



Peer feedback and ChatGPT-generated feedback on Japanese EFL students' engagement in a foreign language writing context

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Abstract

In Second Language Acquisition (SLA), affective, behavioral, and cognitive engagements play crucial roles in how learners interact with and process written feedback on their language production. The present study investigates the efficacy of peer feedback versus ChatGPT-generated feedback in an English as a Foreign Language (EFL) writing context. Participants ($n = 324$) were 1st and 2nd-year undergraduate students at a Japanese university. The peer group ($n = 164$) received peer feedback, while the ChatGPT group ($n = 160$) utilized ChatGPT with crafted prompts for feedback. A survey instrument measuring three engagements, i.e., affective, behavioral, and cognitive engagement, was conducted at the end of the semester. Results revealed that all three types of engagements were higher in the ChatGPT group than those in peer feedback group. However, significant differences were suggested in only affective and behavioral engagements, with the difference in cognitive engagement remaining non-significant. The findings suggest that while ChatGPT-generated feedback can be integrated into EFL instruction, its impact on student engagement, particularly affective and behavioral, warrants careful consideration. Pedagogical implications are discussed.

Keywords: Generative AI; ChatGPT; affective engagement; behavioral engagement; cognitive engagement

Introduction

Written feedback (WF) is pivotal in second language acquisition (SLA), helping learners identify and correct errors, improve linguistic accuracy, and develop language proficiency (Bitchener, 2019). By providing explicit knowledge of language rules, WF promotes long-term skill enhancement and rule application in new contexts (Pawlak, 2013). Teacher and peer feedback play complementary roles, with peer feedback fostering critical evaluation skills and a deeper understanding of language use (Rouhi et al., 2020). Constructive feedback further enhances motivation and confidence, encouraging active engagement and a willingness to experiment with language (Hyland & Hyland, 2019). In this way, WF serves as a powerful tool not only for linguistic accuracy but also for sustaining meaningful engagement in second language acquisition.

Engagement is a central focus in SLA feedback research. Engagement in SLA encompasses three dimensions: affective (emotional responses to feedback), behavioral (actions like revisions), and cognitive (processing and applying feedback). Each dimension uniquely supports learning outcomes and is interrelated, with improvements in one often benefiting the others (Park & Ahn, 2022). Affective engagement influences motivation, behavioral engagement reflects tangible learning efforts, and cognitive engagement emphasizes critical thinking and deep processing (Peungcharoenkun & Waluyo, 2024). Together, these dimensions create a holistic learning experience that fosters proficiency.

Despite the recognized benefits of written feedback, there are several existing challenges in English writing instruction. Students often struggle to interpret and implement feedback effectively (Guo et al., 2024; Zheng, 2012), leading to persistent errors and limited improvement in their writing skills. Moreover, the traditional methods of teacher and peer feedback have inherent limitations. Teacher feedback, while authoritative and comprehensive, can be time-consuming and may not always cater to individual learners' needs (Muncie, 2000). Peer feedback, on the other hand, promotes collaborative learning but may vary in quality and accuracy, potentially leading to misconceptions (Hyland & Hyland, 2006).

To compromise the limitations of peer feedback, emerging technologies like ChatGPT, a generative AI (GenAI) tool, have been used. ChatGPT can provide interactive, personalized support, influencing engagement across affective, behavioral, and cognitive dimensions (Teng & Huang, 2025). For instance, it may boost motivation through tailored feedback, encourage active participation via iterative revisions, and enhance cognitive engagement by facilitating idea exploration and critical analysis (Huang & Mizumoto, 2024; Teng, 2024a). However, there remains a significant gap in understanding how EFL students perceive and utilize ChatGPT's feedback to foster engagement in writing. While traditional written feedback has been extensively studied, the unique ways in which ChatGPT's automated, real-time responses impact learners' engagement—particularly in terms of their motivation, interaction with feedback, and ability to apply suggestions effectively—are less understood. The present study investigates ChatGPT's impact on learning engagement, aiming to provide insights into how GenAI can transform writing in a foreign language context, address this gap, and empower learners in SLA.

Literature Review

Written Feedback

In EFL contexts, WF is a crucial pedagogical tool that involves providing corrective input on students' written assignments (Ferris, 2010; 2012). WF refers to the process of providing corrective input on students' written work. It is considered crucial for consolidating learning

and improving writing skills (Hyland & Hyland, 2006). This process aims to guide learners in identifying and rectifying errors in their writing, thereby enhancing their linguistic accuracy and overall proficiency. Written feedback can take various forms, including comments, annotations, and suggestions, which are designed to address grammatical, syntactical, and stylistic issues. By offering targeted feedback, educators help students to understand language rules more clearly and apply them effectively in their subsequent writing tasks. This corrective input not only aids in immediate error correction but also contributes to long-term language development by encouraging learners to engage in reflective practices and self-correction. Student engagement is the key factor that links feedback with EFL learning outcomes and is essential for making feedback effective (Mao & Lee, 2023).

