

Research Article

Exploring AI-Driven Adaptive Feedback in the Second Language Writing Skills Prompt

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Abstract: Recent developments in the field of artificial intelligence have changed CALL in the last decade, especially in terms of L2 writing. Therefore, the current research focuses on the extent to which AI-based adaptive feedback technologies in CALL improve L2 writing skills. It discusses the work AI does, the means it uses, and the theories it is based on when providing adaptive feedback, in light of the context, focusing on the role it plays in shaping particular educational pathways. The paper provides an overview of AI-integrated CALL tools that provide a measure of the tool's effectiveness in generating useful feedback that helps in teaching L2 writing to meet real-world needs. Research findings and studies from different contexts support the use of these tools to improve learners' L2 writing performance. Issues related to the use of AI-based adaptive feedback will also be addressed, including privacy, algorithm, and learner acceptance issues. By recommending the use of AI technology in language teaching, accompanied by human feedback, this study presents a constructive and moral model of how AI can be used without compromising its learning effect. Consequently, the results of the study show the potential benefits of using AI to generate adaptive feedback in improving L2 writing due to the immediacy, individualization, and possibility of iterating the feedback, which can help revolutionize language learning.

Keywords: Artificial intelligence (AI); adaptive feedback; computer-assisted language learning (CALL); L2 writing skills; personalized feedback; real-time error correction; iterative learning enhancement

1. Introduction

Adaptive feedback in second language writing is described as such feedback through the use of artificial intelligence systems. These systems measure various aspects of writing characteristics and provide reliable simultaneous scores in holistic and analytical variables along with standardized, supplemental, personalized feedback. For example, Automated Writing Evaluation (AWE) can help improve learners' writing, but is not as helpful as human input from instructors and peers (Shi & Aryadoust, 2024; Wei et al., 2023). Escalante et al. (2023) note that many studies have been conducted to investigate the effectiveness and acceptability of AI-supported feedback tools for second language learning environments. In this way, individualization and faster development in the field of second language acquisition were made possible (Woo & Choi, 2021).

For the most part, this research clearly shows that AI-based CALL has had a positive impact and has changed the structure of the learning process in the language classroom. This includes supporting the use of Internet CALL (ICALL), which aims to incorporate natural language processing into language learning and use, while designing learning environments with modularity, flexibility, and reusability in mind. For the integration of NLP into CALL, all computer experts, linguists, language teachers, and NLP specialists need to work closely together to overcome the challenges and hopefully increase the overall effectiveness of the integration in terms of utilizing technology for language development. (Wahl & Winiwarter, 2012). NLP and Semantic Web technologies enable the implementation of an intelligent integrated computerized language learning environment that would allow contextualized learning of a foreign language at work in different organizations in accordance with individual learning styles and methods (Antoniadis et al., 2009; Wahl & Winiwarter, 2011).

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The use of artificially intelligent text-based systems to deliver adaptive feedback to improve second language (L2) writing abilities in CALL applications is an appealing method. It has been found that AI-powered applications such as Wordtune can enhance the quality of writing, engagement in the writing process, and literacy of written feedback for L2 learners (Yang et al., 2023). It is also important to note that systems such as Write & Improve have been proven to improve the level of engagement, motivation, and the ability of learners to write more productively and effectively than they had previously done (Curry & Riordan, 2021). Woodworth and Barkaoui (2020) and Mohsen (2022) have found and discussed that incorporating AWE into conventional instruction has a positive impact on writing instruction by enhancing the common practice goals of writing fluency and accuracy. Informing L2 learners has to be presented in a personal and immediate manner; therefore, if the CALL systems allowed for the adaptation of the tools and the incorporation of personalized feedback generated by AI technologies, L2 learners could easily edit their writing.

The main research question posed in this study is: What is the concept of AI-based adaptive feedback in Computer-Assisted Language Learning (CALL) for L2 writing, and how is it implemented? Additionally, what tools are used, and what effects are likely to be observed? To address this overarching question, the study will pursue the following specific objectives:

- to further understand the concept of adaptive feedback in the context of CALL with the help of AI;
- to assess the tools used in AI-assisted CALL platforms, observing specific criteria;
- to analyze the theoretical implications and possible challenges of AI-driven adaptive feedback in CALL.

These objectives focus on gaining a clear understanding of feedback methodologies in language learning through Artificial Intelligence, what tools are used, and what benefits and drawbacks may be observed with such systems.

