

The Effect of Machine Feedback on Foreign Language Writing

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Abstract: The advancement of artificial intelligence technology has made machine feedback an important tool for teaching foreign language writing. This article systematically explores the technical principles, historical development, and dual impact on writing quality through a literature review. Machine feedback is based on natural language processing (NLP), evolving from early spell checking to intelligent systems that support grammar, vocabulary, and logic optimization, significantly improving learners' vocabulary diversity (such as semantic word recommendation) and text accuracy (reducing grammar error rates by 20% - 30%), and reinforcing learning motivation through instant feedback. However, research also reveals its limitations: excessive dependence leads to a decline in students' ability to write independently, algorithmic standardization ignores cultural context and creative expression, and even triggers academic ethical risks. Through analyzing international empirical research in the past decade, it has been found that machine feedback needs to be coordinated with teacher feedback to balance efficiency and critical thinking development. In the future, we should focus on the design of human-machine collaboration models and pay attention to the differentiated needs of learners with different language proficiency levels, promoting innovation and balanced development of foreign language writing education.

Keywords: Machine feedback, Foreign language writing, Literature analysis

1. Introduction

Machine feedback is an automated assessment mechanism powered by computer algorithms and artificial intelligence, which delivers real-time, data-driven responses to learners' writing, distinguishing itself from traditional human feedback by its immediacy, scalability, and consistency. With the rapid development of artificial intelligence in the world today, machine feedback is gradually becoming an important tool for foreign language writing as an emerging supplementary teaching tool. The application of this technology in foreign language writing provides students with timely and personalised writing feedback, thereby promoting learning efficiency and language proficiency. Timeliness ensures immediate error correction and reinforcement, as exemplified by AI tools such as Grammarly or ChatGPT, which deliver instant feedback on grammar, syntax, and coherence, while personalization tailors feedback to individual writing styles and weaknesses, such as adaptive grammar suggestions from platforms like QuillBot and AI-driven academic writing assistants. In terms of writing skills, machine feedback mainly expands students' vocabulary and helps them solve problems encountered during the writing process.

Research shows that machine feedback is not limited to superficial error correction in language but can provide deeper writing guidance to help students understand essay structure, logical coherence, and so on. Li Ting's research emphasises the construction of an automatic machine learning-based feedback system for English writing, which can provide targeted revision suggestions for students' foreign language writing. Applying this intelligent system enables students to develop a deeper understanding of the structure and use of language, thus gradually improving their writing skills [1]. With the emphasis on writing skills in foreign language education, machine feedback will provide important support for the new era of foreign language learning models and create a more targeted and efficient learning experience. However, machine feedback also has some negative effects on foreign language writing, which will be analyzed in this article. In this trend, further research on machine feedback in academia also has greater significance, which can provide a valuable theoretical basis for practice.

Emerging studies in automated writing evaluation (AWE) and natural language processing (NLP) suggest that foreign language writing instruction is evolving toward a more intelligent, technology-driven approach. The application of machine feedback technology not only changes the traditional teaching model but also provides new possibilities for future educational innovation, with a broad space for practical exploration.

Writing ability is pivotal in foreign language acquisition, significantly shaping learners' linguistic mastery, logical reasoning, and expressive competence. Numerous studies have shown that strong writing skills not only effectively promote language understanding and use but also enhance learners' confidence and self-directed learning abilities. Feedback is an inseparable part of writing, and machine feedback, as an efficient form of feedback, can better detect students' writing errors in real time and provide personalized training for them. Therefore, understanding the impact of machine feedback on foreign language writing not only helps teachers improve teaching strategies but also assists students in better mastering writing skills.

This paper aims to comprehensively examine the development process and research trends of machine feedback in foreign language writing teaching and clarify the key research themes in this field. The current research focus has shifted to evaluating the actual effectiveness of machine feedback in order to reveal its unique value and potential limitations in foreign language writing teaching. Through a systematic analysis of existing literature, this study aims to elucidate the principle of machine feedback, explore its influencing factors, and compare and analyze it with traditional feedback methods. Meanwhile, the study will also evaluate the effectiveness of machine feedback in different writing tasks and learner levels (such as beginner and advanced). These research findings will provide theoretical support for optimizing foreign language writing teaching practices and promote the effective application of machine feedback technology.

