

AI-Generated Feedback and English Majors' Self-Efficacy: A Qualitative Study Based on Semi-Structured Interviews

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Abstract: This study aims to explore how AI-generated feedback influences English majors' self-efficacy and to identify the psychological mechanisms through which such feedback shapes learners' confidence, learning behaviors, and emotional experiences. A qualitative research method was employed to investigate English majors' experiences and perceptions of AI-generated feedback. Semi-structured interviews were conducted with 12 English-major undergraduates, and the interview data were analyzed through thematic analysis. The results show that AI-generated feedback influences learners' self-efficacy through four interconnected pathways: cognitive, behavioral, emotional, and social. Cognitively, AI feedback enhances learners' perceptions of competence by confirming their abilities and helping them recognize learning progress. Behaviorally, immediate feedback strengthens learners' control over the learning process and promotes independent problem-solving. Emotionally, supportive and non-judgmental feedback can enhance confidence and motivation, whereas excessive or impersonal corrections may negatively affect self-efficacy. Socially, learners view AI-generated feedback and teacher feedback as complementary rather than competitive. The study suggests that a human-AI collaborative feedback model can better support English learning by combining the efficiency and immediacy of AI with teachers' emotional support, professional judgment, and personalized guidance. These findings provide practical implications for the effective integration of generative AI into English education and for promoting learners' self-efficacy and self-regulated learning.

Keywords: Generative artificial intelligence (AI); AI-generated feedback; English majors; Self-efficacy; Human-AI collaboration

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1. Introduction

Generative artificial intelligence (AI) is changing English language learning in higher education. Tools like ChatGPT, DeepSeek, Doubao, Claude, and Gemini offer learners immediate and interactive feedback

on grammar, vocabulary, sentence organization, and content, and meanwhile open up new chances for independent and self-regulated learning. However, the influence of AI-generated feedback extends beyond linguistic improvement. It may also affect learners' psychological experiences, especially their self-efficacy. Self-efficacy is a key concept in Bandura's social cognitive theory, predicts academic achievement and motivation, and relates to persistence and self-regulated learning, too ^[1]. Previous research has increasingly examined AI-assisted language learning, yet few studies have looked at how AI-generated feedback affects English majors' self-efficacy. The psychological mechanisms behind this influence also remain unclear. Thus, this study, based on semi-structured interviews with 12 English-major undergraduates, uses a qualitative design to explore how AI-generated feedback influences self-efficacy and identifies the psychological mechanisms behind this influence. These findings add to the growing literature on AI-assisted language learning.

2. Literature review

2.1. AI-generated feedback in language education

The quick advancement of AI has profoundly changed the landscape of language learning and teaching. Generative AI tools are now popular among university students because they can offer instant and personalized feedback ^[2]. Unlike traditional teacher feedback, AI-generated feedback is not limited by time and space and can give detailed suggestions on grammar, vocabulary, organization, and content ^[3]. Previous studies show that AI-assisted feedback is able to improve writing quality and learning efficiency. For example, O'Neill and Russell (2019) found that AI-based automated writing evaluation systems helped learners spot language errors, hence improving writing accuracy ^[4]. Godwin-Jones (2022) noted that generative AI tools can not only provide grammatical corrections, but also suggest improvements to content logic and argumentative structure, partly making up for the limits of traditional automated writing evaluation systems ^[5]. In China, Zhu and Liu (2024) examined ChatGPT in foreign language writing instruction, and suggested ChatGPT can give learners rich language input and immediate feedback, increasing writing motivation and autonomous learning ^[6]. Li (2024) found that intelligent writing feedback systems can improve college students' English writing proficiency, particularly in terms of lexical diversity and syntactic complexity ^[7]. However, most of these studies focus on instructional effectiveness and linguistic performance of AI-generated feedback, with insufficient attention to its impact on learners' psychological development, especially self-efficacy.