2. Conceptual Framework

The use of AI-generated feedback in L2 writing classrooms is a new area of research, hence there is great potential for development. As for feedback provision practice, the examples of the progression of this practice may include the integration of some specific technologies like Wordtune (Rad et al., 2023) alongside with the focus on the need for feedback that can address both linguistic and nonlinguistic aspects of the digital multimodal composition (Elola & Oskoz, 2022). The kind of feedback provided will be in terms of the language used, and if a human instructor has been employed, the feedback will be one on one and real-time; however, it lacks the social aspects and interactions that would result from an instructor having conversations with students (Woodworth, 2023). Writing in the second language for international and students learning in multinational institutions requires transfer of knowledge together with transfer of learning of new knowledge, with less reliance on prior learning and more focus on the translation of knowledge (Chen, 2022). L2 writing feedback has attracted the interest of researchers for decades, especially in recent decades due to an articulated need for more development on the issues of L2 writing feedback (Ferris, 2022). These observations reinforce the importance of the theoretical framework in AI-driven adaptive feedback for improving L2 writing procedures. Adaptive support within a learning setting can be useful since most learners have unique learner traits, for instance, in matters of prior knowledge, learning pace, and learning style.

This paper investigates how personalized adaptive feedback composed by an AI tool can contribute to the development of L2 writing proficiency. Research has demonstrated that the use of the Wordtune AI increases the likelihood of better writing experiences, participation, and feedback awareness (Rad et al., 2023). AI-driven AWEs have proven to be timely feedback to students on their learning progress that leads to improved writing skills (Fleckenstein et al., 2023). A recent study on the provision of feedback to Chinese EFL learners using an AWE system has shown that there are differences in the nature of revision strategies they apply and suggested the need to use individualized feedback (Jian & Tengyao, 2022). More importantly, the subduction of NLP in intelligent tutoring systems improves the quality of feedback to make it more personalized and suitable for learners (Troussas et al., 2023). ADL is achieved via AI-powered recommender systems for self-guided learning by adult learners; the importance of adaptive learning platforms is elaborated on (Digel et al., 2023). In conclusion, the integration of technology-based adaptive feedback designed for



individual learners contributes to the provision of customized instruction aimed at increasing L2 writing skill achievement.

It is agreed to pay specific attention to the feedback provided to the student in second language writing because the focus must be taken on his or her particular needs during the process (Hyland & Hyland, 2019; Zhang & Zhang, 2023). It also speaks to the kind of feedback Learners receive as well as to explicit feedback that is developmental to Learners in various stages of their development (Ai, 2017). Research extols the virtues of feedback in cultivating an instructional environment that greets students with what they can do right, espouses ideas about writing appropriately, and links culture to literacies (Wagner & Wulf, 2016). Several studies have also supported the use of graduated explicit correction, which entails the successive transition from implicit to explicit feedback, as an effective strategy for assisting learners to self-correct given grammatical errors (Ferris, 2012). WCF is beneficial, but its use is dependent on the type of grammatical constructs used. Although it may be easier to provide automated feedback resources to students, how the students access and make use of the automated feedback has been little investigated. Generally speaking, personalized adaptive feedback is crucial to improving L2 writing as it addresses the specific needs of each learner in the process of learning.

3. Results

3.1. Types of Adaptive Feedback in CALL for Writing Proficiency

Several types of feedback in the context of CALL for second language writing proficiency are incorporated whereby collectively, they offer integrated support to the learners. These types are crucial in ensuring that feedback provided by trainers is specific to learners and essential in enhancing quick methods of correcting errors as well as creating learning cycles. This section defines the basic forms of adaptive feedback and introduces concrete AI tools that effectively illustrate each aspect for the improvement of L2 writing skills.

This paper concludes that adaptive feedback in CALL comprises three characteristics: personalization, and im-mediacy that helps bring out the best on the learner. Table 1 shows an overview of the primary properties of the types of adaptive feedback including the functionality, tools, and application on individualization of the student’s learning experience, immediate correction of mistakes and gradual improvement of learning loop.