2. The mechanism and principle of machine feedback

2.1. The operating principle of machine feedback

Machine feedback in foreign language learning operates through data-driven, algorithmic analysis that instantly detects linguistic errors and delivers targeted suggestions, thereby supporting both linguistic accuracy and cognitive engagement. The effectiveness of modern AI-driven language learning systems stems from their multidimensional approach to processing linguistic information and adapting to learner needs. These three dimensions—intelligent data processing, adaptive feedback mechanisms, and personalized learning trajectories—collectively form the foundational framework for comprehensive language acquisition support. Its core operating logic can be explained in the following three dimensions: Intelligent language data processing. The system uses natural language processing (NLP) technology to analyse learners' spoken or written expressions at multiple

levels, covering phonetics, morphology, syntax, and semantics. For example, advanced AI-driven writing assistants detect spelling errors, tense inconsistencies, and collocational inaccuracies by drawing on both pre-defined grammatical rule databases and deep learning-based error detection algorithms [2]. This technical architecture extends error detection from superficial spelling to deeper semantic logic. Second, the dynamic adaptation of feedback strategies. Depending on the difference between the error characteristics and the learning objectives, the system uses a dual-modal feedback mechanism of explicit and implicit feedback. Explicit feedback directly presents the correct form through error marking and correction suggestions (such as Grammarly's grammar annotation function). In contrast, implicit feedback indirectly guides the learner to make corrections independently through recasting or metalinguistic prompts (such as Duolingo's interactive dialogue module). Third, personalised evolution of learning paths. The system dynamically adjusts the feedback intensity and training difficulty using an adaptive algorithm by continuously collecting data such as the frequency of learner errors, correction efficiency, and knowledge mastery curves. For example, the system will automatically generate a special exercise library for learners with a high error rate in using articles; for advanced learners, the proportion of complex sentence reconstruction tasks will gradually increase. This data closed-loop mechanism effectively implements a personalised learning cycle of diagnosis-intervention-reinforcement. Intelligent data processing, adaptive feedback mechanisms, and personalized learning paths synergistically enhance language learning efficiency, foster nuanced linguistic competence, and support continuous developmental progression.

2.2. Historical development and key theoretical frameworks and models

The evolution of machine feedback technology in foreign language learning and writing is closely related to the development of computer-assisted language learning (CALL). Early systems were primarily confined to basic grammar-checking functions and could not conduct in-depth analysis of writing quality. With the continuous advancement of technology, the accuracy and intelligence level of machine feedback have been significantly improved.

The development of computer-assisted writing (CAW) technology is closely related to the progress in computer science and natural language processing. Since the 1980s, CAW systems have evolved from text editing functions to comprehensive writing platforms that combine automatic text generation, grammar checking, and style optimisation. In recent years, writing aids based on artificial intelligence, such as Grammarly and Hemingway Editor, have become widely used worldwide. These tools use advanced algorithms such as deep learning and data mining to analyse user texts in real time and provide precise writing suggestions.

Since the 21st century, machine feedback systems using natural language processing (NLP) technology have gradually emerged. These systems can conduct in-depth text analysis using advanced techniques such as syntactic parsing, semantic role labeling, and transformer-based deep learning models (e.g., BERT or GPT). These technologies facilitate the identification of grammatical patterns, semantic inconsistencies, and discourse structures. Neural networks trained on large corpora dynamically adapt to contextual nuances, thereby offering more granular feedback on syntax, vocabulary, and coherence [3]. Through rule-based algorithms and machine learning models, NLP identifies linguistic patterns, evaluates grammatical accuracy, and assesses semantic coherence, enabling precise feedback on lexical choices, syntactic structures, and discourse-level organization. Through interaction with students, machines can provide personalized learning suggestions. Scholars have also begun to pay attention to the applicability of machine feedback in different learning stages. For example, studies have shown that early learners focus more on correcting basic grammar errors, while advanced learners require deeper discourse and style suggestions.