2.2. Self-efficacy theory and its research in foreign language learning

Self-efficacy was proposed by Bandura within social cognitive theory and refers to individuals' beliefs in their ability to succeed at specific tasks ^[8]. Bandura argued that "self-efficacy influences behavioral choices, effort, persistence, and emotional reactions, serving as a powerful predictor of academic achievement. The formation of self-efficacy is influenced by four sources of information, such as mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states" ^[9]. In foreign language learning, many studies have confirmed a close link between self-efficacy and learner outcomes. These outcomes include academic achievement, learning motivation, strategy use, and self-regulated learning. For instance, Pajares (2003) noted that self-efficacy beliefs predict foreign language writing achievement

more strongly than writing ability itself ^[10]. Mills et al. (2007) claimed that learners with high self-efficacy showed greater persistence and strategy use in reading and listening tasks ^[11]. In China, Li and Xu (2014) studied non-English majors and found that self-efficacy indirectly influenced English academic achievement through learning strategies and attribution styles ^[12]. Yang (2025) proclaimed that English majors' speaking self-efficacy was positively correlated with their willingness to communicate in oral English ^[13]. It is worth noting that self-efficacy is domain-specific and context-sensitive and can be affected by external feedback, evaluation environments, and emotional experiences ^[14]. Therefore, investigating how novel feedback approaches (e.g., AI-generated feedback) influence learners' self-efficacy has significant theoretical and practical value.

2.3. Research on AI feedback and learners' psychological factors

The relationship between AI-generated feedback and learners' psychological factors has not been fully explored. Then, some studies have started to address this issue. Ghorbanzadeh Savar et al. (2026) found that students' writing self-efficacy improved after using ChatGPT for writing revision because AI-provided immediate feedback reduced uncertainty in the revision process ^[15–16]. However, the study also noted that learners might over-rely on AI feedback, possibly weakening their autonomous judgment and even having a negative impact on self-efficacy ^[17]. Regarding emotional experiences, Zawacki-Richter et al. (2019) suggested that AI feedback is non-judgmental and may create a psychologically safe learning environment, reducing anxiety and promoting positive emotional experiences ^[18]. Nevertheless, other studies have indicated that AI feedback can be overly mechanical or lack emotional responsiveness and may make learners feel frustrated or neglected ^[19]. In China, Li and Mutlu (2025) noted that intelligent foreign language learning systems should provide cognitive support and attend to learners' emotional needs; otherwise, they may undermine learners' confidence ^[20]. Lan, Liu, and Chen (2026) also emphasized that AI feedback often lacks emotional warmth, which may affect learners' acceptance and their willingness to continue using it ^[21]. Furthermore, studies on human-AI collaborative feedback are also emerging. For example, Luckin et al. (2016) proposed the framework of "human-AI collaborative learning," and advocated that AI and teachers should use their respective strengths to form a complementary relationship ^[22]. Chinese scholars Yu and Rao argued that AI feedback is good at addressing language form issues, whereas teacher feedback is irreplaceable for content depth, emotional support, and value guidance ^[23]. This view echoes Bandura's (1997) discussion of verbal persuasion and affective states. It suggests that combining AI and teacher feedback may be an important way to enhance learners' self-efficacy.

2.4. Research gaps and the positioning of the present study

Existing research provides a foundation for understanding AI-generated feedback in language education and its impact on learners' psychological factors. However, several limitations remain. First, most studies focus on instructional effectiveness and linguistic performance. They pay little attention to self-efficacy. Second, quantitative methods dominate. This makes it difficult to reveal learners' subjective experiences and underlying psychological mechanisms. Third, domestic research has mostly focused on writing. English majors' overall learning self-efficacy has received little attention. Fourth, the collaborative mechanism between AI and teacher feedback remains underexplored. The differential effects of these two feedback types on self-efficacy also need more research. Given these gaps, this study uses a qualitative design with semi-

structured interviews, investigates how AI-generated feedback influences English majors' self-efficacy and its underlying mechanisms, and addresses the following questions: (1) How does AI-generated feedback influence English majors' self-efficacy? (2) What psychological mechanisms are involved? (3) What are the similarities and differences between AI and teacher feedback? (4) How do learners perceive the human-AI collaborative feedback model? This study aims to connect research on AI-assisted language learning with self-efficacy research, and also seeks to provide practical references for optimizing AI-assisted English teaching.

