature. It specifies how LLM support can be structured across the writing stages, what pedagogical principles should guide adaptive use, how learner autonomy can be protected, and how teachers can mediate ethical AI-supported writing.

4.7 Conceptual Originality and Contribution of the Framework

Unpacking what makes this framework novel reveals two contributions. The first is a move from AI-enabled text production to AI-enabled writing development. The majority of ways we currently see LLMs being used to scaffold writing center around the final product: students hand over power to the AI to edit, polish, rewrite, or fully-complete text for them. By contrast, our model emphasizes staged writing support, student autonomy, metacognitive revision strategies, teacher mediation, and gradually release of responsibility.

A second contribution is our emphasis on how learner profiling can inform scaffolding choices during the writing process. Acknowledging that not all learners "look the same to AI," our model starts with learner/task/context/stage profiling. From there,

nuanced LLM writing support becomes possible and can attend to learners' language proficiency, writing purpose and genre, feedback preferences, and personal/ethical boundaries—a step we see as critical to more differentiated, effective, and ethical scaffolding.

The third contribution is a reconceptualization of prompt engineering as a pedagogical/metacognitive act. In our model, teachers and learners do not construct prompts simply to elicit better AI output. Students use prompts as learning tools to ask the AI to help them detect problems in their writing, request specific types of support, curb AI overwrites, and take responsibility for revision decisions.

The framework also builds ethical safeguards into the writing process itself. Prompt records, revision notes, AI-use disclosure, reflective explanations, and teacher mediation make AI use visible and accountable. The framework, therefore, offers a unified model for using LLMs in the development of more autonomous, reflective, and responsible EFL academic writers.

5. Discussion

The present study conceptualized an LLM-based digital scaffolding framework for EFL academic writing, to organize how large language models can be pedagogically used for the development of writing rather than mere support to facilitate text production. Since this study is more conceptual than empirical, the main "findings" are actually the components of the framework presented in Section 4: learner–task–stage input profiling, three-layer scaffolding, prompt engineering and control strategies, adaptive feedback, reflective revision, teacher mediation, and ethical safeguards. These components directly answer the research questions by showing how the support of LLM should be organized in the different stages of planning, drafting, revising, and self-evaluation and what adaptive use should be based on, how learner agency can be protected, and why teacher mediation is still needed in AI-supported writing instruction.

The first major finding is that LLM-based support becomes pedagogically meaningful only when it begins with learner–task–stage profiling. This component addresses the problem of generic AI interaction, in which learners ask broad prompts such as "rewrite my essay" or "make this academic." Such prompts may lead to fluent texts but not necessarily to awareness on the part of the learner regarding control over the long-term development of writing in a new register. Consequently, the framework presented here asks learners to declare their language proficiency level, task type, stage of writing, support need, and ethical boundary prior to deploying the LLM. This contribution moves the needle further than previous literature has claimed about the utility of generative AI for writing by advancing the conversation. Warzel and Treptow (2023) claim that ChatGPT creates both affordances and contradictions for second-language writers. Specifically, the tool can help with access and obfuscate authorship at the same time. The present framework offers a solution to this tension by introducing input profiling as a way of making learner need, task purpose, and AI involvement known. The second finding concerns how effectively LLM support can be distributed across pre-writing, during-writing, and post-writing phases. Adhering to a process-oriented model matters because much students' use of LLMs stays product-centred. The framework counters prevalent practices of limited LLM use when correcting, polishing, or rewriting text after a draft is completed. It positions academic writing support as a process that can help students interpret a task, come up with ideas, plan thesis statements, develop paragraphs, build coherence, prioritize revisions, and self-evaluate. The framework aligns with Li' (2025) critical synthesis of generative AI and second-language writing literature. Li concludes that research on GenAI and L2 writing is beginning to view writing more often as a recursive process that is impacted by writer agency, environmental feedback, prompting, and authorial negotiation. This paper makes a novel contribution to this literature by describing how those dimensions could be structured into phases of scaffolding rather than addressed separately.

