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Generative AI Feedback in College Students' English Argumentative Writing: Effects, Dilemmas, and Pedagogical Implications

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Abstract: Generative artificial intelligence (GenAI) is gradually entering college students' English argumentative writing instruction. This paper systematically reviews the effects, main dilemmas, and pedagogical implications of generative AI feedback in college students' English argumentative writing. Existing studies show that generative AI feedback provides notable immediate support at lower-order linguistic levels such as grammar, spelling, punctuation, lexical substitution, language fluency, and lexical diversity, and can enhance writing motivation, self-efficacy, and some aspects of learning engagement. However, in higher-order dimensions such as argument development, argumentation quality, discourse organization, coherence and cohesion, cultural context, and authorial voice, the effect of AI feedback used alone is limited; teacher feedback and human–AI hybrid feedback are better able to compensate for these shortcomings. At the same time, generative AI feedback also brings problems such as lengthy and difficult-to-understand feedback, insufficient specificity, over-reliance, weakened critical thinking, academic integrity concerns, authorial voice issues, cultural bias, assessment validity, and insufficient AI literacy. On this basis, this paper proposes that generative AI feedback should be positioned as "supplementary rather than substitutive"; that a human–AI division of labor should be implemented in which AI handles lower-order language feedback and teachers lead higher-order argumentative feedback; that the timing of AI intervention should be arranged in stages; that collaborative processing of feedback, revision logs, prompt engineering, and AI feedback literacy training should be carried out; and that academic integrity and data-use regulations should be established, thereby improving the quality of college students' English argumentative writing instruction.

Keywords: College Students, English Argumentative Writing, Feedback Literacy, Generative Artificial Intelligence.

1. Introduction

English argumentative writing is an important manifestation of college students' academic English ability. It requires writers to put forward a clear stance, organize arguments and evidence, address counterarguments, and maintain discourse coherence and linguistic accuracy. For non-English-major college students, argumentative writing involves not only language-form issues but also higher-order abilities such as argumentative content, logical structure, and academic expression. Although traditional teacher feedback is authoritative and contextualized, under conditions of large classes, tight class hours, and heavy teacher workloads, it is difficult to cover every student's individualized needs in a timely manner. Generative artificial intelligence tools, especially ChatGPT, DeepSeek, and others, can instantly generate grammar corrections, lexical substitutions, discourse evaluations, and revision suggestions according to prompts, and are therefore regarded as an important resource for alleviating the contradiction between feedback supply and demand. Amoush and Alhobsan's systematic review pointed out that ChatGPT in English as a foreign language writing can improve accuracy, vocabulary use, fluency, coherence, and learning motivation, but there are also concerns about over-reliance and academic integrity [10]. Barrot also argued that ChatGPT can serve as a writing assistance tool while potentially bringing challenges to writing instruction and academic integrity [16]. Therefore, the question is no longer whether college students use generative AI feedback, but how to use it reasonably in English argumentative writing so that it truly promotes the development of writing ability.

Existing research has formed two seemingly contradictory judgments about the effects of generative AI feedback. On the one hand, AI feedback is immediate, abundant, and repeatedly accessible, and can reduce writing anxiety and improve revision efficiency; on the other hand, AI feedback is still inferior to teachers in higher-order argumentation, content depth, cultural context, and individualized judgment, and may induce cognitive outsourcing and over-reliance. Liu and Liang's three-level meta-analysis found that AI-assisted feedback had a small overall positive effect on second language writing, with a relatively strong effect on emotional outcomes and a limited effect on cognitive learning outcomes, and was therefore more suitable as a supplementary tool in second language writing instruction [1]. Wang et al.'s systematic review also found that the application of generative AI in second language writing processes is concentrated in the feedback, revision, and polishing stages; learning activities change rapidly, while learning objectives and assessment strategies lag behind, resulting in the problem of "hot tool use, shallow pedagogical transformation" [3]. This indicates that discussion of generative AI feedback cannot remain at the binary judgment of "effective or ineffective," but should distinguish writing dimensions, timing of intervention, teacher roles, and student engagement approaches. Focusing on college students' English argumentative writing, this paper addresses three questions:(1) In what aspects is generative AI feedback effective? (2)What dilemmas does it face in argumentative writing? (3)What pedagogical strategies can teachers adopt to improve the quality of its application?

