

Impact of Technology Enhanced Cooperative Learning based of Dialogic Feedback Strategy on Students' Learning Effectiveness

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Abstract: *As technology advances, essay writing is critical in higher education, but its incorporation into writing processes is undervalued. Students struggle with properly utilizing technology, which limits its potential for collaboration and better writing performance. This study investigates how dialogic peer feedback, paired with tech-enhanced collaborative writing, improves critical thinking, metacognition, and motivation. Based on Dialogic Feedback Theory, it uses a mixed-methods approach that includes pre/post-study questionnaires and collaboratively edited writings. Paired t-tests show that combining technology and peer feedback considerably improves these skills, which are closely correlated with improved writing skills.*

Keywords: Tech-enhanced collaborative writing (TECW), Dialogic Feedback Theory, Critical Thinking, Learning Motivation, Metacognition.

1. Introduction

Academic writing is a complicated skills that requires critical thinking, metacognition, and motivation to achieve academic achievement (Stephen, 2022). Critical thinking is vital in writing since it involves analyzing and improving arguments rather than simply following writing strategies (Rahmat, 2020). Peer feedback improves this skill by allowing students to analyze and refine their ideas and assessments (Zou et al., 2023). Metacognition is crucial for enhancing argumentative writing because it improves self-assessment and problem-solving skills, allowing students to successfully control their learning (Rios, 2020). Peer feedback increases metacognitive awareness by prompting students to think about their writing and make informed revisions (Carless, 2013). It also improves motivation for academic writing (Süğümlü et al., 2019). Technology-enabled peer feedback broadens these benefits by encouraging collaboration, improving critical thinking, metacognition, and motivation (Halpern, 2013). As technology advances, its role in academic writing becomes increasingly important. However, concerns about creativity and originality often hinder its adoption. While researches into TECW have grown, the significance of dialogic feedback in tech-enhanced collaborative writing, particularly its impact on critical thinking, motivation, and metacognition, remains unexplored. This study address these shortcomings through three key questions: (1) Does integrating dialogic peer feedback with tech-enhanced collaborative writing improve students' critical thinking? (2) Does this method enhance metacognition in academic writing? (3) Does this method boost learning motivation?

2. Literature Review

Dialogic feedback includes dialogues that negotiate meaning, clarify expectations, and foster mutual understanding (Winstone et al., 2022). It is most effective when teachers and students build trust and share learning procedures and quality standards. Dialogic feedback, which is frequently utilized in the classroom, has been noticed to improve writing skills. Bouwer et al. (2024) showed that students who received dialogic feedback had greatly improved their semantic writing and revision skills. Dialogic peer feedback combines dialogue and peer feedback to promote two-way communication in which students actively construct meaning from input (Steen, 2017). It is especially useful in second language (L2) writing, enhancing writing skills and critical thinking (Hu, 2019). Gielen (2020) expands on this

perspective by offering a three-phase collaborative framework: planning, feedback and task involvement, which improves students' ability to process and use feedback through self-, shared-, and cooperative regulation.

Collaborative writing involves two or more students working together to create a single text (Storch, 2019). This process consists of planning, drafting, writing, and reviewing, with complete participation from all participants and no task division (Zhang & Zhang, 2022). Tech-enhanced collaborative writing has been extensively researched and identified as an effective way to second language (L2) learning (Su & Zou, 2022). Technology enhances the process's flexibility, engagement, and efficiency, resulting in better interaction and higher-quality writing than traditional techniques (Zou et al., 2022). Over the last decade, studies have verified TECW's effectiveness in L2 learning (Zou et al., 2022). It allows students to apply their knowledge, master their skills, share resources, exchange ideas, and engage in self-reflection and peer evaluation, all of which improve the quality of collaborative writing.

3. Research Methodology

The experimental process starts with an Introduction and Pre-questionnaire that assesses students' baseline skills and introduces them to dialogic peer feedback and TECW. During the Brainstorming ideas stage, students develop their ideas through peer discussions, embracing various perspectives. Then, in Creating a Detailed Outline stage, students structure their essays collectively while addressing logical flaws through systematic feedback. During the Writing Draft and Feedback stage, students engage in iterative peer review to improve their individual and group work, ensuring coherence and alignment with the essay's overall argument. Finally, in the Final Submission and Post-Questionnaire stage, students incorporate feedback, finalize their essays, and reflect on how dialogic collaboration influenced their writing and critical thinking. This organized procedure encourages active participation, peer-driven modifications, and in-depth analytical abilities, ultimately improving students' overall writing skills.