The third conclusion is that prompt engineering ought to be viewed as a pedagogical and metacognitive practice, not merely technical skill. In this conceptualization, prompts are tools EFL learners can use to learn how to define their writing problems, delimit AI intervention, request explanations, and stay in control as authors. Tam's (2025) recent study on ChatGPT use and internal feedback also supports this perspective. Tam discovered learners' capacity to provide themselves quality feedback through ChatGPT was contingent on how they engaged with the tool as well as their interpretation of ChatGPT's responses. Similarly, Shi et al.'s (20 25) research showing that AI literacy skills and self-regulated learning predict student writing outcomes when using generative AI writing tools in postsecondary courses lends credence to this claim. For this reason, this framework conceives of prompt literacy as yet another strand of literacy that should be taught in tandem with feedback literacy, revision literacy, and ethical AI literacy during EFL academic writing instruction. The fourth finding relates to adaptive feedback. The framework doesn't view AI feedback as inherently useful. On the contrary, it posits that feedback only becomes educationally beneficial when it is stage-specific, learner-sensitive, and can scaffold connection-making during revision decisions. This position is bolstered by recent findings that ChatGPT feedback can resemble human-like feedback (similar to summary feedback above) in some ways and completely differ in attention to focus, specificity, and pedagogical subtleties in others. One example of a study demonstrating this idea is Steiss et al.'s (20 24) work, which showed that ChatGPT was able to offer quite effective feedback. However, this research also showed that when placed in comparison to human feedback. More precisely, evidence that debunks the idea mentioned earlier in this paragraph that AI feedback is inherently useful because it highlights how the comparison with human feedback is important for determining in what ways (if any) AI feedback may be useful. (20 25) demonstrated that while both ChatGPT-generated corrective feedback and human corrective feedback can support L2 writing development, we should not conflate their

pedagogical roles. The present framework interprets this evidence critically: LLM feedback can support the writing of EFL, but only when learners are guided to interpret, evaluate, and selectively apply it.

There is, however, an important contradiction. On the one hand, recent research appears to indicate that feedback from an automatic writing system may enhance the quality of revisions and be scalable in supporting writing; on the other hand, the evidence also indicates that learners may overtrust automated feedback or fail to understand its limitations. This may seem contradictory but this does not undermine the framework. Rather it supports the need for reflective revision as a core principle of LLM-based scaffolding. In other words, the framework demands that learners have to accept, reject, modify, and justify the AI's suggestions. With this consideration feedback is no longer treated as a correction mechanism, but rather as a cue for metacognitive decision-making. In this way, the framework recontextualizes the efficacy of AI feedback. It moves away from asking the question "Does the LLM improve the text?" (a question where learners are only passive decision-makers) and towards asking "Does the learner understand, evaluate, and internalize the revision principle?"

Finding 5 relates to teacher mediation. The framework repositions teachers not as replacement source of feedback but rather as mediator of AI-supported writing. This claim bears significance in both theory and practice. Recent research has shown that large language models can be consistent and accurate judges in pedagogical contexts (Seo et al., 2025). Where automated scoring/judging is concerned however, teachers should be skeptical of these measures and carefully consider how scores are being used. This finding aligns closely with the one above. If teacher mediation is required to confirm the validity of AI recommendations, contextualize AI feedback, explain/write ethical considerations, and/or gauge writing process/product, than teachers are less serving as providers of feedback on student writing but designers of ethical AI-enabled writing ecologies. The ethical or moral consequences of this framework are significant. As LLMs are able to produce quality academic writing, it may obscure a learner's true writing capability, particularly in EFL contexts where fluency is often equated with competency. Mizumoto et al. (2024) demonstrated that essays written by ChatGPT can be identified as not having been written by EFL learners through unique linguistic markers. This presents the risk that AI-generated fluency can obscure authorship of a text and the level at which it was written. Baek et al. (2024) found that students' perceptions of and actual use for generative AI was differentiated by institutional and social factors, indicating responsible use is contingent upon more than an individual learner's choices but also classroom environment and policy. These studies highlight the importance of timestamping, notes indicating usage of AI, and explicit rationale in LLM-informed writing instruction. The framework also contributes theoretically by integrating sociocultural scaffolding, self-regulated learning, cognitive load management, feedback literacy, prompt literacy, and ethical AI use into one model. Existing research often examines these areas separately. Luo et al. (2025)(2025) note that the field is rapidly expanding but remains quite distributed across tool types, feedback practices, learner outcomes, and ethical concerns. Hence, the current framework attempts to resolve such fragmentation by providing a conceptual building that is cohesive enough to set the affordances of AI into the appropriate relationship with conditions conducive to writing development. Its theoretical contribution is how it positions LLMs as mediational means amidst a learning ecology consisting of learners, teachers, tasks, prompts, feedback, reflection, and accountability.