While SLA researchers focus on how CF facilitates the acquisition of specific linguistic features, L2 writing researchers examine its impact on overall text effectiveness (Ferris, 2010). Various strategies and types of written CF exist, each with its own characteristics, advantages, and limitations (Hyland & Hyland, 2019). These may include teacher written comments, peer feedback, writing workshops, conferences, and computer-mediated feedback (Hyland & Hyland, 2006). Despite its widespread use, the effectiveness of written CF remains controversial, with researchers and practitioners continuing to explore its potential and optimal implementation in language learning contexts (Ferris, 2012).

ChatGPT and Generative AI in Second Language Learning

The introduction of OpenAI's ChatGPT in November 2022 has significantly impacted academic writing, demonstrating its ability to generate high-quality papers and writing assessment (Mizumoto et al., 2024). This transformative technology has sparked discussions about its implications for education, particularly in the field of second language (L2) learning. While the use of large language models like ChatGPT offers potential benefits for enhancing the learning experience and supporting teachers, it is crucial to acknowledge its limitations and address potential biases (Kasneci et al., 2023). The evolving nature of AI tools suggests that the field is in its early stages, and continuous exploration is necessary to navigate its integration effectively (Teng, 2023).

ChatGPT has generally been well-received in education, with researchers proposing pedagogical frameworks to guide its implementation. One such framework, developed by Tseng and Warschauer (2023), emphasizes a five-part approach: understanding, accessing, prompting, corroborating, and incorporating AI. This framework highlights the importance of educating students about AI tools and fostering responsible usage within and beyond the classroom. Additionally, it is crucial for university staff to establish clear guidelines regarding assessment design and academic integrity to mitigate potential misuse (Cotton et al., 2023). By promoting transparency and providing comprehensive guidance, educators can facilitate a learning environment that leverages the benefits of AI while maintaining academic rigor.

Emerging research highlights ChatGPT's potential in L2 learning, particularly in enhancing learner perceptions and language proficiency. Van Horn (2024) demonstrated its ability to promote autonomy and personalized learning among EFL students. Marzuki et al. (2023) found that AI tools improve writing quality, particularly in content and organization, while Liang et al. (2024) reported positive learner attitudes towards AI's usefulness in writing and intentions to use it for writing tasks. Athanassopoulos et al. (2023) and Vera (2023) concluded that ChatGPT improves foreign language writing, especially vocabulary and grammar, and overall language proficiency. Barret and Pack (2023) noted its value in assisting teachers with the writing process, though Jeon and Lee (2023) emphasized the importance of teachers' pedagogical expertise when using AI. Teng (2024b) found ChatGPT enhances EFL learners' writing motivation,

self-efficacy, engagement, and collaborative tendencies, with learners viewing it as a companion rather than a threat to teaching. Teng (2024c) further linked higher metacognitive awareness to improved writing motivation, self-efficacy, and engagement. Huang and Zou (2024) highlighted AI's role in improving EFL learners' willingness to communicate, benefiting speaking skills, while Huang and Mizumoto (2024) supported its effects on Japanese students' motivation and writing self-efficacy.

A mixed result was reported on teachers' perspective of ChatGPT usage by Mohamed (2024). While it shows potential in providing rapid and accurate responses to a wide range of questions, concerns were raised that it may hinder students' development of critical thinking and research skills, and potentially reinforce biases or misinformation. Despite the mixed result, technology has proven beneficial in pre-writing, during-writing, and post-writing stages, enabling learners to refine their writing skills while maintaining academic integrity if it is properly used (Barrot, 2023; Teng, 2023; Yang et al., 2024). ChatGPT's ability to enhance learner comprehension and assist teachers in lesson preparation further solidifies its potential as a valuable asset in education (Kohnke et al., 2023). As the use of ChatGPT becomes increasingly prevalent, its long-term effects on L2 learning, particularly on learners' self-perception and overall learning experience, warrant further investigation.