The current methodological system for machine feedback research shows a trend of diversification and integration, with the use of mixed-methods design being particularly prominent, forming a two-

wheel-drive research paradigm of ‘quantitative verification-qualitative interpretation’. Chen Xue, as a representative of empirical research, innovatively adopted a longitudinal tracking design to collect multimodal data through a three-stage writing experiment: the pre-test stage used language complexity analysis tools (such as Coh-Metrix) to establish a baseline for writing ability; the intervention stage integrated the machine feedback system with writing logs to dynamically capture process data; and the post-test stage used analysis of covariance (ANCOVA) to control for irrelevant variables and accurately quantify the effect of feedback intervention [4]. Recent research has increasingly incorporated eye-tracking and keylogging technologies to construct micro-genetic frameworks of writing behavior. This not only breaks through the limitations of traditional outcome-oriented assessments, but also reveals the deep cognitive mechanisms through the measurement of mediating variables such as cognitive load and metacognitive strategies, which machine feedback affects writing ability development. This type of methodological innovation provides solid methodological support for constructing evidence-based feedback models, while promoting the paradigm shift of foreign language writing research from single outcome evaluation to process-based ability diagnosis.

The academic value of current machine feedback has broken through the boundaries of traditional applications, forming a research paradigm of ‘theory construction-technology research-teaching practice’. Research shows that the field is developing along two main lines: one is the study of feedback mechanisms from the perspective of cognitive science, which focuses on the synergistic effect of machine feedback and the development of learners' metalinguistic awareness, revealing the restructuring effect of multi-level interventions such as instant error correction, text polishing, and rhetorical optimisation on second language writing cognitive schemas; the other is the study of system development within the framework of educational technology, which constructs an intelligent feedback system with diagnostic, predictive and developmental characteristics through the deep integration of natural language processing and educational big data. This innovation in the research paradigm has promoted the paradigm shift from "result-oriented" to "process empowerment" in writing teaching theory. It has also established a personalized learning path generation mechanism grounded in dynamic corpora. It is worth noting that recent empirical studies have begun to focus on the differences in the cognitive neural mechanisms of machine feedback and human feedback. Eye tracking and EEG technology have revealed the neurobiological basis of how different types of feedback regulate writing anxiety and shape self-efficacy. This provides interdisciplinary evidence to support constructing an accurate feedback intervention model. A recent EEG study focusing on second language acquisition demonstrated that learners receiving structured feedback during English writing tasks exhibited enhanced theta wave synchronization in the prefrontal cortex, a neural marker associated with reduced anxiety and improved cognitive control. Specifically, researchers compared EEG data between native speakers and EFL learners during error-correction tasks, revealing that targeted feedback triggered stronger event-related potential (ERP) components (e.g., N400) in learners, indicating more efficient integration of linguistic feedback and reduced emotional resistance. These neurophysiological findings align with behavioral outcomes, showing a 23% decrease in writing anxiety and a 17% increase in self-efficacy scores among EFL learners exposed to real-time neurofeedback protocols [5]. Their theoretical contributions are reflected in the construction of innovative theoretical frameworks such as the ‘Human-Machine Collaborative Writing Ability Development Model’ and in establishing a technology research and development path oriented by learners' cognitive characteristics for the iterative upgrading of intelligent education products.

Overall, the evolution of machine feedback technology in foreign language learning and writing reflects the deep integration of educational technology and language teaching theory and provides new ideas and methods for improving the quality of writing teaching.

3. The concentration of machine feedback in foreign language writing

3.1. The role of machine feedback in vocabulary improvement in writing

Machine feedback improves writing vocabulary in three main ways: accurate identification and immediate correction of lexical errors, suggestions for more precise word choices, and personalized reinforcement through adaptive learning.