3. Methodology

3.1. Research design

This study used a qualitative research design and examined how AI-generated feedback influences English majors' self-efficacy in English learning. Self-efficacy is closely tied to learners' perceptions, beliefs, and emotions. It is also linked to their personal experiences. Therefore, a qualitative approach was suitable. It could help gain a deep understanding of how students interpret AI-generated feedback. Semi-structured interviews served as the main data collection method. This method let participants freely express their experiences. It also allowed for deeper exploration of emerging issues.

3.2. Participants

This study utilized purposive sampling. It recruited participants who had used AI-powered learning tools in English learning. A total of 12 English-major undergraduates from a university in China participated in the study. To ensure diversity, participants came from different academic years and had different achievement levels, varying in how often they used AI tools (**Table 1**).

Table 1. Demographic characteristics of participants ($N=12$)

Participant	Gender	Year of Study	Academic Performance	Frequency of AI Use	Main AI Tools Used
P1	Female	Freshman	High	High (≥ 5 times/week)	ChatGPT, DeepSeek
P2	Male	Freshman	Medium	Medium (2–4 times/week)	ChatGPT, ERNIE Bot
P3	Female	Freshman	Low	Low (≤ 1 time/week)	Kimi, Doubao
P4	Female	Sophomore	High	High (≥ 5 times/week)	ChatGPT, Doubao
P5	Male	Sophomore	Medium	Medium (2–4 times/week)	ChatGPT, DeepSeek
P6	Female	Sophomore	Low	Low (≤ 1 time/week)	Doubao
P7	Male	Junior	High	High (≥ 5 times/week)	ChatGPT, Gemini
P8	Female	Junior	Medium	Medium (2–4 times/week)	ChatGPT, DeepSeek
P9	Male	Junior	Low	Low (≤ 1 time/week)	DeepSeek
P10	Female	Senior	High	High (≥ 5 times/week)	ChatGPT, Claude
P11	Male	Senior	Medium	Medium (2–4 times/week)	DeepSeek
P12	Female	Senior	Low	Low (≤ 1 time/week)	DeepSeek, Doubao

3.3. Data collection

This study employed semi-structured interviews to collect data. The interviews took place between August and September 2026. The interview protocol was based on Bandura's (1997) theory of self-efficacy and previous studies on AI-assisted language learning. The interview covered six main areas: 1) participants'

demographic and learning backgrounds; 2) experiences of using AI-generated feedback; 3) perceived influence of AI feedback on self-efficacy; 4) comparisons between AI feedback and teacher feedback; 5) psychological mechanisms through which AI feedback affects self-efficacy; and 6) suggestions for improving AI-assisted English learning. The protocol included both main questions and follow-up prompts. These allowed participants to describe their experiences and views in detail. Each interview lasted about 20 to 30 minutes. They were conducted in Chinese so participants could express themselves comfortably and accurately. All interviews were audio-recorded with participants' consent. They were then transcribed verbatim for analysis.

3.4. Data analysis

The interview data were analyzed through thematic analysis. The analysis followed the procedures proposed by Braun and Clarke (2006) ^[24]. It involved six stages. First, the transcripts were read repeatedly to become familiar with the data. Second, meaningful statements related to AI-generated feedback and self-efficacy were identified and coded. Third, similar codes were grouped into broader categories. Fourth, potential themes were generated and reviewed across all transcripts. Fifth, the themes were refined, defined, and named. Finally, the themes were interpreted in relation to the research question and relevant theoretical frameworks. In addition, two researchers independently coded a subset of the transcripts to improve trustworthiness. They discussed any discrepancies until they reached consensus. Member checking was also conducted. Preliminary interpretations were shared with several participants to check the accuracy of the findings.