Engagements

Affective engagement refers to students' emotional responses and attitudes towards learning and feedback. In the context of WF, students generally respond positively to detailed, balanced feedback that motivates without overwhelming corrections, which can enhance their motivation and self-efficacy (Ene & Yao, 2021). However, engagement levels vary based on feedback type, with form-focused feedback often eliciting more positive reactions than content-focused feedback (Fan & Xu, 2020). The tone and style of feedback are also crucial in shaping students' emotional responses and fostering sustained engagement (Yu et al., 2020). Additionally, language proficiency mediates engagement, with low- and high-proficiency students showing different patterns, particularly with local feedback (Cheng & Liu, 2022). In EFL contexts, students may respond more positively to feedback from native English-speaking teachers compared to non-native speakers (Ene & Yao, 2021). Affective engagement is interconnected with cognitive and behavioral engagement, forming a complex, nonlinear relationship (Fan & Xu, 2020; Cheng & Liu, 2022).

Behavioral engagement refers to the observable actions and efforts learners take in response to WF, often measured through the extent and quality of their revisions (Fu et al., 2024). While revisions are a primary indicator, even feedback that doesn't lead to immediate action may still involve cognitive and affective engagement (Fu et al., 2024). Proficiency levels also influence engagement patterns, with high-proficiency learners demonstrating more cognitive engagement in response to teacher feedback (Cheng & Liu, 2022). In peer feedback contexts, behavioral engagement is most prevalent, followed by cognitive and affective engagement (Farsani & Aghamohammadi, 2021). Activities that promote deeper cognitive processing tend to result in greater uptake of WCF during revision, though the impact can vary depending on the type of error (Park & Ahn, 2022). Factors such as feedback quality, language proficiency, and well-designed peer review activities also play a significant role in the effectiveness of engagement (Fu et al., 2024). These findings underscore the complex, nonlinear relationship between behavioral, cognitive, and affective engagement with WF in second language acquisition (SLA) and EFL contexts.

Cognitive engagement refers to the mental processes learners use when interacting with written feedback (WF). It involves understanding, analyzing, and applying feedback, which

encourages learners to reflect on their language use and stimulates deeper cognitive processing, potentially leading to improved writing quality. Activities that promote this deeper cognitive engagement have been shown to result in a higher uptake of written corrective feedback (WCF) during revisions (Park & Ahn, 2022). Research indicates that cognitive engagement is the most frequent type of engagement with teacher feedback, whereas behavioral engagement is more common in peer feedback scenarios (Farsani & Aghamohammadi, 2021). Language proficiency also mediates students' engagement, with low- and high-proficiency learners engaging differently with local feedback but similarly with global feedback (Cheng & Liu, 2022). Additionally, self-regulation skills influence engagement, as more skilled self-regulators tend to demonstrate higher levels of cognitive, behavioral, and affective engagement compared to less-skilled self-regulators (Yang & Zhang, 2023). These findings highlight the multifaceted nature of student engagement with WCF and the importance of tailoring feedback to maximize cognitive engagement and support writing development.

ChatGPT and Engagement in Language Learning

As stated in Section 2.2, ChatGPT has demonstrated its potential in classrooms, benefiting both students and teachers. A recent systematic review by Lo et al. (2024) on student engagement with ChatGPT concluded that affective engagement is mixed, with both positive aspects (such as satisfaction and interest) and negative ones (such as disappointment and anxiety). Evidence of behavioral engagement and disengagement is strong but limited, with use cases including both productive academic applications and concerns such as academic dishonesty. Cognitive engagement has been observed, albeit weakly, showing improvements in understanding while raising concerns about reduced critical thinking. Notably, the scope of this review extended beyond language learning to include other educational fields, offering a broader perspective on ChatGPT's impact.

One intervention study by Wang and Xue (2024), which focused on Chinese EFL students using AI-powered chatbots, found higher scores across all three aspects of engagement: affective, behavioral, and cognitive. The study highlighted the key role AI-powered chatbots played in enhancing these dimensions of engagement. Similarly, Rad et al. (2023) investigated the effectiveness of an AI application in L2 writing classes and reported significant improvements in students' writing outcomes, engagement levels, and feedback literacy, further supporting the potential of AI tools in language learning contexts. However, a more recent study by Teng and Huang (2025) specifically examined the efficacy of peer feedback versus ChatGPT feedback in an EFL writing context. The study involved 169 first-year Chinese undergraduate students. The participants were divided into a control group ($n = 86$), which did not use ChatGPT, and a treatment group ($n = 83$), which utilized ChatGPT with carefully crafted prompts to receive feedback on their writing. A survey instrument measuring affective, behavioral, and cognitive engagement was administered at the beginning and end of the semester. The results revealed that ChatGPT has the potential to enhance specific aspects of student engagement, particularly affective and behavioral engagement, in EFL writing. For example, students in the treatment group reported higher levels of motivation and active participation. However, cognitive engagement, while slightly higher in the treatment group, did not differ significantly between the two groups, suggesting that ChatGPT's impact on deeper critical thinking and cognitive processing may be limited.