2. Conceptual Basis and Analytical Framework

The generative AI feedback referred to in this paper means grammar corrections, lexical suggestions, structural evaluations, content revision suggestions, or rewritten texts generated by generative artificial intelligence tools such as ChatGPT, DeepSeek, and DeepL Write according to students' texts and prompts. Compared with earlier automated writing evaluation systems, generative AI can not only point out errors but also explain reasons, provide alternative expressions, generate revised versions, and even directly rewrite paragraphs. Wilson and Roscoe's research on automated writing evaluation reminded us that the effects of writing evaluation tools cannot be judged only by a single writing-quality score; multiple indicators such as self-efficacy, standardized test performance, teacher perceptions, and implementation contexts should also be examined. Their study found that automated writing evaluation did not significantly improve single-task holistic writing quality, but was indirectly associated with writing self-efficacy and state-level English language arts test performance, and that the implementation context was very important [2]. This conclusion is equally instructive for generative AI feedback: the effect of AI feedback depends on the teaching task in which it is embedded, how teachers use it, and how students process it.

English argumentative writing has distinct genre characteristics. It requires writers to take a stance on controversial topics, provide reasons and evidence, respond to counterarguments, and form a coherent argumentative structure. Luo et al. pointed out that AI-only feedback is effective in vocabulary and grammar but insufficient in higher-order aspects such as content selection, coherence, and cohesion; teacher–AI hybrid feedback can compensate for these deficiencies, and they therefore recommended "partially automated" human–AI hybrid feedback: AI is responsible for lower-level feedback and teachers for higher-level feedback [11]. Yang and Wu, from the perspective of intervention timing, pointed out that throughout-process embedding of generative AI in writing and post-task feedback each have advantages: throughout-process embedding is more conducive to the content and organization dimensions, while post-task feedback is more conducive to the vocabulary dimension; both can improve spelling and formatting, but have limited effects on syntactic ability [13]. It can thus be seen that the role of generative AI feedback in argumentative writing is not uniform but dimensional, conditional, and process-based.

Feedback can be transformed into writing ability only when students understand, evaluate, and adopt it. Zhang and Jiang found that a human–AI hybrid feedback environment can significantly improve learning engagement and thereby improve second language writing performance; in a hybrid feedback environment, cognitive engagement has the greatest impact on writing performance, followed by behavioral engagement, with emotional engagement having the least impact, and metacognitive strategies significantly predict writing performance [4]. Chen and Liang found that when students collaboratively processed ChatGPT feedback on argumentative writing, behavioral, cognitive, and social engagement gradually increased, but emotional engagement was contradictory: on the one hand, students acknowledged that the feedback helped improve writing quality; on the other hand, they considered the feedback insufficiently clear and specific, and their attitudes toward the feedback gradually shifted from appreciation at the beginning of the semester to criticism [9]. This suggests that the analysis in this paper should simultaneously attend to the "textual effects" and "learning-process effects" of AI feedback and incorporate student feedback literacy and teacher mediation into the analytical framework

3. Effects of Generative AI Feedback in College Students' English Argumentative Writing

3.1. Relatively Stable Immediate Support at the Linguistic-Form and Lexical Levels

Multiple studies have shown that generative AI feedback has notable immediate support effects at the levels of grammar, spelling, punctuation, and vocabulary. Wei and Li, taking college English compositions as an example, pointed out that ChatGPT can be used for grammar correction and punctuation revision in initial-stage revision, for lexical substitution, semantic fluency, and style adjustment in intermediate-stage polishing, and for summary writing in advanced-stage output; ChatGPT can provide multiple expression options and revision rationales, helping students understand errors and revise quickly [7]. Pretorius and Thewissen, in a study of teacher-moderated ChatGPT feedback, found that after ChatGPT-assisted revision, students' texts improved on some accuracy indicators, and lexical diversity increased noticeably; however, many errors remained in the texts, and some revisions came from selective uptake, paraphrasing, or direct copying, indicating that AI feedback does not automatically equal improved linguistic accuracy [15]. Amoush and Alhobsan also concluded that ChatGPT can improve EFL students' writing accuracy, lexical diversity, fluency, and coherence [10]. Yang and Wu's quasi-experiment found that the post-task feedback group improved more noticeably in the vocabulary dimension, suggesting that obtaining AI feedback after independently completing a first draft may prompt students to engage in deeper processing through lexical retrieval and comparison [13]. Overall, the effects of AI feedback at lower-order linguistic-form levels are relatively consistent, and it is especially suitable for tasks such as grammar checking, lexical substitution, sentence polishing, and improvement of language fluency.