Such considerations have transparent implications for EFL writing pedagogy. Teachers cannot simply ask students if they can or cannot use LLMs but how they can make AI-use transparent, limited, incremental, and conducive to development. In other words, writing assignments will need boundaries for AI-use, instructions for prompt-design, requirement for revision logs, and explanations of thinking. Learners will need to understand how to formulate diagnostic, explanatory, strategic, reflective, and bounded prompts. Evaluation should also take into consideration more than just the final draft. In order to evaluate how learners are using LLMs as scaffolding, assessment will also need to be more process-sensitive than before. By evaluating learners' strategies when generating ideas, how they interpret feedback, what they decide to revise and why, we can start to change how LLM use is perceived from cheating to learning.

That said, the proposed framework is not without flaws and should be used with caution. For one, it has not been empirically tested at the time of this writing. Therefore, the framework should be used more as a source of clarification over the idea itself and framework for teaching, rather than as a compilation of quantitative research data. Ideally, future studies will look to test the framework in authentic EFL writing environments by measuring the impact of conditioned LLM scaffolding against open-ended LLM use, teacher commentary only, and traditional writing instruction with no technological intervention. Possible dependent variables can include quality of writing, revision behavior, literacy of prompts, learner autonomy, interpretation of feedback, academic integrity, and teacher workload. Additional variables can include if certain levels of proficiency require different degrees of AI-support or if incremental scaffolding allows for knowledge transfer after the target writing task is completed.

To summarize, the researcher hopes to have provided value to previous discussions by identifying AI support and scaffolding in hopes of encouraging future teachers to use the later when integrating LLMs into their EFL writing classrooms. Students should not be assessed on the quality of an end-product that LLMs can easily produce for them, but instead on how they can plan, monitor, revise, and reflect on their ideas in order to one day write with little to no AI support. What makes this framework unique is how it incorporates learner profiling, incremental scaffolding, systematic prompting, adaptive feedback, and reflective journaling in conjunction with teacher involvement.

6. Conclusion

The paper proposed a conceptual framework of LLM-grounded digital scaffolding for EFL academic writing. Proposed to articulate ways that generative AI can be optimally used to mediate the development of writing without reducing learner agency or the potential for pedagogical mediation, our framework showed that intentional integration of LLMs for writing is pedagogically multistep beyond simply offering LLM-generated feedback. It includes learner/task/stage profiling, staged scaffolding throughout the pre-writing, during-writing, and post-writing phases, learner control of prompting, adaptation of feedback in response to revisions and reflection, and prevention of ethical issues. The main contribution of our framework defines the separation of AI help versus pedagogical scaffolding and repositions LLMs as mediational tools to support planning, monitoring, revising, and gradually transferring control. While yet to be empirically validated, our framework offers theoretical foundations for conscientious classroom adoption. By scaffolding L2 writers to become reflective, strategic, and ethical writers, it advances EFL writing pedagogy even as LLMs mediate it.

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