Overall, these findings underscore the potential of AI tools, such as ChatGPT, to support student engagement in language learning. However, the mixed results highlight the complexity of integrating such tools effectively into educational practices. While ChatGPT shows promise in enhancing affective and behavioral engagement, its impact on cognitive engagement remains

an area requiring further exploration. Future research should aim to address these gaps, focusing on how AI tools can be optimized to foster not only surface-level engagement but also deeper cognitive processing and critical thinking in language learning contexts. Additionally, studies should investigate the effects of using ChatGPT for feedback and engagement, as well as strategies for mitigating challenges associated with AI-generated feedback.

Research Questions

Although emerging studies highlight the significant potential of GenAI tools like ChatGPT in improving EFL teaching and learning, more detailed, context-specific research is still required. Current research tends to emphasize the overall utility and effectiveness of these tools, while paying less attention to specific factors such as student engagement. Contributing to Teng and Huang (2025) that has demonstrated the potential of AI-driven chatbots positively influenced students' writing engagement in Chinese EFL classrooms., the present study further strengthens the validity of using the tool rather than avoid it for possible student engagement. While there is a lack of similar research in Japan, hence this study aims to fill the gap with the following research question:

RQ1: Do Japanese students report higher engagements, including affective, behavioral, and cognitive engagement, after ChatGPT utilization?

RQ2: How do Japanese university students perceive ChatGPT after instructor-led ChatGPT usage writing classes?

Methods

Participants and Setting

Three hundred and eleven undergraduate students from a well-known private university in the Kansai region of Japan participated in this study, and they were enrolled in either a required reading and writing course (ChatGPT group) or a speaking and listening English course (peer group). All the participants had at least eight years of compulsory English education during primary and secondary school. Although their English proficiency was not directly tested, it was assumed to range from A2 to B2 on the CEFR scale, as per Aizawa et al. (2020).

The peer group had 165 students from a Listening/Speaking class, students in this class were required to give two group oral presentations during the semester, and the topics were closely related to the university's designated textbook to ensure consistency. Before presentation, students were divided into several groups (4 to 5 students in one group), and they were given a class period to work on speaking scripts and receive feedback from peers. They were encouraged to provide constructive feedback, focusing on aspects such as transitions and script coherence, rather than offering simple comments. Based on the feedback, students revised, finalized their scripts and then submit to the instructor for evaluation, after the oral presentation.

The ChatGPT group comprised 146 students from a Reading/Writing class. Students worked together to write essays, with each one contributing a paragraph (introduction, body, or conclusion). Each group engaged in their respective activities twice throughout the semester. Students collaboratively wrote two group essays during the semester. The essay topics aligned closely with the university's designated textbook to ensure consistency and enhance writing skills. Each group, comprising 5 students, had each member responsible for a different paragraph of the essay: introduction, body 1, body 2, body 3, or conclusion. Students collaborated to create a flow chart, draft an outline, and produce an initial draft on paper to reduce reliance on ChatGPT.

Any unfinished work could be completed as homework. Then, students received a mini-lecture on using ChatGPT, followed by guidance on pre-crafted prompts for feedback on the structure, organization, coherence, and integrity of essay components (see Huang, 2023). Students were also instructed on plagiarism prevention, with strict no copy-pasting rules. Feedback leading to revisions had to be documented on paper. Additionally, students submitted their feedback through the university's online learning management system for review. Finally, students submitted the final version of their essay along with the paper-based drafts showing their revisions.

Instruments

For this study, a set of 17 items (see Appendix A) was adapted from Cheng and Zhang's (2024) instruments, which were originally developed to measure three types of engagement after peer feedback. These items were modified to measure engagement after receiving feedback from GenAI for the ChatGPT group. The first category, affective engagement (5 items), measures the students' emotional responses to feedback. Questions like "I enjoy reading ChatGPT (peer) feedback" and "I feel good receiving ChatGPT (peer) feedback" were included to assess students' feelings toward the feedback. The second category, behavioral engagement (6 items), measures students' actions following feedback. This category included questions such as "I revise based on ChatGPT (peer) feedback" and "I carefully take notes of ChatGPT (peer) feedback" to evaluate how students responded behaviorally to the feedback. Finally, cognitive engagement (6 items) measures the students' mental processes in response to feedback. Questions like "I understand ChatGPT (peer) feedback" and "I use strategies to improve my writing based on ChatGPT (peer) feedback" were used to assess how students understood, analyzed, and applied the feedback. The survey was conducted in Japanese, and participants provided responses on a 6-point Likert scale, with 1 indicating "strongly disagree" and 6 indicating "strongly agree." In the ChatGPT group, students were tasked with answering three extra open-ended questions (refer to Appendix B) to gain deeper insights into their perspectives on using ChatGPT. The questions were designed to assess their views on the suitability of the tool for the writing class, to determine if they observed enhancements in their written communication skills following its use, and to gauge their intentions regarding continued use of the tool post-course.