3.2. Effects on Discourse Organization and Argumentative Content Depend on Teacher Collaboration and Intervention Timing

Compared with the linguistic-form level, the effects of generative AI feedback on argumentative content, argumentation, and discourse organization are more complex. Luo et al. found that AI-only feedback had limited effects on content selection and coherence and cohesion, whereas teacher-plus-AI hybrid feedback significantly improved argumentative content selection and brought more obvious improvements in conceptual coherence; therefore, AI is more suitable for handling lower-level issues such as vocabulary and grammar, while teachers should focus on higher-level issues such as consistency, style, and argumentation [11]. Yang and Wu found that the throughout-process embedding group significantly outperformed the post-task feedback

group in the content and organization dimensions; the mechanism was that students could interact with AI in real time during the planning and drafting stages and develop higher-order writing abilities through "iterative ideation" and "strategy internalization"; the post-task feedback group, owing to the "black box of thinking" and "cognitive restart," was more inclined toward surface-level revision [13]. This indicates that if the teaching goal is to improve argumentative content organization and argumentative structure, AI intervention should not be merely after-the-fact error correction but should be embedded in planning, outlining, argument checking, and revision planning. However, throughout-process embedding may also bring risks of cognitive dependence, so teachers need to design scaffolds and gradually withdraw them.

3.3. Facilitative Effects on Learning Motivation, Self-Efficacy, and Feedback Engagement

The immediacy and low evaluative pressure of generative AI feedback help reduce writing anxiety and enhance self-efficacy and willingness to revise. Amoush and Alhobsan pointed out that ChatGPT's interactive design can stimulate students' motivation and enhance self-regulated learning [10]. Liu and Liang's meta-analysis found that AI-assisted feedback had the strongest effect on emotional outcomes, indicating that AI feedback has advantages in creating a low-pressure feedback environment and enhancing emotional engagement, but its direct effect on cognitive learning outcomes is limited [1]. Zhang and Jiang found that human–AI hybrid feedback can more significantly improve learning engagement and writing performance than teacher feedback alone, and that metacognitive strategy use within cognitive engagement significantly predicts writing performance [4]. Chen and Liang found that collaborative processing of ChatGPT feedback can enhance students' behavioral, cognitive, and social engagement; students processed feedback through strategies such as reading aloud, questioning, retelling, explaining, comparing, and goal setting in group discussions; however, as the number of uses increased, students gradually found the feedback insufficiently specific, and their critical awareness increased [9]. Escalante et al.'s study showed that AI-generated feedback and human tutor feedback did not differ significantly in learning outcomes, and students' preferences for the two types of feedback were nearly evenly split, indicating that AI feedback can serve as an acceptable source of formative feedback but is more suitable for mixed use with human feedback [5].

3.4. Effects are Markedly Conditional and Differentiated

The effects of generative AI feedback are influenced by intervention timing, teacher mediation, student proficiency, and feedback processing methods. Yang and Wu found that both throughout-process embedding and post-task feedback were effective in overall writing scores, but the dimensional effects differed: throughout-process embedding was beneficial to content and organization, post-task feedback was beneficial to vocabulary, both had limited improvement in syntax, and both improved spelling and formatting [13]. Pretorius and Thewissen emphasized that teacher-moderated ChatGPT use, through pedagogical safeguards such as ethical agreements, teacher-provided sample prompts, and submission of chat logs, prompted students to make restrained revisions rather than wholesale copying; even so, accuracy improvement remained uneven, and increased lexical diversity might also come from selective uptake, paraphrasing, or partial copying [15]. Guo and Wang found that ChatGPT generated significantly more feedback than teachers and distributed it relatively evenly across content, organization, and language; however, teacher feedback used more informative feedback and queries, while ChatGPT used more direct instructions and praise; teachers believed that ChatGPT could supplement their own feedback and reduce their burden, but also pointed out that its feedback was lengthy, difficult for lower-proficiency students to understand, could not directly annotate texts, and lacked knowledge of students' backgrounds [8]. These differences indicate that AI feedback is not a stable "pedagogical prescription"; its effects depend on instructional design and student processing.

