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A Study on the Intervention and Optimization of Generative AI in Mitigating Negative Semantic Transfer in English Writing

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Abstract: This study focuses on the intervention and optimization of generative AI in addressing semantic negative transfer in English writing. It first elaborates on the theoretical foundations and research progress of AI-assisted second language writing, followed by an analysis of the types, characteristics, and native language roots of semantic negative transfer in English writing. Subsequently, the intervention effects of generative AI are examined in terms of its identification capabilities, the quality of revision suggestions, its impact on students' revision behaviors and writing skill development, as well as student attitudes. Finally, strategies and recommendations are proposed from three perspectives: optimizing the use of AI tools, refining teaching processes, and cultivating students' AI literacy, aiming to promote the intelligent development of second language writing instruction.

Keywords: Generative AI; English Writing; Semantic Negative Transfer; Intervention Strategies

Introduction

In English writing instruction, semantic negative transfer is a critical factor affecting the quality of learners' writing. The emergence of generative AI presents new opportunities to address this issue. Leveraging its powerful language capabilities, it can not only identify semantic errors but also provide suggestions for expression. However, its effectiveness in application, existing challenges, and optimization methods have become urgent research topics. This paper aims to conduct an in-depth investigation into the intervention of generative AI on semantic negative transfer in English writing and propose targeted

optimization strategies to enhance second language writing instruction.

1. Generative AI-Assisted Second Language Writing: Theoretical Foundations and Research Progress

Generative AI-assisted second language writing has a solid theoretical foundation. From the perspective of cognitive linguistics, language learning is a process of knowledge construction and cognitive processing. Generative AI can provide rich language input, helping learners build their language knowledge system. Constructivism emphasizes learners' active participation, and AI can create interactive



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environments to stimulate learners' interest and initiative in writing. In recent years, significant progress has been made in related research. Early studies focused on the application of AI in grammar correction, but with technological advancements, current research places greater emphasis on semantic-level assistance^[1]. Leveraging its powerful language generation and comprehension capabilities, generative AI can not only identify semantic errors in writing but also offer diverse expression suggestions. This brings new opportunities to second language writing instruction, making AI an important tool for enhancing learners' writing skills and driving the field toward intelligent and personalized development.

2. Analysis of Types and Characteristics of Semantic Negative Transfer in English Writing

2.1 Encoding Framework for Semantic Negative Transfer

The semantic negative transfer analysis framework serves as the foundation for systematically examining semantic negative transfer phenomena in English writing. Grounded in language contrast theory, this framework is constructed across three dimensions: lexical, syntactic, and discourse. At the lexical level, it focuses on negative transfer arising from differences in semantics and collocations between the native language and English. The syntactic level analyzes the influence of native language structures on English sentence construction. At the discourse level, it investigates the inappropriate application of native language discourse organization patterns in English writing. This framework enables precise identification of semantic negative transfer points, clarifies their origins, and provides a clear pathway for further in-depth research. It facilitates a comprehensive and thorough exploration of the complexities of semantic negative transfer in English writing, thereby offering robust support for pedagogical interventions.

2.2 Distribution Characteristics of Semantic Negative Transfer in Pretest Corpora

Analysis of pre-test corpora revealed distinct patterns in the distribution of semantic negative transfer. At the lexical level, confusion between near-synonyms was prominent—for instance, indiscriminately substituting "big" for "large" while overlooking subtle semantic

differences. Collocation errors were also frequent, such as using "make a research." Syntactically, influenced by the native language, sentence structures appeared disorganized, as when Chinese run-on sentence patterns were directly applied to English, resulting in a lack of logicity and coherence. At the discourse level, native language thinking patterns led to unnatural paragraph transitions in English writing, characterized by an absence of topic sentences and transitional words. These features reflect the varying degrees of interference from the native language across different linguistic levels and provide empirical support for targeted instruction.

2.3 Analysis of Native Language Roots of Semantic Negative Transfer

The primary roots of mother tongue negative semantic transfer lie in differences in language systems and thinking patterns. At the language system level, significant distinctions exist in lexical semantic ranges and collocation habits between different languages. Taking Chinese and English as examples, Chinese vocabulary often carries broader and more generalized meanings, with a single word potentially covering multiple related connotations, whereas English vocabulary tends to be more precise and detailed, with each word having relatively clear semantic boundaries. This discrepancy can easily lead to vocabulary misuse in English writing by learners, such as inaccuracies in word choice or inappropriate collocations. In terms of thinking patterns, Chinese emphasizes parataxis, focusing on internal logical coherence, where sentences are often connected through semantic associations. English, on the other hand, prioritizes hypotaxis, relying on rigorous grammatical structures and explicit connectors to construct sentences and paragraphs. Additionally, the cultural background of the mother tongue can subtly influence learners' understanding and expression of semantics, further leading to semantic errors in English writing that do not conform to English cultural norms^[2].