First, machine feedback uses natural language processing (NLP) technology to detect vocabulary errors in learners' writing in real time, including misspellings, misuse of parts of speech, improper collocations, and semantic biases. For example, the intelligent grading system can flag subject-verb inconsistencies in "He have a book" and suggest a correction to "He has a book", and prompt a more authentic expression "do homework" for collocation errors such as "make a homework". This immediate feedback reinforces learners' awareness of lexical errors and improves correction efficiency, enabling the rapid formation of accurate vocabulary usage patterns. Lee, S. M. conducted a comparative experimental study involving 120 intermediate-level L2 learners randomly assigned to an experimental group (EG) and a control group (CG). The EG utilized an AI-driven feedback system during writing tasks, which provided real-time vocabulary suggestions (e.g., high-frequency synonyms), collocation corrections, and contextually adapted lexical replacements based on semantic analysis. In contrast, the CG received traditional teacher-written feedback focusing on general grammar and structure without targeted vocabulary interventions. Both groups completed three argumentative essays over six weeks, with pre- and post-tests analyzing vocabulary accuracy through automated lexical error detection tools and human raters. The EG showed a 32% reduction in vocabulary misuse (e.g., synonym confusion decreased by 41%, collocation errors by 28%), attributed to the system's ability to highlight semantic biases (e.g., replacing vague terms like "very big" with "severe" in environmental essays) and scaffold contextually appropriate word choices [6]. In addition, the machine-driven vocabulary revision process strengthens students' cognition of vocabulary repetition rules, so they can actively use higher-order vocabulary and academic expression in subsequent writing. Although the study also observed a global optimization of writing strategies, the data showed that the improvement at the vocabulary level was the most prominent: the learner reflection report repeatedly mentioned that machine feedback helped them break through the phenomenon of "word petrification" and establish a dynamic vocabulary iterative mechanism.

On the other hand, machine feedback is not limited to error correction. It also provides learners with suggestions for synonyms, recommendations for higher-order vocabulary, and optimisation of contextualised expressions through semantic analysis and corpus matching. For example, when a student uses the basic word 'good', the system may suggest replacing it with a more precise adjective such as 'excellent' or 'remarkable', and indicate the difference in applicability in different contexts.

Leveraging learners' error history analysis, the intelligent feedback system dynamically generates adaptive learning tasks to address linguistic deficiencies. The system algorithmically constructs customized exercise sets when recurrent errors are detected in specific grammatical categories, such as determiner usage or prepositional collocations. These personalized drills are subsequently integrated into a spaced repetition scheduling algorithm to optimize lexical retention and grammatical accuracy through scientifically validated memory consolidation patterns. In addition, Wang Yiyun and other scholars found in their research that using an AI-driven language learning platform has a positive impact on English vocabulary learning outcomes in EFL teaching, and that using AI-driven mobile language learning apps for self-testing and classroom testing can effectively improve vocabulary learning efficiency [7].

In summary, the effectiveness of machine feedback in improving writing vocabulary is mainly reflected in three aspects: first, intelligent recognition and real-time correction of vocabulary errors;

second, suggestions for synonyms and expression style optimisation; and finally, analysis of user language characteristics to generate a personalised learning path to enhance vocabulary acquisition.

3.2. The role of machine feedback in the process of revising foreign language writing

Current research on machine feedback systems primarily explores their influence on learners' revision strategies during the writing process, with empirical investigations focusing on how automated corrective mechanisms influence linguistic accuracy and compositional refinement. Multiple empirical studies indicate that machine-assisted writing feedback enhances L2 learners' linguistic accuracy and structural sophistication. For instance, experimental research demonstrates that real-time corrective feedback (e.g., grammar checks, syntactic restructuring prompts) enables students to identify and revise surface-level errors 43% faster than manual editing, while adaptive suggestions (e.g., vocabulary upgrades, coherence markers) foster deeper metalinguistic awareness by guiding learners to internalize rule-based patterns [7]. Quantitative analyses further reveal that automated platforms increase revision depth: learners exposed to iterative machine feedback exhibit a 17.3% improvement in grammatical accuracy and a 22.5% rise in syntactic complexity across drafts, compared to minimal gains in non-feedback groups [8]. Crucially, while machine systems boost practice frequency, quality improvements depend on scaffolded feedback design, such as highlighting semantic inconsistencies or prompting content reorganization, rather than mere error correction.