4. Main Dilemmas in Applying Generative AI Feedback to College Students' English Argumentative Writing

4.1. Limited Higher-Order Feedback Ability and Uneven Feedback Quality

Generative AI feedback performs relatively well at the grammar and vocabulary levels, but still has obvious limitations in the dimensions most central to argumentative writing: argumentation quality, content depth, logical coherence, and cultural context. Luo et al. pointed out that AI feedback has limited effects on content selection and coherence and cohesion, and may generate suggestions that do not conform to the genre requirements of argumentative writing, requiring teacher correction [11]. Guo and Wang found that although ChatGPT feedback was large in quantity and broad in coverage, it contained off-task feedback unrelated to requirements and could not directly annotate problem locations in student texts, increasing the burden on students to locate and understand problems [8]. Chen and Liang found that students considered ChatGPT feedback comprehensive but insufficiently specific, lacking additional explanations and examples, and difficult to directly transform into revision actions [9]. Pretorius and Thewissen found that teacher-moderated ChatGPT revisions still retained many errors, and some new errors even appeared during revision, indicating that the quality and stability of AI feedback remain insufficient [15]. Barrot also pointed out that ChatGPT may produce templated writing, inaccurate references, and insufficient grasp of specific audiences and contexts [16]. Therefore, AI feedback cannot be regarded as an "automatically reliable" evaluator, especially in the cultivation of higher-order argumentative abilities, where teacher screening and supplementation are needed.

4.2. Risks of Over-Reliance and Cognitive Outsourcing

The convenience of generative AI may lead to over-reliance and weaken students' abilities to independently plan, argue, and revise. Wu and Ji's survey of 915 undergraduates from 9 universities found that about 73% of participants showed moderate or severe generative AI dependence tendencies in English writing; internal motivation, writing anxiety, academic pressure, and grade level were significantly

positively correlated with dependence, and humanities students' dependence was higher than that of students in science and engineering, social sciences, agriculture and medicine [12]. This datum indicates that AI dependence in college students' English writing is no longer an isolated phenomenon. Kubota pointed out that generative AI may be a writing partner, a tool, or even a "dictator," and learners need to develop critical reading and thinking abilities rather than completely handing writing judgment over to AI [14]. Wang et al.'s systematic review found that generative AI's "hybrid activity" merges feedback provision and revision execution into one step; students may directly obtain optimized texts after a single prompt, thereby skipping the cognitive processes they should undergo [3]. Yang and Wu also warned that throughout-process embedding may induce cognitive dependence and weaken deep learning effects [13]. If students treat AI feedback as a tool that "thinks for them" rather than a scaffold that "helps them think," argumentative writing ability will be difficult to truly develop.

4.3. Academic Integrity, Authorial Voice, and Assessment Validity

Generative AI feedback also brings issues of academic integrity and authorial voice. Amoush and Alhobsan pointed out that the main concerns about ChatGPT in EFL writing include over-reliance, academic integrity, and cultural bias [10]. Barrot argued that ChatGPT may make it too easy for students to complete writing tasks, weaken critical and creative thinking, and that AI-generated content may be difficult for traditional plagiarism-detection tools to identify [16]. Pretorius and Thewissen emphasized that if AI-assisted revision produces linguistically overly perfect texts, authentic markers of students' language performance may disappear, thereby affecting the validity of second language assessment; their study attempted to preserve student authorship through safeguards such as ethical agreements, teacher-provided sample prompts, and submission of chat logs, but still found some direct copying [15]. Kubota proposed that in the AI era, the goals of writing learning need to be reconsidered: learners must be able both to communicate effectively with AI and to read AI-generated texts critically [14]. Therefore, the use of AI feedback must be combined with authorial identity, process records, and assessment reform; otherwise, writing assessment may become an assessment of the quality of AI output.

4.4. Cultural Bias, Intercultural Communication, and Insufficient Contextual Adaptation

Generative AI is mainly trained on large-scale corpora and may implicitly contain particular cultural writing norms and biases. Amoush and Alhobsan pointed out that ChatGPT is mainly trained on Western English writing texts and may misunderstand different cultural writing styles and reflect cultural bias in lexical choice, syntactic patterns, and default tone [10]. Zhang and Hong also pointed out that ChatGPT pays more attention to language form than cultural connotation; if training data carry cultural stereotypes, it may output texts that do not conform to intercultural communication rules, which is not conducive to cultivating learners' intercultural communicative competence [6]. Kubota reminded us that AI-generated texts may contain errors and biases, and learners must possess critical reading ability [14]. In English argumentative writing, students from different cultural backgrounds may have different understandings of argumentative directness, authoritative citation, and handling of counterarguments; if AI feedback indiscriminately imposes a single rhetorical norm, it may cause student confusion. Therefore, teachers need to help students identify cultural assumptions in AI feedback and retain reasonable local expressions and authorial stances.