Table 1. Comparison of types of adaptive feedback in CALL

Aspect	Personalized Feedback	Real-Time Error Correction	Iterative Learning Enhancement
Description	Tailored suggestions addressing individual strengths and weaknesses	Immediate feedback on errors during writing	Continuous feedback and support through multiple drafts
Functionality	Customized guidance for coherence, vocabulary, and grammar	Highlighting errors, suggesting corrections in real time	Providing feedback across drafts, guiding revisions
Tool Example	Wordtune	Write & Improve	ChatGPT
Owner/Developer	AI-driven platforms	University of Cambridge	OpenAI
Personalization Aspect	Aligns feedback with learner's proficiency and writing style	Helps prevent error and promotes accuracy and fluency	Promotes resilience and persistence through multiple revisions

Source: authors’ own development.

To support these types, it is helpful to present AI-based tools that embody them; therefore, the paper illustrates the practical use of AI in the CALL context. Thus, every tool reflects one aspect of adaptive feedback, illustrating how technology can improve the feedback process in second language writing, make individual instruction more effective, and apply immediate correction in the context of scaffolding.

To sum up, adaptive feedback in CALL employs individualization during effective communication, timely, and repeat-with-difference approaches to meet the learners’ variability and improve the error correction procedures and the continuous development of the learners. The subsequent sections outline exemplar AI-driven tools that participate in these types, portraying how they contribute to variation in the L2 writing course and students’ proficiency acquisition.

3.2. Tools in AI-enhanced CALL

Learning assistants are essential in L2 writing-learning because they remedy and provide suitable feedback on the students' corrections (Mouchel et al., 2023). These are used for promoting the students' technique through self-critique on revision and progressive refinement of student writing (Bhowmik & Chaudhuri, 2021). Secondly, the authors put forward that the development of writing as feedback, insight into textual structures, and samples, differences, and ample practice is also what instructors do (Brown et al., 2023). Further, L2 writing teachers need to come up with possible integration strategies of Web 2 in teaching and learning. As a result, the tools purposefully guide the learners to apply them and set up group writing practices to adhere to the guidelines of the TPACK model recommended by Karimi and Asadnia (2022). This is useful to educators who wish to comprehend the operations and effectiveness of these tools before incorporating them into the L2 writers' processes. The authors' beliefs are mincing to some extent regarding the applicability of AI enabled tools for L2 writing. For instance, when the Wordtune application, which is an application based on artificial intelligence, was integrated, it yielded more in relation to student writing, writing activity, and comments on the writing (Rad et al., 2023).

Similarly, the contemporary AI application, such as the new launched chatbot known as ChatGPT, made from AI tools offered a clear indication of the performance of AI in the L2 writer pedagogy and the added advantage of efficiency. Further, some of the experiments with different AI writers illustrated its functionality and the possible implementation in language classes that the students will have; they are going to learn how to work using AI writers and along with them (Simonsen, 2021). The summary of the descriptive statistics in this research combines to show how the tools that accompany the AI can influence L2 writing assessments and teaching.

In light of the above deductions, it is evident that the instructional feedback in CALL for second language writing proficiency has the following characteristics; these are complex but interdependent aspects of providing full support to the learners. These types are particularly useful for adjusting the feedback for the learner's learning type and for giving feedback on the entire learning cycle within which mistakes are made with calls for repeating particular components. This part explains the fundamental types of adaptive feedback and displays some AI-based tools indicating each of these aspects and their possible transformative impact on the development of L2 writing

3.3. Wordtune for Personalized Feedback

Before making a comparative analysis of AI writing tools, it is necessary to emphasize that Wordtune successfully provides feedback based on context and provides recommendations based on the learner's level and tendencies. An example of an innovative teaching tool called Wordtune applies artificial intelligence for helping EFL writers to write continuously and in the process introduce them to good ways to express their ideas in written English. As acknowledged by Mahmud (2023), Zhao (2022) concluded that Wordtune enhanced Saudi students' written production regarding the quality and lexical and syntactic developments of the final writing test, thus obtaining better results in the final writing test than the control group.

Wordtune excels in offering recommendations related to the particular issues to enhance a piece at the level of sentence, word and grammar. It interprets conceptions and offers possibilities for reformulating with various tones and lengths and helps the EFL writers to avoid interruptions and to provide the efficient strategies for the expression of their concern (Zhao, 2022). Also, Wordtune evolves interactively regarding the answers furnished by the learner, the feedback is real and helpful since it suits the learner's goals. Therefore, Wordtune works to build the coherence and cohesion of the writings as well as offering an important tool to learners in their language development.