Fig.1 The experimental process

This study focuses on students who have completed their final reports for the Introduction to Database Systems course, which requires them to work in groups to choose one of five database-related themes. The research technique is divided into three stages: brainstorming ideas, developing a detailed outline, and composing the writing with feedback, all using an online collaborative writing platform with standardized templates. The study included 43 students (23 males and 20 females) ages 20 to 22, who were randomly assigned to seven groups. Based on the pre-questionnaires, all individuals volunteered and shared similar characteristics in critical thinking, metacognition, and learning motivation. Students used an online collaborative writing platform to track their progress and receive peer feedback from their groups. The groups used three templates: brainstorming idea, detail outline, and draft writing with feedback. The five criteria for feedback are accuracy, fluency, complexity, mechanics, and content, with participants responding based on these criteria.

4. Result

The study used a paired t-test to evaluate students' critical thinking skills in essay writing before and after using an integrated learning method that included dialogic peer feedback and tech-enhanced collaborative writing. The study found a modest pretest score ($M = 4.03$, $SD = 0.56$) and a considerable posttest improvement ($M = 4.36$, $SD = 0.49$). The t-test result ($t = -3.22$, $p < 0.001$) indicated a statistically significant increase in critical thinking skills.

Table 1. Critical thinking skills paired t-test

Variable	N	Mean	SD	<i>t</i>
Pretest	43	4.03	0.56	-3.22***
Posttest	43	4.36	0.49	

$P^{***} < 0.001$

As a result, after using the integrated essay writing learning technique, students' self-assessed metacognition writing skills tend to improve. In the pretest phase, students self-assessed their skills with $M = 3.89$, $SD = 0.59$, but in the posttest phase, these two values reached a little, with $M = 4.25$ and $SD = 0.50$. The t-value of -3.29, with a mean difference of -0.36, indicates a significant difference between the pretest and posttest phases.

Table 2. Metacognition skills paired t-test

Variable	N	Mean	SD	<i>t</i>
Pretest	43	3.89	0.59	-3.29***
Posttest	43	4.25	0.50	

$P^{***} < 0.001$

Based on the results, we found that students' learning motivation skills improved after the learning activity. According to Table 3, the mean of the pre-test was $M = 3.98$, $SD = 0.55$; the post-test scores were $M = 4.34$ and $SD = 0.43$ ($t = -4.19$). It can be found that students can effectively improve their learning motivation skills after using dialogic peer feedback with the tech-enhanced collaborative writing method.

Table 3. Learning motivation skill paired t-test

Variable	N	Mean	SD	<i>t</i>
Pretest	43	3.98	0.55	-4.19***
Posttest	43	4.34	0.43	

$P^{***} < 0.001$

To verify the effectiveness of this essay writing process, we compared draft templates through 4 weeks using an online collaborative platform. The results revealed a considerable improvement in both content quantity and quality. In weeks 1-2, essays averaged 300 words, mostly containing preliminary thoughts and outlines. By weeks 3-4, essays grew to 700-1200 words, featuring deeper analysis and greater consistency. Students demonstrated increasing confidence in expressing ideas as well as considerable progress in critical thinking skills, as they identified merits and shortcomings in their own and their classmates' essays.

5. Discussion and conclusion

The current study created an integrated learning model that blends tech-enhanced collaborative writing with dialogic peer feedback to help students improve their essay writing skills while simultaneously investigating the impacts on metacognition, learning motivation, and critical thinking. Students evaluated peer feedback using platform features such as "Change History" to establish its validity and utility, and the findings revealed a considerable improvement in critical thinking. Furthermore, the technique was helpful in improving students' metacognitive skills and learning motivation. The length and depth of essays increased through 4 weeks, indicating a significant improvement in their ability to organize thoughts, build arguments, and present evidence-based analysis. Furthermore, the feedback got more extensive and helpful, with students citing logical aspects and academic theories to explain and defend their points of view. Feedback no longer just pointed out flaws but also provided precise advice on how to improve the essay's structure and links between ideas, assisting peers in improving both substance and expression. Despite its benefits, there are still problems with applying this method, such as variances in student engagement, which are sometimes caused by

a lack of motivation or familiarity with peer evaluation. Furthermore, variances in study habits and knowledge backgrounds can result in variable feedback quality. The study is also limited by its small sample size, as it is the first experimental group. However, additional study with more diverse sample size will assist to improve the results' generalizability and dependability. Overall, the TECW with peer feedback has demonstrated to improve essay quality, critical thinking, metacognition, and motivation. Further research could look into the long-term effect and the incorporation of more tailored feedback methods for different learning demands.

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