

The Pedagogical Effectiveness Of Ai-Based Feedback In Language Education: Evidence From University Students' Academic Writing

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Abstract: The growing use of artificial intelligence in higher education has reshaped how writing feedback is delivered, received, and revised. In language education, AI-based feedback has become especially relevant because it can provide immediate, individualized, and scalable comments on students' academic texts. This article examines the pedagogical effectiveness of AI-based feedback and its impact on university students' academic writing. The discussion is grounded in established feedback theory, which emphasizes that useful feedback should help learners understand goals, monitor performance, and plan further improvement. Recent studies suggest that AI-supported feedback can improve students' writing quality, feedback engagement, and revision practices, particularly in areas such as grammar, vocabulary, structure, and organization. At the same time, the literature also shows that the educational value of AI feedback depends on teacher mediation, students' feedback literacy, and the degree to which learners engage critically rather than mechanically with automated suggestions. This article argues that AI-based feedback is most effective when used not as a replacement for teachers, but as a pedagogical support tool integrated into process writing, reflection, and revision.

Keywords: Artificial intelligence; AI-based feedback; academic writing; language education; university students; feedback literacy; writing pedagogy; higher education.

Introduction: Feedback has long been recognized as one of the most influential factors in student learning, but its impact depends on quality, timing, and the learner's ability to interpret and use it effectively. Hattie and Timperley [2] conceptualized effective feedback around three core questions: where the learner is going, how the learner is doing, and what should happen next. Nicol and Macfarlane-Dick [4] likewise argued that feedback is most productive when it supports self-regulated learning rather than merely correcting surface-level errors.

In academic writing instruction, these principles are especially important because writing development is recursive and revision-based. Students need timely responses not only to linguistic errors, but also to organization, argumentation, clarity, and coherence.

However, in many university contexts, teacher feedback is constrained by large classes, limited time, and uneven opportunities for individualized support. This challenge has created space for AI-based tools that can generate rapid comments on multiple dimensions of writing. Broader reviews of AI in education describe substantial growth in the use of AI for personalized support, assessment, and learning assistance in higher education [6].

Recent writing-focused studies indicate that AI-supported feedback may improve writing performance and feedback processes, but they also caution that effectiveness is not automatic. Guo et al. [1] found gains in feedback quality and writing ability in an AI-supported peer-feedback context, while Yeung [7] showed that student engagement with AI-supported automated writing evaluation varied according to

cognitive, behavioral, and affective factors. A 2025 systematic review of AI-assisted feedback on academic texts [5] similarly reported positive effects, especially on text structure, organization, and language use, while noting limitations related to depth of revision and overreliance.

Against this background, the present article explores a central question: How pedagogically effective is AI-based feedback in improving university students' academic writing in language education? The article argues that AI feedback has clear instructional potential, but its effectiveness depends on how it is integrated into pedagogy, reflection, and teacher-guided revision.

Literature Review and Methodology

This article uses a qualitative review-based methodology. Rather than reporting original experimental data, it synthesizes foundational feedback theory and recent research on AI-supported writing feedback in higher education. The analysis draws on two groups of sources: first, key theoretical works on feedback and self-regulated learning [2, 4]; second, recent empirical and review studies on AI-supported writing feedback and AI in education [1, 5, 6, 7].

The selection criteria were relevance to three dimensions: (1) feedback theory in higher education, (2) AI-supported feedback in writing or language learning, and (3) university-level educational settings.

The analysis focused on recurring themes across the literature: the speed and accessibility of AI feedback, its contribution to revision and writing quality, its role in student autonomy, and its pedagogical limitations. Through thematic comparison, the article identifies patterns in how AI-based feedback influences academic writing development and under what conditions that influence becomes educationally meaningful.

Results

The review indicates four main results.

First, AI-based feedback improves immediacy and access to revision support. In contrast to teacher feedback, which may be delayed by workload and class size, AI systems can provide responses instantly. This immediacy is pedagogically important in writing instruction because students can revise while their

drafting decisions are still cognitively active. The literature therefore suggests that AI feedback is particularly useful in process-oriented writing environments where multiple drafts are expected.

Second, AI feedback appears most effective for local and mid-level features of writing. Across recent studies, students benefit from AI-generated comments on grammar, word choice, sentence clarity, structure, and organization. The 2025 systematic review on generative-chat feedback [5] reported positive effects mainly on organization, language accuracy, and textual structure. Similarly, Guo et al. [1] found that AI-supported peer feedback enhanced both feedback quality and writing ability in a university EFL setting. These findings suggest that AI tools can serve as valuable scaffolds during drafting and revision.

Third, the pedagogical value of AI feedback depends on student engagement and feedback literacy. Feedback is not effective simply because it is delivered; it becomes effective when learners interpret it, evaluate it, and act on it. The feedback-literacy framework developed by Molloy, Boud, and Henderson [3] emphasizes that students must appreciate feedback, make judgments about it, manage affect, and take action. Yeung's study [7] reinforces this point by showing that university students' engagement with generative AI-supported AWE feedback differs substantially across behavioral, cognitive, and affective dimensions. In other words, AI can provide feedback, but it cannot guarantee meaningful uptake.

Fourth, AI feedback has clear limitations when used without pedagogical mediation. The literature points to several risks: superficial revision, overdependence on automated suggestions, insufficient attention to argument quality, and the possibility that students accept feedback uncritically. Studies on feedback theory have long argued that effective feedback should promote self-regulation and deeper learning rather than passive correction [2, 4]. Current AI-writing studies suggest the same principle still applies: the strongest outcomes emerge when AI is embedded within teacher guidance, peer dialogue, reflective writing, and explicit revision tasks.

Taken together, the results show that AI-based feedback is pedagogically promising but conditionally effective. Its greatest strength lies in scalability,

immediacy, and support for iterative revision; its greatest weakness lies in the risk of shallow engagement if students are not trained to use it critically and reflectively.

Conclusion

AI-based feedback has significant potential to improve university students' academic writing in language education. It can expand access to timely feedback, support drafting and revision, and help students notice recurring linguistic and structural problems. Current research indicates that such feedback can positively influence writing quality and feedback processes, especially when used in EFL and higher-education writing contexts.

At the same time, AI feedback should not be treated as a substitute for pedagogical judgment or human interaction. Its real value lies in complementing teacher feedback, not replacing it. For this reason, the most effective instructional model is a blended one in which AI provides rapid preliminary feedback, while teachers guide interpretation, reflection, and higher-order revision. In such a model, students do not merely correct texts; they develop feedback literacy, self-regulation, and greater independence as academic writers.

Therefore, the pedagogical effectiveness of AI-based feedback in language education is best understood as context-dependent but substantial. When integrated into a reflective and process-based writing pedagogy, AI can become a powerful educational tool for developing university students' academic writing skills.

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