3.4. Real-time Feedback for Writing Errors

One major aspect of the use of Write & Improve is the instant correction of writing mistakes within the framework of the daily routine application. This Cambridge software as soon as you underline you get the corrections, suggestions for better word usage and how to structure the text. Write & Improve (W&I) is a motivational and effective intelligent CALL system focusing on the improvement of learners' written practices and written language skills while requiring less effort from the teacher and dealing with spelling and syntactic error (Curry & Riordan, 2021).

The user-friendly website *www.writeandimprove.com* enables learners to enhance their

written English by responding concurrently to the errors made in spelling, vocabulary, and grammar, level recognized by CEFR (Shirazizadeh & Amirfazlian, 2019). The “Write and Improve” AWE tool positively contributes to the improvement of university learners’ writing, enabling management and promoting motivation for writing and improving the quality (Karpova, 2020). Apart from that, if W&I is introduced and used as the extracurricular activity, its positive impact on the PG students’ writing skills is marvelous the most essential growth is indicated in the Language competence spectrum (Kostikova & Miasoiedova, 2019).

3.5. ChatGPT for the Enhancement of Iterative Learning

ChatGPT dialogues with learners and employs interaction so that the learner is able to rehearse, organize concepts and revise with the help of the tool. It also makes ChatGPT a successful tool for generating comprehensive, more fluent and coherent feedback and can even enhance the students’ learning abilities (Dai et al., 2023).

ChatGPT brings added value to education processes by providing help, directions, and ongoing feedback to-self-motivated students and learners, resulting in improved motivation levels and the proactive involvement (Murad et al., 2023). Using this tool, the feedback as well as suggestions given are continuous, which enable the learners to learn gradually and enhance their writing skills. Although it can be used at any level, it is especially useful for communication, business writing, and composition classes, but the ethical use and correct evaluation methods should be employed to prevent negative side effects (Al Afnan et al., 2023).

Applying it to nursing education, ChatGPT is useful for the automatic writing feedback to provide more rigorous grading and feedback differentially with no added workload (Parker et al., 2023). Moreover, ChatGPT assists developing writers in the elimination of writer’s block and in critical evaluation of the material it generates (Beck & Levine, 2023). Every text with ChatGPT enhances the discussions that preceded them, which contributes to writing efficiency and development. The below table 2 presents the comparison of AI-driven tools in computer assisted language learning with their functions and types of adaptive feedback.

Table 2. Comparison of AI-driven tools in CALL.

Tool	Features	Developer	Functions	Types of Adaptive Feedback
Wordtune	Context-specific suggestions, sentence rephrasing	AI21 Labs	Enhances coherence and fluency, adjusts to writing style and proficiency	Based on writing style and proficiency
Write & Improve	Real-time assessments, highlights errors, suggests improvements	University of Cambridge	Grammatical error detection, vocabulary suggestions, structural recommendations	Real-time feedback, iterative process
ChatGPT	Interactive dialogues, brainstorming, ongoing feedback	OpenAI	Helps organize thoughts, refines writing through conversation	Continuous improvement through dialogue

Source: authors’ own development.

This way, the information remains concise but, at the same time, each entry provides a clear understanding of how the tool enhances students’ learning and their writing skills.

4. Implications and Challenges

As Jian and Tengya (2022) discovered, and Rad, Parvaresh, and She (2023) feature, the use of AI-based adaptive feedback has improved L2 writing achievement in several ways; (Woodworth 2023). Similarly, studies show that AI performers, Wordtune or feedback amalgamation systems enhance students’ writing abilities, performance, interest, and feedback abilities (Dong, 2023; Ferris, 2022). In the pedagogy of writing across the curriculum (WAC), AI not only helps students improve their writing skills but also provides timely, personalized feedback and assists in grading more efficiently. While for CALL, AI-based adaptive feedback systems for L2 writing instruction have raised some challenges and considerations, Among these are the requirement that AI applications should be transparent and actionable and also provide fair feedback to students (Rad et al., 2023); the idea of hybrid feedback that combines the feedback of AI applications with that of teachers for improved outcomes (Katsarou et al.,

2023); and the potential impact of rendering AI tools such as Wordtune on writing outcomes, engagement, and feedback literacy outcomes (Woodworth, 2023). Further, in the review article on IVAs which the present study builds on, it has highlighted the need for more empirical investigations to be done on the significance of the effective IVAs implementation to the performance of college-level EFL learners in regards to academic achievement (Matsumura et al., 2022). These challenges and considerations are very informative and crucial as they shed light on how decisions can be made towards selecting integration of AI-based adaptive feedback systems in CALL for L2 writing instruction.