Data Collection

Data collection involved administering a survey designed to measure student engagement after receiving feedback, focusing on affective, behavioral, and cognitive dimensions. The survey was conducted in Japanese to ensure clarity and ease of understanding for all participants. On average, the survey took about 2 minutes to complete. However, for students in the ChatGPT group, additional time was provided to complete open-ended questions, allowing them to elaborate on their experiences and perceptions of ChatGPT-generated feedback. This ensured that participants had ample opportunity to reflect and provide meaningful responses while maintaining the efficiency of the data collection process.

Data Analysis

The collected data were initially subjected to descriptive statistical analysis to summarize key measures such as means, standard deviations, and ranges. These basic statistics provided an overview of the dataset and helped in understanding the distribution of the variables. Once normality was assessed and confirmed, a one-way ANOVA was conducted to determine if there were any statistically significant differences between the peer and ChatGPT groups. The analysis aimed to test whether the interventions led to notable changes between the two groups. All analyses were performed using R software version 4.3.3.

For the analysis of the open-ended survey responses, a word cloud method was employed to identify and visualize key themes and frequently mentioned terms. The word cloud analysis involved processing the text responses to extract the most commonly used words, with greater prominence (e.g., larger font size) given to words that appeared more frequently. This method provided a quick and intuitive way to identify recurring patterns, such as positive or negative sentiments, levels of engagement, and specific aspects of ChatGPT feedback that resonated with students. By using this technique, researchers were able to capture an overview of students' perceptions and experiences, which complemented the quantitative survey results and provided richer insights into the impact of ChatGPT feedback on student engagement.

Results

RQ1: Do Japanese students report higher engagements, including affective, behavioral, and cognitive engagement, after ChatGPT utilization?

The following descriptive statistics highlight the impact of group treatment on all three engagements, addressing the first research question. As shown in Table 1, the mean scores for the constructs range from 4.30 to 4.85, with standard deviations between 0.71 and 0.89, indicating relatively homogenous variances. The Shapiro-Wilk *p*-values (*w*) between .97 and .98 suggest normal distribution of the data for each construct and group. Furthermore, Cronbach's alpha (α) values ranging from .77 to .79 demonstrate moderate internal consistency and reliability of the measured constructs. Across all three engagements, the means reveal higher scores for the treatment group compared to the control (4.37 to 4.85, 4.30 to 4.65, and 4.47 to 4.62). Given the normally distributed, homogenous, and reliable datasets, a one-way ANOVA is appropriate to test for significant differences between the groups, validating whether the observed increase in mean scores for the constructs is statistically significant.

One-way ANOVA was conducted to identify the if the significant difference between the two groups amongst the three constructs.

Table 1 Descriptive statistics.

Constructs	Group	n	Mean	SD	w	α
Affective	Control	164	4.37	0.89	.97	.77
	Treatment	160	4.85	0.74		
Behavioral	Control	164	4.30	0.84	.98	.78
	Treatment	160	4.65	0.76		
Cognitive	Control	164	4.47	0.86	.98	.79
	Treatment	160	4.62	0.71		

Table 2 One-way ANOVA between two groups.

Source	SS	df	MS	F-ratio	p-value	Partial η^2
Affective	19.18	1	19.18	28.54	< .001	0.08
Behavioral	10.05	1	10.05	15.61	< .001	0.05
Cognitive	1.73	1	1.73	2.80	.095	0.00

The one-way ANOVA results above compare the affective, behavioral, and cognitive engagements between two groups. For affective engagement, the F -ratio is 28.54, with a highly significant p -value of less than .001, and a partial η^2 of 0.08, indicating a moderate effect size. Similarly, behavioral engagement shows an F -ratio of 15.61, a significant p -value of less than .001, and a partial η^2 of 0.05, suggesting a small but significant effect. However, for cognitive engagement, the F -ratio is 2.80, with a non-significant p -value of .095 and a partial η^2 of 0.00, indicating no meaningful difference between the groups in cognitive engagement.

RQ2: How do Japanese university students perceive ChatGPT after instructor-led ChatGPT usage writing classes?