In addition, the study found that machine feedback is very helpful in improving writing skills during the writing process. Fitria, T. N. found that after several attempts, ChatGPT can answer all questions on different topics, such as English composition, including descriptive texts about Solo and My Family, narrative texts about personal experiences and memorable moments, resolutions for 2023, and future careers. ChatGPT accounts for the logical writing flow, including topic sentences, supporting details, and conclusions. It uses two voices, active and passive. In addition, it considers the use of tension related to the given topic of the essay [9]. Hung and his colleagues studied the impact of the AWE system and conducted a primary review of the writing skills of 59 students in an English as a foreign language (EFL) course. The experimental group, consisting of 30 students, was asked to revise their work based on the feedback provided by the AWE system. The results of the tests showed that the experimental group's writing level had improved significantly statistically. Combining the AWE system with revision activities significantly improved the writing level of EFL course learners [10].

In the field of writing quality improvement, the multiple values of machine feedback have led to in-depth discussions in the academic community. The latest research finds that its function has broken through the traditional error correction category and expanded to multiple evaluation dimensions such as content organization, logical structure, and language expression. Relevant studies have shown that different feedback modes (such as process feedback and summative feedback) have different effects on improving writing ability, and it is found that learners' adoption of feedback is significantly positively correlated with their self-efficacy. This two-way interaction mechanism facilitates personalized learning paths and enhances learner motivation and writing outcomes through increased cognitive engagement. Burstein and his colleagues elaborated on the development and application of the E-rater automatic scoring system, showing how natural language processing (NLP) technology can provide a multidimensional diagnosis of English writing by analyzing grammar, vocabulary, and text structure [11].

With the acceleration of technology iteration, machine feedback systems are undergoing a paradigm shift from a single error correction tool to an intelligent learning ecosystem. The latest research reveals that intelligent writing platforms with multimodal text analysis functions (such as deep learning-based grammar detectors and style optimization engines) have realized full-dimensional monitoring of the writing process, extending their coverage from the traditional lexical

grammar layer to the level of discourse coherence and rhetorical strategies, to improve the quality of foreign language writing.

Machine feedback now empowers writers to navigate the revision process across cognitive, linguistic, and metacognitive dimensions, transforming surface-level editing into strategic discourse refinement while cultivating critical thinking and self-regulation capabilities in foreign language acquisition. This multidimensional scaffolding bridges mechanical error correction with intentional meaning-making, ultimately fostering autonomous writing evolution.

4. The relationship between machine feedback and foreign language writing

4.1. The positive effects of machine feedback on foreign language writing

Machine feedback has significant advantages in evaluating student writing. It provides timely and efficient feedback and demonstrates high scoring reliability and validity [12]. In her study, Zhang Ling explored the mechanism of intelligent feedback in foreign language writing, emphasising how computer-based feedback systems can promote students' autonomous learning and writing skills through instant assessment and feedback [13]. These intelligent systems identify grammatical errors and help students better understand the context of language use, effectively improving writing skills. For example, in the study by Elliot and Mikulas, 709 randomly selected high school sophomores were used to explore whether the MY Access system could improve the writing scores of American students on state exams. The study spanned from September 2003 to March 2004, during which the students submitted their essays through the system and revised them based on the feedback. The results showed that 91% of the students successfully passed the exam, and that students who used MY Access made more significant progress in their writing skills than those who did not receive feedback from the system.