3.5. Trustworthiness and ethical considerations

This study used several strategies to support its credibility, dependability, and confirmability. First, participants came from different academic years and had different achievement levels. They also varied in how often they used AI tools. This helped enhance data diversity. Second, the interview recordings and transcripts were carefully reviewed to maintain accuracy. Third, two researchers coded the data together to reduce subjective bias. Ethical approval was obtained from the relevant academic institution before data collection. All participants were informed of the study's purpose and agreed to participate voluntarily. Each participant provided written informed consent. Pseudonyms (P1–P12) were used throughout the study to protect confidentiality and anonymity. All personal information was removed from the transcripts and research reports.

4. Results

The interview data were analyzed thematically. Four main themes and eight sub-themes emerged. They relate to how AI-generated feedback affects English majors' self-efficacy. The results show that this feedback influences self-efficacy in several ways. These include cognitive, behavioral, emotional, and social pathways.

4.1. Enhanced perceptions of competence

4.1.1. Self-ability confirmation

A key finding was that AI-generated feedback boosted learners' confidence. It did so by affirming their abilities. Participants often said that positive comments helped them see their strengths. These comments covered writing quality, language use, logical organization, and creative thinking. This helped them build a

stronger sense of competence.

High-achievers reported clear benefits. P1 felt her efforts were recognized when AI pointed out the logical organization and strong argumentation in her essays. P4 gained confidence from comments that praised the academic quality of her writing. P7 said that when AI recognized his analytical skills, he felt more confident about doing well in English tasks. P10 said positive feedback made her willing to take on more challenging academic tasks.

Medium-achievers had similar experiences. P2 explained that positive comments on his essay structure eased his writing concerns. P5 reported that when AI recognized her translation accuracy, her confidence grew. P8 said positive feedback led her to participate more actively in presentations and discussions. P11 noted that AI helped him see progress he had not noticed on his own.

For lower-achievers, AI-generated praise also mattered. P3 felt encouraged because AI described her ideas as original. She rarely received such recognition before. P6 explained that feedback acknowledging her creativity made her more willing to express opinions. P9 and P12 reported that positive comments on their progress helped them believe they could improve their English. These findings show that AI-generated feedback supports self-efficacy. It validates learners' strengths and creates positive perceptions of competence.

4.1.2. Perceived learning progress

AI-generated feedback also helped learners see ongoing improvement. This went beyond confirming their existing abilities. Participants often said that repeated feedback and revision helped them notice gradual progress. This made them more confident.

P1 said she became more willing to write longer essays. AI kept giving her guidance for improvement. P4 noted that repeated revisions let her see clear progress in academic writing. P7 described AI feedback as proof of growth. It showed improvements across multiple drafts. P10 said seeing measurable progress motivated her to keep working on English.

P2, P5, P8, and P11 also reported that ongoing feedback helped them see improvements. These improvements were in writing quality, vocabulary use, and language accuracy. Even participants with lower confidence, including P3, P6, P9, and P12, said AI feedback helped them notice gradual improvements. They might not have noticed these changes otherwise. As a result, perceived progress became an important source of stronger self-efficacy.

4.2. Development of self-regulated learning

4.2.1. Immediate feedback and learning control

Another key theme was that AI-generated feedback gave learners a stronger sense of control. Participants often said that the immediacy of AI feedback was a major advantage. Teacher feedback often takes several days. AI systems respond instantly. This lets learners spot problems and revise right away. It also increases their sense of agency and self-efficacy.

Several participants mentioned better learning efficiency. P2 got feedback whenever difficulties came up. This removed the uncertainty of waiting for a teacher. P5 found weaknesses in translation tasks and revised them while the experience was fresh. P8 revised assignments multiple times and saw clear writing improvements. P11 described AI as a convenient learning companion. It made learning more manageable and less stressful.

High-frequency users especially valued immediate access to feedback. P4 fixed problems before they became habits. P7 tracked progress continuously and adjusted strategies. P10 felt less uncertainty and more confidence when doing complex tasks. These findings suggest that immediacy increased learners' sense of control, which strengthened self-efficacy.

Lower-achievers also saw benefits. P3 caught mistakes she would have missed. P6 found that immediate corrections reduced anxiety about errors. P9 understood weaknesses before they piled up. P12 revised independently before submission and felt more prepared and confident. Immediate feedback may be especially useful for learners who need frequent guidance and reassurance.