The first open-ended question revealed 72% of the respondents support the use of ChatGPT in writing classes, citing its ability to provide quick, efficient feedback that can help students improve their skills faster by identifying grammatical errors, enhancing sentence structure, and expanding vocabulary. Additionally, ChatGPT can alleviate teachers' workloads with automated feedback. However, some are concerned that reliance on ChatGPT could lead students to depend too heavily on the tool or inhibit their creativity. A word cloud generated from the responses, illustrated in Figure 1, indicates that "yes," "use," and "ChatGPT" were the top three words in the responses.

As for the second open-ended question, 47% of the respondents indicated that ChatGPT positively influenced their written communication skills. They found that it increased their awareness of grammatical errors, improved sentence structure and vocabulary, and enhanced their understanding of different writing styles and techniques. However, a few noted that it did not significantly affect their willingness to communicate in writing or their overall communication skills. A word cloud generated from the responses, illustrated in Figure 2, indicates that “think,” “appropriate,” and “ChatGPT” were the top three words in the responses.



Figure 1 Word cloud depicting responses to the first open-ended question.

the benefits theme, students reported several advantages, including improved writing skills, increased efficiency, and enhanced motivation and confidence. Specifically, they mentioned improvements in grammar, spelling, vocabulary, sentence structure, and paragraphing, along with quick and accessible feedback. Under the concerns theme, some students expressed apprehension about over-reliance on ChatGPT, reduced originality, and the limitations of AI in providing accurate feedback. They also emphasized the continued importance of personalized guidance from human teachers. Finally, regarding the appropriateness of ChatGPT, opinions were divided: some students supported its integration, others advocated for conditional use with clear guidelines, and a few opposed it, emphasizing the value of independent skill development. These findings highlight a nuanced perspective on ChatGPT, suggesting both opportunities and challenges in incorporating AI tools into educational settings.

Discussion

The discussion section is divided into two parts: ChatGPT's role in fostering EFL students' engagement and students' perceptions of ChatGPT use. Both parts are analyzed based on the findings of the present study while drawing connections to previous research to provide a comprehensive interpretation.

ChatGPT for EFL Learners' Engagement

The present study aimed to explore whether ChatGPT-generated feedback had a significant impact on Japanese EFL students' affective, behavioral, and cognitive engagement compared to peer feedback. Consistent with Teng and Huang (2025), the results revealed that students who received feedback from ChatGPT exhibited higher levels of affective and behavioral engagement, while cognitive engagement, although higher in the ChatGPT group, showed no significant difference between the groups.

For affective engagement, the findings indicated that it was significantly higher for students who received ChatGPT feedback. This suggests that students responded more positively to AI-generated feedback, possibly due to the immediacy and clarity it provided. Consistent with Teng (2024b), ChatGPT's ability to deliver rapid, constructive feedback without delay might have contributed to a more enjoyable and less stressful learning experience, increasing students' emotional connection to the feedback process. Since affective engagement involves emotional responses, feedback from ChatGPT hence can be interpreted as more supportive or personal as compared to peer feedback. This result is on par with Wang and Xue's (2024) finding of positive influence of affective engagement after AI Chatbot usage. One possible explanation is that students may perceive ChatGPT feedback as similar to feedback from a native English speaker, which, as noted by Ene and Yao (2021), is often preferred. The survey items assess students' perceptions and emotional reactions to receiving feedback, including the perceived value and importance of the feedback, enjoyment in reading it, and expectations for future feedback. This empirical study suggests that the higher scores for the ChatGPT group might indicate a preference for ChatGPT feedback over human feedback. Students also enjoy reading the feedback and have positive expectations for future feedback, which may include believing that future feedback will be useful in improving their work.

Students in the ChatGPT group also demonstrated higher behavioral engagement, indicating that they were more likely to revise their work based on ChatGPT feedback. This may be due to the precision and actionable nature of AI-generated feedback, which provided clear steps for improvement. The structured and immediate nature of ChatGPT feedback likely encouraged students to take more frequent and deliberate action. This finding is similar to Wang and Xue's (2024) study, which reported a positive influence of behavioral engagement following

AI chatbot usage. The survey items measure behavioral engagement by assessing how actively students revise based on feedback, take detailed notes, put effort into understanding and applying the feedback, persist despite difficulties, discuss the feedback with others, and use external resources (such as textbooks or the internet) to address the feedback. This suggests that students receiving ChatGPT feedback tend to put more effort into addressing the feedback or improving their writing. The additional step of interpreting feedback from fellow learners, in the peer group, might explain why the ChatGPT group seem more effective in this regard.