3. Analysis of the Intervention Effects of Generative AI

3.1 AI's Ability to Identify Negative Semantic Transfer

Generative AI has demonstrated certain capabilities in identifying semantic negative transfer in English

writing. Utilizing advanced natural language processing technologies, it can analyze text semantics, compare the linguistic rules and expression habits between the native language and English, and accurately pinpoint instances of semantic negative transfer. For example, AI can effectively identify issues such as confusion of near-synonyms and collocation errors at the lexical level, as well as structural disorganization at the syntactic level. However, its recognition abilities still have limitations. When faced with complex semantic relationships or semantic errors related to cultural background, AI may produce misjudgments or omissions. Additionally, there are differences in the recognition capabilities among various generative AI models, which necessitates continuous optimization of algorithms and models to enhance the accuracy and comprehensiveness of semantic negative transfer identification.

3.2 Quality Assessment of AI Modification Suggestions

The accuracy and suitability of AI-generated revision suggestions vary. Some recommendations are precise and reasonable, effectively correcting semantic negative transfer and enhancing text quality. For instance, AI can provide appropriate alternative vocabulary for lexical misuse and correct sentence structures for syntactic errors. However, certain suggestions are problematic, such as proposing contextually inappropriate replacements or producing grammatically correct but semantically incoherent sentences. This is primarily because AI lacks an understanding of deeper factors like cultural nuances and contextual implications. Evaluating the quality of AI revision suggestions requires a comprehensive consideration of multiple aspects, including grammatical correctness, semantic rationality, and contextual appropriateness. By combining manual assessment with data analysis, a foundation for AI improvement can be established to enhance the practicality of its suggestions.

3.3 Impact on Students' Revision Behavior

Generative AI has multifaceted impacts on students' revision behaviors. On the positive side, it offers students convenient revision pathways, enabling them to quickly obtain suggestions and enhance revision efficiency. AI feedback can also guide students to focus on issues of semantic negative transfer, strengthen their

language awareness, and encourage proactive thinking about how to improve their writing. However, negative effects cannot be overlooked. Some students over-rely on AI, lacking independent thinking and judgment, and directly adopt AI suggestions without understanding the underlying language rules, resulting in revised texts that lack individuality and innovation. Additionally, the limitations of AI recommendations may lead students to develop misconceptions about their own writing abilities, negatively affecting their motivation to learn. Therefore, it is essential to guide students in using AI appropriately and cultivate their independent revision skills ^[3].

3.4 Impact on Writing Ability Development

Generative AI has a dual impact on the development of students' writing skills. On the positive side, it provides students with abundant learning resources and feedback, helping them accumulate vocabulary, master syntactic structures, and improve the accuracy and fluency of their language expression. Through interaction with AI, students can be exposed to diverse ways of expression, broaden their writing perspectives, and enhance their writing proficiency. However, over-reliance on AI may hinder the development of students' writing abilities. Students may lack an in-depth understanding and practical application of language knowledge, making it difficult for them to think and create independently. Moreover, texts generated by AI may lack emotion and individuality, which is not conducive to students developing a unique writing style. In teaching, AI should be used appropriately to guide students in utilizing it as a supplementary tool, thereby promoting the comprehensive development of their writing skills.

3.5 Student Attitudes and Acceptance

Students exhibit varying attitudes and acceptance levels towards generative AI-assisted writing. Some students hold a positive view of AI, believing it can quickly provide feedback and suggestions to help improve their writing skills. They show interest and anticipation for AI-assisted writing, are willing to actively try it, and cooperate enthusiastically. However, other students express concerns and resistance. They worry that AI might replace their own thinking and hinder the development of their writing abilities, or they question the accuracy and reliability of AI, making

them hesitant to rely on it completely ^[4]. Students with different learning levels and styles also differ in their acceptance of AI. Therefore, in teaching, it is necessary to pay attention to students' attitudes and needs, strengthen guidance and training, help students correctly understand the role of AI, and enhance their acceptance of AI-assisted writing.