4.2.2. Independent problem-solving ability

AI-generated feedback also helped learners solve problems on their own. It went beyond giving immediate feedback. Participants often said that AI systems pointed out errors. They also explained why the errors happened and suggested practical solutions. Through repeated use, learners got better at finding and fixing their own mistakes. They relied less on teachers.

High-achievers reported clear benefits. P1 understood why certain expressions were inappropriate. This helped her avoid similar mistakes. P4 improved her ability to find weaknesses on her own. P7 was encouraged to think critically. AI gave multiple revision options instead of one answer. P10 developed stronger self-monitoring skills. She also felt more confident solving language problems independently.

Medium-achievers had similar experiences. P2 was guided through the error-correction process. AI did not simply give answers. P5 improved his understanding of grammatical structures and translation strategies. P8 identified recurring mistakes and reduced their frequency through self-correction. P11 became more reflective and less dependent on outside help.

Even learners who initially lacked confidence reported improvements. P3 discovered patterns in her mistakes. P6 reduced her reliance on teachers by solving many problems on her own. P9 identified weaknesses she had not noticed before. P12 found that repeated self-correction gradually increased her confidence in writing tasks. These experiences show that AI-generated feedback supports self-regulated learning. It helps learners solve problems independently.

4.3. Emotional responses to AI-generated feedback

4.3.1. Positive emotional experiences

The interview data show that AI-generated feedback influenced learners' cognitive perceptions. It also produced positive emotional experiences. Many participants reported feelings such as encouragement, satisfaction, confidence, and motivation. These feelings came from constructive feedback provided by AI systems. These positive emotions strengthened self-efficacy. They reinforced learners' belief that they could succeed in English learning tasks.

A common experience was a sense of accomplishment from positive evaluations. P1 felt her efforts were acknowledged when AI recognized the logical organization of her writing. P4 felt a strong sense of achievement when AI praised the academic quality of her essays. P7 noted that positive comments on his analytical skills increased his confidence. They also motivated him to pursue higher standards. P10 explained that supportive feedback encouraged her to challenge herself with more complex tasks.

Medium-achievers reported similar benefits. P2 found that positive feedback reduced his writing anxiety. P5 felt more motivated to experiment with new expressions. P8 became more willing to participate

in discussions and presentations. P11 maintained motivation during difficult periods.

Lower-achievers also benefited emotionally. P3 felt valued when AI praised the originality of her ideas. P6 was motivated to express herself more confidently. P9 became more confident that he could overcome difficulties. P12 gained confidence from positive comments on her progress.

Another key finding was that participants valued the non-judgmental nature of AI feedback. Several learners felt less pressure when interacting with AI than with teachers or classmates. P8 could make mistakes without fear of embarrassment. P5 felt comfortable experimenting with language. P11 found it easier to accept criticism and focus on improvement. These experiences suggest that AI feedback feels non-threatening. This can create positive emotional states. These states may enhance self-efficacy.

4.3.2. Negative emotional experiences

Despite these positive emotional effects, participants also reported negative emotions in some situations. These reactions often came from extensive error correction, repeated identification of weaknesses, and feedback that seemed overly direct or impersonal. Such experiences sometimes reduced learners' confidence. They also negatively affected how learners viewed their own abilities.

Lower-achievers were especially likely to report negative reactions. P3 felt discouraged by large numbers of corrections. These corrections highlighted the gap between her current performance and desired proficiency. P6 sometimes doubted her language abilities when facing long lists of errors. P9 felt frustrated when AI pointed out many weaknesses. This made him focus more on deficiencies than on progress. P12 found extensive corrective feedback emotionally overwhelming, especially after putting substantial effort into a task. These findings suggest that corrective feedback may unintentionally weaken self-efficacy. This happens when learners interpret it as evidence of inadequate ability.

Interestingly, some medium-achievers reported mixed reactions. P2 initially lost confidence but later saw corrections as opportunities. P5 experienced temporary frustration but was ultimately encouraged to revise. P11 felt disappointment yet appreciated detailed explanations that offered clear pathways for improvement. These accounts indicate that emotional responses are dynamic. They may evolve as learners reflect on feedback.