4.5. Implementation Conditions, AI Literacy, and Challenges to Teacher Roles

The effective implementation of generative AI feedback also faces issues such as AI literacy, prompt engineering, teacher burden, and access equity. Wang et al.'s systematic review pointed out that generative AI applications often show a "constructive misalignment" in which learning activities change rapidly while learning objectives and assessment strategies lag behind, and that the most frequently used AI functions often correspond to the shallowest pedagogical changes [3]. Guo and Wang found that teachers believed ChatGPT could reduce the feedback burden, but its feedback needed teacher screening, modification, and supplementation; teachers also worried that ChatGPT did not understand the class and student backgrounds and found it difficult to provide individualized feedback [8]. Zhang and Hong pointed out that ChatGPT may affect fairness and integrity in foreign language learning, weaken face-to-face human communication, reduce intercultural communicative competence, and hinder the development of critical thinking; teachers need to change their hostile attitudes toward AI, give play to AI as a teaching assistant, and establish an assessment approach of "dual-brain collaboration and intellectual symbiosis" [6]. Wu and Ji suggested that teachers should provide assessment criteria, optimize assignment design, introduce collaborative writing, attend to human–AI interaction processes, and improve generative AI feedback literacy [12]. This indicates that AI feedback is not simply "sent to students"; rather, teachers need to redesign tasks, assessment, and classroom interaction.

5. Pedagogical Implications

5.1. Clarify the Supplementary Positioning of Generative AI Feedback and Build a Human–AI Collaborative Feedback Mechanism

College English argumentative writing instruction should position generative AI feedback as a supplementary, formative feedback tool rather than a substitute for teacher evaluation. Liu and Liang's meta-analysis showed that the overall effect of AI-assisted feedback is small and limited for cognitive outcomes, and that it is most suitable as a supplementary tool in second language writing instruction [1]. Luo et al. recommended partially automated human–AI hybrid feedback: AI is responsible for lower-order feedback such as vocabulary and grammar, and teachers are responsible for higher-order feedback such as content, argumentation, coherence, and style [11]. Amoush and Alhobsan also advocated combining AI feedback with teacher guidance and training students to use AI tools responsibly [10]. Escalante et al. found no significant difference between AI feedback and human tutor feedback in learning outcomes, with student preferences nearly evenly split, and therefore recommended hybrid feedback to leverage the strengths of both [5].

Accordingly, teachers can establish a process of "AI initial screening, teacher selection, student revision": AI first provides language and structure suggestions; teachers then screen, supplement, and annotate them according to argumentative writing teaching objectives; and students then complete revision explanations.

5.2. Differentiate the Timing of AI Intervention According to Writing Stages and Teaching Objectives

The timing of AI intervention should match different stages of argumentative writing and teaching objectives. Yang and Wu found that throughout-process embedding is more beneficial to content and organization, post-task feedback is more beneficial to vocabulary, and the two have different effects on syntax and spelling/formatting [13]. Therefore, if the teaching focus is planning, outlining, and argumentative organization, students can be allowed to use AI during the planning and drafting stages for questioning, counterargument checking, and structural comparison, but they should be required to keep planning records; if the teaching focus is lexical richness and linguistic accuracy, students can independently complete a first draft before using AI feedback, so as to increase lexical retrieval and comparative processing. Luo et al. also pointed out that AI feedback has limited effects on content selection, and teachers should play a leading role in higher-order feedback [11]. Pretorius and Thewissen's study suggests that teacher-moderated prompts and submission of chat logs can limit wholesale copying and prompt students to make restrained revisions [15]. Teachers should design "AI-use windows" according to task objectives and avoid unconstrained use throughout the process.

5.3. Embed AI Feedback in Collaborative Processing, Revision Logs, and Argumentative Scaffolds

Generative AI feedback can be transformed into writing ability only when students process it deeply. Chen and Liang found that collaborative processing of ChatGPT feedback can enhance behavioral, cognitive, and social engagement; students understood feedback through strategies such as questioning, retelling, explaining, comparing, and goal setting in group discussions; however, students also gradually found the feedback insufficiently specific and needed teacher guidance [9]. Zhang and Jiang found that in a human–AI hybrid feedback environment, cognitive engagement and metacognitive strategies importantly predict writing performance [4]. Therefore, teachers can design "collaborative feedback processing" activities: first, students independently read AI feedback and mark their acceptance; then, in small groups, they discuss which suggestions are suitable for the argumentative essay's claims, evidence, and counterarguments; finally, they formulate a revision plan. Teachers can also require students to submit revision logs recording "what the AI suggestion was, why I accepted or rejected it, how I revised, and whether the argument became stronger after revision." This design can both leverage the immediacy of AI feedback and promote higher-order writing ability through metacognitive strategies and peer interaction.