4. Optimization Strategies and Teaching Suggestions

4.1 Optimization of AI Tool Usage

To further optimize the application of AI tools in second language writing instruction and enhance teaching effectiveness, the primary task is to improve the performance of AI models. This requires continuous investment in research and development efforts to refine algorithms. Currently, AI still has certain limitations in identifying semantic negative transfer, and its accuracy and stability need improvement. By conducting in-depth research on language patterns and common error types among second language learners, targeted algorithmic enhancements can significantly increase the accuracy of semantic negative transfer recognition and the quality of revision suggestions. At the same time, considering the differences in language proficiency, learning styles, and cultural backgrounds among learners, AI models should possess stronger adaptability to meet diverse learning needs. Secondly, developing personalized features is crucial. By leveraging multidimensional data such as students' proficiency levels, writing styles, and interests, tailored feedback and suggestions can be provided. For example, for students with weaker foundations, the focus should be on correcting and guiding vocabulary and grammar; for more advanced students, greater emphasis should be placed on optimizing text structure and logic ^[5]. Strengthening human-computer interaction design is also essential. Designing simple, intuitive, and user-friendly interfaces lowers the barrier for student use, enabling them to get started easily. Additionally, establishing robust feedback mechanisms encourages students to promptly report issues encountered during use, allowing developers to continuously refine and improve AI tools based on this feedback, thereby better serving second language writing instruction.

4.2 Optimization of Teaching Processes

In terms of the teaching process, fully integrating

AI assistance into all stages of writing instruction can significantly enhance the systematicity and effectiveness of teaching. Before writing, teachers can make full use of AI tools to provide students with rich vocabulary, diverse sentence structures, and exemplary essays closely related to the writing topic. These resources help students broaden their perspectives, stimulate creative inspiration, and accumulate writing materials, laying a solid foundation for subsequent writing tasks. During the writing process, it is crucial to guide students in using AI for real-time checks. AI can quickly identify issues such as negative semantic transfer, grammatical errors, and spelling mistakes, offering timely corrective suggestions. This enables students to promptly identify and resolve problems, develop good writing habits, and improve writing efficiency. After writing, organizing peer review and discussion activities is essential. Students can use AI feedback to deeply analyze the strengths and weaknesses in each other's work, collaboratively explore improvement methods, and foster mutual learning and collective progress. Additionally, teachers can leverage AI-generated data analysis to gain a comprehensive understanding of students' writing performance, including common error types and progress trends, thereby adjusting teaching strategies to achieve precise instruction and effectively enhance second language writing outcomes.

4.3 Cultivating Students' AI Literacy

In the current era of intelligence, cultivating students' AI literacy is crucial for second language writing learning and future development. Schools should actively take on this responsibility by offering specialized courses or organizing lecture series to systematically introduce students to the fundamental principles of generative AI, its wide range of application scenarios, and its inherent limitations. This enables students to fully understand the role and usage of AI in second language writing, recognizing that AI is merely an auxiliary tool, not a complete substitute for human creation ^[6]. During the teaching process, educators should focus on guiding students to use AI correctly, emphasizing the cultivation of critical thinking skills. This approach helps students analyze and evaluate AI feedback with a rational mindset, avoiding blind reliance on AI suggestions. Instead, they should integrate their own knowledge and

reasoning to make informed decisions. Encouraging students to actively participate in AI-assisted writing practice allows them to continuously explore and summarize experiences, thereby enhancing their ability to utilize AI tools. Simultaneously, it is essential to foster students' information literacy and self-directed learning capabilities, enabling them to quickly filter useful resources from vast amounts of information. By leveraging AI tools to integrate and utilize these resources, students can continually improve their second language writing skills and better adapt to the demands of future intelligent learning environments.

Conclusion

Generative AI has injected new vitality and challenges into English writing instruction. Analysis of its intervention effects on semantic negative transfer reveals that while it offers certain advantages, issues such as imprecise identification and inconsistent suggestion quality persist. However, through strategies like optimizing AI tool usage, refining teaching processes, and cultivating students' AI literacy, its application effectiveness in English writing pedagogy can be significantly enhanced. Moving forward, continuous exploration is needed to better leverage generative AI in second language writing instruction, thereby fostering sustained improvement in students' writing proficiency.

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