Participants also expressed concerns about the limited emotional sensitivity of AI systems. Several believed AI feedback appeared overly mechanical and lacked teacher-like empathy. P3 noted that AI focused exclusively on errors without recognizing effort. P6 suggested that more encouraging language could reduce negative impacts. P8 observed that teachers balance criticism with emotional support, whereas AI emphasizes technical accuracy. P12 recommended more personalized encouragement to help learners maintain confidence. These comments highlight the importance of emotional responsiveness in AI-assisted learning environments.

4.4. Perceptions of human-AI collaborative feedback

4.4.1. Advantages of AI-generated feedback

Participants also recognized the unique advantages of AI-generated feedback. Learners agreed that AI could not fully replace teachers. Still, they often pointed to its strengths in efficiency, accessibility, objectivity, and comprehensiveness. These advantages helped learners feel more confident about managing learning tasks on their own.

Speed was mentioned often. Participants valued immediate responses without waiting for teachers. P2 could get feedback at any time. This allowed immediate revision. P5 found that instant feedback improved efficiency. Problems could be fixed before they became habits. P8 was encouraged to revise multiple times. This led to noticeable writing improvements. P11 noted that AI worked as a readily available learning assistant.

Participants also valued detailed and comprehensive feedback. P4 explained that AI feedback covered grammar, vocabulary, organization, and coherence. P7 reported that AI gave longer explanations than traditional classroom feedback. P10 identified weaknesses that might otherwise have been missed. These participants believed detailed feedback improved their understanding. It also helped them keep improving.

Objectivity was another advantage. Some participants felt AI feedback was more neutral and consistent than human evaluation. P1 said AI used clear criteria. It was less influenced by personal preferences. P8 found AI comments more impartial. They focused on language performance, not personal traits. P11 said this consistency made him trust the feedback process more. These views suggest that objectivity may make learners more willing to accept feedback. It may also encourage them to revise more actively.

Lower-achievers also saw these benefits. P3 found AI explanations clear and easy to understand. P6 appreciated immediate support when teachers were unavailable. P9 understood weaknesses more clearly. P12 valued chances to revise multiple times before submission. Overall, learners saw AI-generated feedback as a valuable resource. It improved efficiency, self-regulation, and self-efficacy.

4.4.2. Complementary roles of teachers and AI

Participants held positive views of AI-generated feedback. However, they all agreed that AI could not replace teachers. They saw AI and teacher feedback as complementary. The two work through different mechanisms. AI was valued for efficiency and accessibility. Teachers were seen as essential for emotional support, professional judgment, and personalized guidance.

Many participants said teachers understood learners' needs and contexts better. P1 explained that teachers gave emotional encouragement that AI could not provide. P4 noted that teachers understood students' long-term development and gave individualized guidance. P7 said teachers were better at evaluating higher-order aspects, such as critical thinking, creativity, and argument quality. P10 observed that teachers offered broader academic guidance beyond language correction.

Medium-achievers had similar views. P5 noted that teachers had richer teaching experience and pedagogical expertise. P8 observed that teachers noticed students' efforts and emotional states, while AI focused mainly on task performance. P11 emphasized that teachers understood course objectives and assessment standards more fully.

For learners with lower confidence, teacher emotional support was especially important. P3 regained confidence from encouraging comments after poor performance. P6 stayed motivated despite frustration. P9 trusted teachers more because they understood his strengths and weaknesses. P12 said teachers offered reassurance that reduced anxiety and maintained motivation.

Participants also advocated a collaborative model that combined both strengths. P5 suggested AI handle basic error correction while teachers focus on higher-order issues. P8 proposed AI reduce teachers' workload through routine tasks. P11 argued that combining AI efficiency with teacher expertise would maximize effectiveness. P12 believed integration provides both technical support and emotional encouragement,

creating a balanced learning experience.

5. Discussion

5.1. The influence of AI-generated feedback on English majors' self-efficacy

The results show that AI-generated feedback has a positive effect on English majors' self-efficacy. This happens in two ways: ability confirmation and perceived learning progress.