Despite the higher affective and behavioral engagement in the ChatGPT group, there was no significant difference in cognitive engagement between the two groups. This suggests that both peer and AI-generated feedback were equally effective in stimulating deep cognitive processing. Cognitive engagement involves understanding and critically reflecting on feedback, and it appears that both feedback methods encouraged students to think critically about their writing. This finding contrasts with Wang and Xue's (2024) study, which reported a positive influence on cognitive engagement following AI chatbot usage. The survey items measure cognitive engagement by assessing individuals' ability to notice and understand feedback, reflect on and evaluate its content, prioritize feedback during revisions, recognize strengths and weaknesses in their writing, and use strategies to improve their writing. The similarity in cognitive engagement across both groups highlights that while ChatGPT is effective in fostering emotional and behavioral responses, it may not necessarily lead to greater mental effort in processing feedback compared to human-generated input.

It is important to note that all three aspects of engagement—*affective, behavioral, and cognitive*—are interconnected, even though this study examines them individually. Positive affective engagement can lead to increased behavioral and cognitive engagement, as learners who feel confident and motivated are more likely to invest effort in revising and reflecting on their writing (Huang & Mizumoto, 2024). The higher affective engagement in the ChatGPT group likely contributed to the high in behavioral engagement. Students who felt motivated and supported by the AI were more inclined to revise their work actively. The relationship between cognitive and behavioral engagement further influences the overall effectiveness of written feedback in enhancing second language writing skills (Teng & Huang, 2025). Higher levels of cognitive engagement, such as understanding the rationale behind feedback, can lead to more effective behavioral engagement during the revision process (Park & Ahn, 2022). However, the lack of a corresponding higher in cognitive engagement in this study suggests that while students appreciated and acted on the feedback, the depth of their reflection remained similar across both feedback types. This may indicate that cognitive engagement is driven more by intrinsic factors such as the student's own motivation and proficiency (Huang & Mizumoto, 2024), rather than the source of feedback itself.

EFL Learners' Perceptions of ChatGPT Use

Regarding the appropriateness of using ChatGPT in an EFL writing class, the responses indicated strong support for its inclusion. The majority view ChatGPT as a valuable tool that offers accurate advice, grammar correction, improvement suggestions, and new perspectives. Many students appreciate its ability to provide both objective and personalized feedback with the convenience of instant access, in line with Chinese students' reported perceptions of ChatGPT use for writing (Teng, 2024b). ChatGPT is especially valued for its role in identifying personal weaknesses, highlighting unnoticed mistakes, and easing the workload on teachers. Despite the overwhelming support, some students voice concerns about potential issues such as the challenge of crafting effective prompts, the risk of over-reliance on AI impeding independent thinking, and occasional ambiguity or incompleteness in ChatGPT's responses (Teng, 2023).

Overall, the responses highlight a nuanced perspective, recognizing both the benefits and potential drawbacks of incorporating ChatGPT into writing classes.

A range of perspectives on whether using ChatGPT has enhanced students' written communication skills were revealed. While some students reported noticeable improvements, attributing them to ChatGPT's ability to help structure sentences better, incorporate new expressions, and write more engaging paragraphs, others indicated no significant change or only modest gains. Some students found that ChatGPT's feedback made them more careful and conscious of their writing, while others felt it was merely an evaluation tool that did not directly impact their willingness to communicate. A few students even noted a decrease in motivation, expressing concerns about over-reliance on AI or finding the feedback repetitive and lacking personalization. Overall, the responses suggest that while ChatGPT can contribute to improved written communication skills for some students by helping them identify and address their weaknesses, its impact on motivation and willingness to communicate appears to be more varied and subjective, consistent with Huang and Mizumoto (2024).

Regarding the continued use of the tool after the class ends, there is a strong inclination towards continued use of ChatGPT even after the completion of their writing course. Many students express a desire to keep using ChatGPT due to its effectiveness in improving their writing skills. They appreciate the readily available feedback, grammar correction, and suggestions for improvement that ChatGPT provides, leading them to feel more confident and motivated in their writing endeavors. Such findings reflect Teng's (2024c) argument on the importance of EFL learners' metacognitive awareness in using ChatGPT for effective writing use. Some students highlight the convenience of using ChatGPT 'anytime and anywhere' and its ability to personalize feedback. The positive learning experience with ChatGPT in the writing class has clearly left a lasting impression on many students, encouraging them to integrate this AI tool into their future writing practices. However, a few students express a preference for human feedback or note a lack of significant impact on their motivation, suggesting that individual preferences and learning styles still play a role in determining the long-term appeal of ChatGPT.