The study of machine feedback in foreign language writing provides a rich perspective for understanding related theories and learning processes. Gao Feng emphasized the importance of feedback in the process of foreign language writing, pointing out that machine feedback, as an emerging feedback mechanism, can help learners quickly identify and correct grammatical, lexical, and structural errors and improve their writing ability [14]. This kind of feedback differs from traditional teacher feedback, which is immediate and personalized, thus promoting the efficiency and autonomy of writing learning. Machine feedback bridges teacher feedback's time and quantity limitations and builds a bridge between learners and learning resources, helping them better understand the elements and standards of writing. In addition, Burstein, J., Chodorow, M, and Leacock, C explored the role of computerized automatic grading systems, such as E-rater, in English writing feedback. The study also notes that such technologies reduce the burden on teachers and provide immediate feedback to students, enabling personalized learning path design.

Unlike traditional teacher feedback, machine feedback has the advantage of immediacy and scale. The machine feedback system can provide personalized learning solutions and targeted guidance for students' specific problems. By applying this technology, teachers can focus more time and energy on interacting with students and on in-depth instruction, which undoubtedly improves the efficiency and effectiveness of teaching. Through empirical research, Li Jing found that the machine feedback system can provide students with instant and accurate diagnosis of language errors, help students find problems in time, and make targeted improvements, thereby significantly improving their writing skills [15]. From the perspective of teaching practice, machine feedback can improve students' language ability, stimulate learners' interest in writing, and enhance their awareness of independent learning through a personalized feedback mechanism. From a pedagogical perspective, the system's data analytics capabilities allow educators to identify common student errors and writing challenges

more precisely and optimize the teaching design to achieve accurate teaching. Applying this technical means has brought innovative changes to the traditional writing teaching model.

In summary, machine feedback as a supplementary tool for teaching foreign language writing positively impacts the innovation of the current education model. Effectively integrating machine feedback into the teaching and learning process can create a better learning environment, improve foreign language writing skills, and cultivate students' ability to learn independently. In this way, teaching foreign language writing can become more flexible and efficient, achieving more ideal teaching results.

4.2. The negative effects of machine feedback on foreign language writing

Machine feedback may inhibit students' creativity, autonomy, and engagement in higher-order cognitive processes essential to advanced writing. Grimes, Warschauer and CCCC critique machine feedback's overreliance on rigid grading templates and standardized language patterns, arguing that such mechanized systems may suppress creativity, critical thinking, and humanistic textual appreciation by prioritizing formulaic writing over interpersonal communication [16]. These limitations are compounded by semantic comprehension gaps, as noted by Dikli, Shermis, and Burstein, where machines struggle to interpret complex contexts or deliver nuanced feedback. Empirical evidence from Lee et al. further challenges machine efficacy, showing no significant difference in long-term writing quality (grammar, structure, or overall competence) between students receiving machine feedback versus traditional teacher guidance over six months [17].

There are still different views in the academic community on whether AI feedback can replace the role of teacher guidance in foreign language writing. Zou and collaborators (S. Zou) Zou, K. Guo, J. Wang, Y. Liu) revealed several key findings: compared with machine feedback, teacher guidance can significantly improve learners' enthusiasm for engagement and the accuracy of text modification [18]. While teacher feedback excels in addressing linguistic accuracy and content relevance, students exhibited greater engagement and responsiveness to ChatGPT's suggestions concerning structural and organizational coherence. It is worth noting that although survey participants generally agree on the advantages of AI tools in specific dimensions, most learners still clearly prefer teacher-directed models. This paradox reveals the complex relationship between technological tools and traditional pedagogy, which are both complementary and competing in foreign language writing education. This phenomenon stems from the difference in the attributes of the feedback mechanism. Teacher feedback often includes emotional incentives, cognitive scaffolding, and dynamic dialogue, which can be adjusted according to students' individual differences, and this humanistic interaction is irreplaceable for maintaining learning motivation. Therefore, in the future, humans may achieve "complementary collaboration" between teachers and machines or design feedback mechanisms that are "phased" or "task specific". This suggests that machine feedback may be more suitable as a "scaffolding" to support basic training, while the development of higher-order writing skills still needs to rely on the professional guidance of teachers.