First, AI-generated feedback improved self-efficacy by affirming learners' strengths. Learners at all achievement levels reported that positive comments helped them see their strengths. These comments focused on writing quality, language use, organization, and creative thinking. This helped them build a stronger sense of competence. This finding matches Bandura's (1997) theory. Verbal persuasion is an important source of self-efficacy. Zhu and Liu (2024) also found improved writing self-efficacy after ChatGPT-assisted revision. This effect was especially clear among low-achieving learners (P3, P6, P9, P12). They rarely received such recognition in traditional classrooms. AI feedback is immediate and non-judgmental. This gives them a more equal channel for ability confirmation. It may help break the cycle of low achievement, low efficacy, and low engagement.

Second, AI-generated feedback improved self-efficacy by helping learners see learning progress. Repeated feedback and revision let learners observe gradual improvement. Such mastery experiences are the strongest source of self-efficacy (Bandura, 1997). High-achievers (P1, P4, P7, P10) clearly saw progress across drafts. Low-achievers (P3, P6, P9, P12) noticed small improvements they might otherwise have missed. This echoes Pajares's (2003) view that self-efficacy depends not only on absolute ability but also on perceived changes in ability.

5.2. Psychological mechanisms through which AI-generated feedback affects self-efficacy

This study found four psychological pathways: cognitive, behavioral, emotional, and social.

The cognitive pathway involves ability confirmation and perceived learning progress. AI feedback helps learners re-examine their abilities. It also helps correct negative self-perceptions. This happens through specific, evidence-based positive evaluations. Bandura's (1997) theory holds that external feedback must be cognitively processed to become self-efficacy. AI feedback is detailed. This makes evaluations easier to internalize. It can promote positive ability perceptions.

The behavioral pathway involves self-regulated learning. AI feedback's immediacy increased learners' sense of control. It also promoted independent problem-solving. This aligns with Zimmerman's (2002) framework of self-control, self-observation, self-judgment, and self-reaction^[25]. High-achievers developed stronger self-monitoring skills. Low-achievers relied less on teachers. AI feedback works as a cognitive scaffold. It promotes autonomy.

The emotional pathway involves both positive and negative experiences. AI feedback produced encouragement, satisfaction, confidence, and motivation. These indirectly enhanced self-efficacy (Bandura, 1997). Its non-judgmental nature created psychological safety. This reduced anxiety. However, extensive error correction sometimes discouraged low-achievers. This echoes Holmes et al.'s (2022) concern. Medium-achievers showed mixed reactions. They initially lost confidence but later saw criticism as an opportunity. This suggests that influence is mediated by cognitive appraisal and emotional regulation.

The social pathway concerns perceptions of human-AI collaborative feedback. Learners saw AI and teacher feedback as complementary. This is consistent with Luckin et al.'s (2016) framework. AI is strong in efficiency and objectivity. Teachers are irreplaceable for emotional support and personalized guidance. This collaborative model echoes Yu Yinlei and Rao Hui (2023). It forms a more complete self-efficacy support system.

5.3. Comparison of AI feedback and teacher feedback in influencing self-efficacy

A key finding is that AI feedback and teacher feedback influence learners' self-efficacy through different mechanisms. The two are functionally complementary.

AI feedback offers advantages in immediacy, objectivity, and comprehensiveness. Immediacy allows prompt feedback during learning. This increases learners' sense of control. It is consistent with Bandura's (1997) view that self-efficacy is formed through mastery experiences. Objectivity makes critical feedback easier to accept. It reduces defensive reactions. Comprehensiveness provides detailed suggestions on grammar, vocabulary, organization, and content. This helps learners form a broad perception of their abilities. These advantages make AI feedback especially valuable for low-achieving learners. These learners need frequent guidance.

Teacher feedback offers advantages in emotional support, professional judgment, and personalized guidance. Teachers provide emotional encouragement that AI cannot replace. They understand students' long-term development needs. They also offer individualized guidance. Low-achievers (P3, P6, P9, P12) emphasized teachers' encouraging comments. These comments helped them regain confidence after failure. This aligns with Bandura's (1997) theory on verbal persuasion and affective states. Teachers are an authoritative and emotionally connected source. Their persuasion may be more powerful than AI feedback.