Overall, affective engagement is demonstrated by users' positive emotions towards the AI's utility, such as feelings of satisfaction derived from personalized advice and immediate feedback, signifying emotional investment. On the contrary, negative sentiments, such as finding the AI complex or untrustworthy, indicate a lack of emotional connection. Behavioral engagement is evident when users plan to continue using ChatGPT or actively engage with it throughout their tasks, showing a high level of practical commitment. Conversely, minimal use of the AI points to lower behavioral involvement. Cognitive engagement is illustrated by users who reflect on improvements in their writing skills, such as grammar and clarity, showcasing a deep intellectual engagement and application of feedback. However, the absence of noticeable improvement might point to either superficial cognitive engagement or limited opportunities to leverage the AI's benefits.

Limitations, Implications, and Conclusion

The present study investigated the impact of ChatGPT-generated feedback on the affective, behavioral, and cognitive engagement of Japanese EFL students, comparing it to peer feedback. The results indicate that ChatGPT significantly enhanced affective and behavioral engagement, as students appeared to appreciate the immediacy and structured nature of AI-generated feedback. Affective engagement, reflecting students' emotional responses, was notably higher in the ChatGPT group, suggesting that students preferred the AI-generated feedback over peer feedback. Similarly, behavioral engagement, measured by the effort students put into revisions,

was also higher, indicating that students were more likely to actively engage with feedback from ChatGPT. However, there was no significant difference in cognitive engagement between the two groups, meaning both AI and peer feedback were equally effective in fostering critical reflection and cognitive processing. This suggests that while ChatGPT can enhance emotional and action-based responses, its ability to stimulate deeper cognitive engagement is on par with peer feedback. Students' perceptions of ChatGPT are largely positive, but mixed reactions underscore the need for careful integration of AI tools into educational practices.

Despite these positive findings, the present study has several limitations. First, the results may not be easily generalizable beyond the Japanese university context, as cultural factors could shape students' responses to AI-generated feedback. The study's short duration also limits understanding of the long-term effects of ChatGPT feedback on engagement and learning outcomes. Furthermore, the focus was restricted to affective, behavioral, and cognitive engagement, leaving out other factors such as social or motivational aspects. Third, the quality and personalization of ChatGPT's feedback were not examined, which might explain its limited impact on student engagement. Finally, variations in students' technological proficiency and the quality of their revisions based on the feedback were not considered, both of which could have influenced the results.

Despite limitations, the findings highlight the potential of ChatGPT as a valuable tool for providing written feedback in EFL contexts, especially for promoting affective and behavioral engagement. However, its limited impact on cognitive engagement underscores the need for a more integrated approach, combining AI tools with human interaction to fully support students' learning processes. Future research could explore how to optimize AI feedback by tailoring it to individual learners or by supplementing it with peer or instructor input to maximize overall engagement and learning outcomes in second language acquisition.

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Appendix A

Affective Engagement

1. I find ChatGPT (peer) feedback helpful and important.
2. I enjoy reading ChatGPT (peer) feedback.
3. I feel good to receive ChatGPT (peer) feedback.
4. I feel negatively when receiving ChatGPT (peer) feedback. (Reversed coded)
5. I expect to receive ChatGPT (peer) feedback in the future.

Behavioral Engagement

6. I make revision based on ChatGPT (peer) feedback.
7. I take notes of ChatGPT (peer) feedback carefully.
8. I put effort into ChatGPT (peer) feedback.
9. I keep dealing with ChatGPT (peer) feedback even if I have difficulty.
10. I discuss ChatGPT (peer) feedback with others (e.g., friends and teachers).
11. I use outside resources to deal with ChatGPT (peer) feedback (e.g., textbooks, dictionaries, internet).

Cognitive Engagement

12. I can notice ChatGPT (peer) feedback.
13. I can understand ChatGPT (peer) feedback.
14. I self-reflect on and evaluate ChatGPT (peer) feedback.
15. I give priority to some ChatGPT (peer) feedback in revision.
16. I recognize the weaknesses and strengths of my writing based on ChatGPT (peer) feedback.
17. I use strategies to improve my writing based on ChatGPT (peer) feedback.

Appendix B

Optional Open-ended Questions (Treatment Group Only)

1. In your opinion, is it appropriate to incorporate ChatGPT in a writing class? Please explain your reasoning.
2. Have you noticed an enhancement in your written communication skills as a result of using ChatGPT? Please elaborate on how it impacted or did not impact your willingness to communicate in writing.
3. Are you planning to continue using ChatGPT after completing this course? If yes, what aspects encourage you to continue? If no, what factors influence your decision?