5. Conclusions

ICALL is therefore built on the principles of CALL which is a process that entails the use of computers to support language learning and which mostly has reliance on the NLP tools. While employing Pigai and Wordtune, the students, as L2 learners, benefitted in terms of improved writing performance, higher interest and experience in the writing process, and enhancing feedback capabilities.

The main purpose of the study was to research the main aspects of the concept, tools, and impact of AI-driven adaptive feedback in CALL to improve L2 writing skills. Adaptive feedback aids language learners' development in L2 writing by optimizing machine-generated feedback provision based on learner needs as well as characteristics, providing immediate and frequent corrective feedback, and increasing proficiency. The feedback provided by tools such as Wordtune and automated writing evaluation systems also proves to be time-effective and reflects the theoretical models advocating for adaptive support.

This refers to the individualized feedback observed that satisfies the individual learner's needs for sustainable development and also enhances writing performance. As found out in the context of this study, automaticity tools act in a significant and positive manner in improving L2 writing performance through their contributions in self-regulated learning and the adoption of better revisions. Tools like Wordtune may hold the solutions to the attaining of writing advantages, acquisition of engagement techniques, and feedback on literacy. Using ChatGPT in writing is useful when checking against excessive repetition and their occurrences in writing are also amply demonstrated in Pigai, which also shows that warranted research exists around connecting cognitive psychology with AI feedback.

The theoretical principles and functional aspects of the integration of AI-driven adaptive feedback methods into CALL have their practical issues and weaknesses. The evidence suggests that integrating AI with human feedback can help learners achieve increased levels of success, depending on their understanding of acceptance and revision. AI systems need to keep something useful and not become biased feedback systems. Key threats include: transparency; data privacy; and algorithmic biases. Control strategies are crucial for the successful integration of AI in implementing adaptive feedback systems for L2 writing in the CALL classroom. This reveals the possibilities of AI and its contributions to L2 writing development, but also the challenges of how to implement the technology and use it efficiently.

The following implications with regard to AI changing the nature of L2 writing and how it can be used to enhance personalized learning by means of adaptive feedback. The use of AI-based add-ons like Wordtune and the AWE assist tool is highly beneficial in improving writing outcomes, engagement, and feedback literacy. These implications concern revisions to the nature of L2 writing and how AI can be integrated to improve the feedback process to optimize the individually tailored approach to learning. AI provides instant, customized formative evaluation and a mode of assigning the instruction necessary for a learner to learn the ability effectively. Also, there are many other tools, like ChatGPT and Pigai that help improve efficiency and performance through customization. The use of AI does assist in meeting the diversity of learners by advising them on self-regulated learning and revision behaviors.

Further research should embrace longitudinal studies in order to understand AI's direct and indirect influence on L2 writing performance. The retention and course completion rates will be measured to determine how AI feedback affects the proficiency and engagement of learners in various demographics and proficiency levels over time. This will ensure that there are increased insights into the long-term impact and risks of adopting the use of AI in the process of learning languages. In summary, it was argued in this essay that a balanced approach should be followed by involving human as well as AI-driven feedback in classroom instruction. With the use of AI writing assistants such as AWE systems, students receive

feedback in real time and exactly for themselves, but human teachers are capable of giving grades and understanding of the student's problems and feelings. This kind of hybrid approach means that learners are getting the best out of artificial intelligence as well as its ability to benefit from human intelligence, understanding effective learning, and addressing individual needs.

Creating confidential and ethical principles for AI-driven feedback systems is essential. Specific privacy requirements apply to educators; they need to inform people about AI usage and create algorithms that do not benefit one group over another. This ethical concern helps to address the issue of biases and students' privacy and reduces the gap in inequalities.

Teachers of foreign languages ought to take the lead and utilize AWE systems to deliver feedback to their learners at the right time, place, and way. They enable an instructor to provide differential feedback appropriately and empower the learner to develop better writing practices. Educators also need to keep or develop knowledge on how to use the tools in the classroom and how to interpret the AI-generated feedback that students may receive to provide full support for the students. This approach has the potential to revolutionize language learning for the better and provides a robust justification attuned to concerns about real-world implementation and duty of care.

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