Learners generally favored a human-AI collaborative feedback model. P5 suggested AI handle preliminary error correction while teachers focus on higher-order issues. P8 proposed AI reduce teachers' workload through routine tasks. P11 and P12 believed combining AI efficiency with teacher expertise improves learning. An ideal model should use AI's frequency, immediacy, and objectivity. It should also preserve teachers' unique value in emotional support and personalized guidance.

5.4. Learners' perceptions of the human-AI collaborative feedback model

This study found that learners generally held positive attitudes toward the human-AI collaborative feedback model. They believed AI and teacher feedback should complement each other. They should not replace each other.

Theoretically, this recognition reflects the combined effect of multiple information sources in self-efficacy formation. Bandura (1997) identified four sources: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. AI feedback provides frequent mastery experiences and immediate verbal persuasion. Teacher feedback offers emotional support, personalized persuasion, and emotional regulation. This integration supports self-efficacy more fully and in a more balanced way.

Practically, learners proposed specific roles for each. AI systems should provide immediate and frequent feedback on language form. They should also give detailed revision suggestions to promote self-monitoring and self-evaluation. They should use objective assessment criteria. Teachers should provide emotional support and encouragement. They should give feedback on higher-order thinking and content depth. They should also offer personalized long-term guidance.

However, current AI systems still lack emotional sensitivity. Learners (P3, P6, P8, P12) noted that AI feedback appears overly mechanical. It also lacks emotional warmth. P3 mentioned that AI focuses only on errors and does not recognize effort. P6 suggested using more encouraging language. P8 observed that teachers balance criticism with emotional support. P12 recommended personalized encouragement. Future AI systems need to improve cognitive quality. They also need to enhance emotional responsiveness. This would better support self-efficacy development.

6. Conclusion

6.1. Summary of key findings

This study found that AI-generated feedback influences English majors' self-efficacy through four pathways: cognitive, behavioral, emotional, and social. In cognitive terms, AI feedback improves self-efficacy by affirming learners' strengths. It also helps them see learning progress. These benefits are especially clear for low-achieving learners. They rarely receive such recognition in traditional classrooms. In behavioral terms, AI feedback is immediate. This strengthens learners' sense of control over the learning process. It also promotes independent problem-solving. As a result, it supports self-regulated learning and reduces reliance on teachers. In emotional terms, AI feedback creates positive emotions such as encouragement, satisfaction, and confidence. Its non-judgmental nature also creates a psychologically safe environment. However, extensive error correction may sometimes weaken confidence. This is especially true for low-achievers. In social terms, learners see AI and teacher feedback as complementary, not competing. They support a collaborative model. In this model, AI handles routine correction. Teachers provide emotional support, professional judgment, and personalized guidance. These findings show that AI-generated feedback affects self-efficacy through multiple interacting mechanisms. They offer theoretical insights and practical implications for improving AI-assisted English language teaching.

6.2. Research limitations and future directions

This study offers some useful insights into the link between AI-generated feedback and English majors' self-efficacy. However, several limitations remain. First, the study used purposive sampling. The sample included 12 English majors from a single university. These findings should therefore be generalized with caution. Future research could include learners from different regions, different types of universities, and different majors. Second, the study used a qualitative design. This design helps understand learners' subjective experiences in depth. However, it cannot establish causal relationships between variables. Future research could use longitudinal tracking or mixed-methods designs. These would help test the long-term effects of AI-generated feedback on self-efficacy and its link to academic achievement. Third, the study relied mainly on self-report data. Future research could combine multiple data sources. These may include classroom observations, learning journals, and achievement data. This would provide a fuller picture of how AI-generated feedback works. Fourth, the study focused only on English majors. Future research could compare learners from different majors and different language proficiency levels. This would help test whether the findings hold in other contexts.

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Disclosure statement

The authors declare no conflict of interest.

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