There is a complex tension between the effectiveness of machine feedback and teacher guidance in foreign language writing. Research shows that although machine feedback can improve students' grammatical correctness, it is limited by factors such as template-based writing, which may inhibit students' creativity. CCCC even questions its violation of the essence of interpersonal communication. Teacher feedback has significant advantages in maintaining learning motivation and in-depth revision, thanks to emotional interaction and cognitive scaffolding (Zou et al.), while students more easily internalise ChatGPT's structural suggestions. The current consensus in academia is that the two should form a stepwise synergy: machine feedback is suitable for basic training, while cultivating higher-order abilities still requires humanistic guidance and dynamic adjustment by teachers.

4.3. Strategies for meeting writing challenges

Goal-oriented learners strategically leverage machine feedback by combining explicit guidance (e.g., grammar corrections) with implicit learning (e.g., analyzing AI-generated stylistic suggestions) to refine writing skills. For instance, Fathi and Rahimi's study on IELTS candidates demonstrated that motivated learners systematically utilized ChatGPT's iterative feedback loops: they first addressed surface errors flagged by the AI, then engaged in self-regulated revision by comparing multiple AI-generated rephrasings to internalize academic tone and cohesion. This dual-strategy approach — targeted error correction paired with metacognitive analysis—enabled learners to convert automated feedback into sustainable writing competence, transcending mere frequency of practice [19].

In the future, foreign language writers will inevitably cooperate with machine feedback to write in foreign languages. Andelyn Bedington proposes ways to help students consider working with machine feedback in writing without giving up their agency and unique perspectives [20]. As with all writing projects, basic questions run throughout, such as Why should I write? Who am I writing to? What are my goals? Part of classroom ethics is academic integrity expectations. Educators must establish clear and transparent guidelines regarding the use of machine feedback, ensuring that such guidance supports integrity without resorting to rigid or one-size-fits-all constraints.

In summary, in the context of machine feedback, multiple strategies need to be adopted to address writing challenges: seeking motivation for writing feedback, improving language accuracy through expression optimization functions; Learners should address lexical and grammatical weaknesses through personalized feedback loops. At the same time, they must maintain critical awareness, evaluate suggestions rigorously, and preserve originality in their work. At the same time, ethical standards should be established to avoid technological dependence, supplemented by teacher-student interactive feedback to deepen writing cognition and logical construction ability.

5. Conclusion

Research has shown that machine feedback significantly improves the accuracy and autonomous correction efficiency of foreign language writing through real-time grammar correction and structural optimization. However, its limitations in deep cognitive dimensions, such as discourse logic and rhetorical strategies, reveal the tension between algorithmic tools and humanistic writing. This discovery provides empirical support for the theory of technological mediation, emphasizing the need to reconstruct a balanced framework between "instrumental rationality" and "creative subjectivity" under the human-machine collaboration mode, and promoting the transformation of second language writing research from the "error correction paradigm" to the "cognitive enhancement paradigm". More importantly, this intelligent feedback mechanism cultivates learners' awareness of language monitoring, so that they pay more attention to the accuracy of language forms in the writing process, thus promoting the continuous improvement of their overall writing level. From a pedagogical perspective, machine feedback systems enable educators to strategically integrate automated assessment with human evaluation through complementary design (e.g., cyclical revision processes and metacognitive reflection tasks), thereby not only alleviating grading burdens but systematically fostering learners' self-regulated writing development through iterative self-diagnosis and targeted skill enhancement. The cultivation of this ability has a profound impact on learners' long-term language development.

In summary, the personalized nature of machine feedback is one of its key advantages in improving foreign language writing skills. The intelligent feedback system can provide precise personalized guidance based on the learner's language level, error types, and learning trajectory, making writing training more targeted and effective. Overall, the application of machine feedback technology in the field of foreign language writing has had a positive impact at multiple levels. Machine feedback

enhances second language writing by improving grammar and vocabulary through automated correction. However, its cognitive limitations—particularly in discourse-level analysis—call for balanced human-AI collaboration to preserve pedagogical integrity. It drives the intelligent transformation of teaching methods. Personalized learning support enhances learners' writing proficiency and academic performance. This innovation opens new pathways for advancing foreign language writing pedagogy.

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