5.4. Strengthen AI Feedback Literacy and Critical Thinking Training

Students need the ability to evaluate, screen, and transform AI feedback. Zhang and Hong pointed out that when using ChatGPT, critical thinking should be cultivated, including active independent thinking, reflective thinking, and comparative thinking; students should verify information from multiple sources and should not completely rely on AI for information [6]. Kubota emphasized that learners in the AI era must be able to read AI-generated texts critically and identify errors and biases [14]. Amoush and Alhobsan suggested training students to critically evaluate AI feedback rather than simply accept it [10]. Wu and Ji suggested incorporating human–AI interaction processes as part of course assignments and assessing whether students ask questions according to criteria and whether they can discern the quality of AI feedback [12]. Teachers can carry out prompt engineering training so that students learn to specify roles, provide argumentative writing scoring criteria, ask AI to explain revision rationales, ask AI to provide counterargument checklists, and compare feedback differences under different prompts. At the same time, teachers should train students to identify cultural bias, templated expressions, and inappropriate suggestions in AI feedback, and to retain their own argumentative stances and authorial voices.

5.5. Establish Supporting Systems for Academic Integrity, Data Security, and Assessment Reform

Classroom application of generative AI feedback requires institutional safeguards. Pretorius and Thewissen's study adopted safeguards such as students co-developing and signing ethical agreements, teachers providing sample prompts, and submitting ChatGPT chat logs, in order to reduce wholesale copying and protect authorship [15]. Amoush and Alhobsan suggested that institutions formulate clear guidelines for AI use in academic writing and require students to document their use of AI tools [10]. Barrot suggested that teachers emphasize the writing process, have students record topic selection, outlining, drafting, and revision steps, and use recent, localized topics to reduce the risk of AI ghostwriting [16]. Wu and Ji also suggested that teachers should not hand over all evaluation and revision to generative AI but should provide feedback that AI cannot provide [12]. Universities can establish supporting systems such as "AI-use declarations, spot checks of chat logs, process-based assessment, oral defenses, or reflective writing," shifting the focus of assessment from a single final draft to the processes of planning, revision, and reflection, thereby balancing efficiency, integrity, and assessment validity.

5.6. Attend to Emotional Experience and Motivation and Prevent "Low Pressure" from Becoming "Low Engagement"

Generative AI feedback can reduce writing anxiety and enhance self-efficacy, but it may also keep students in a comfort zone. Liu and Liang found that AI feedback has a relatively strong effect on emotional outcomes and a limited effect on cognitive outcomes, suggesting that teachers should connect positive emotional experiences with clear learning objectives [1]. Wu and Ji found that writing anxiety and academic pressure positively affect generative AI dependence,

and suggested providing clear assessment criteria, designing interesting topics, and introducing collaborative writing to reduce anxiety and pressure [12]. Zhang and Jiang found that hybrid feedback can enhance learning engagement, but emotional engagement has the smallest impact on writing performance, while cognitive engagement, especially metacognitive strategies, is more important [4]. Therefore, teachers should use AI feedback to reduce anxiety while using challenging tasks, peer assessment, teacher questioning, and revision requirements to transform students' positive emotions into sustained cognitive engagement, avoiding "high satisfaction but low depth of learning."

6. Conclusion

Synthesizing the existing literature, generative AI feedback in college students' English argumentative writing has obvious immediate language-support value and can improve grammar, spelling, lexical diversity, language fluency, and some aspects of writing motivation and engagement; however, in higher-order dimensions such as argumentative content, discourse organization, coherence and cohesion, cultural context, and authorial voice, the effect of AI feedback used alone is limited, and teacher feedback and human–AI hybrid feedback are more necessary. Its main dilemmas include insufficient higher-order feedback ability, uneven feedback quality, over-reliance, weakened critical thinking, risks concerning academic integrity and assessment validity, cultural bias, and insufficient AI literacy and institutional safeguards. Pedagogically, generative AI feedback should be positioned as supplementary formative feedback; a human–AI division of labor should be implemented in which AI is responsible for lower-order language feedback and teachers for higher-order argumentative feedback; the timing of intervention should be differentiated according to writing stages; collaborative processing, revision logs, and argumentative scaffolds should be embedded; AI feedback literacy and critical thinking training should be strengthened; and systems for academic integrity, data security, and process-based assessment should be established.

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