


Peer assessment in English argumentative writing: Module development and its impact on writing proficiency and self-efficacy of Chinese college EFL learners



 Lei Zhang¹

 Samah Ali Mohsen Mofreh^{2*}

 Sultan Salem³

^{1,2}School of Educational Studies, Universiti Sains Malaysia, 11800 Penang, Malaysia.

¹Email: zhanglei@student.usm.my

²Email: samahmofreh@usm.my

³Department of Economics, Birmingham Business School, College of Social Sciences, University of Birmingham, B15 2TT Birmingham, United Kingdom.

³Email: s.salem@bham.ac.uk



(+ Corresponding author)

ABSTRACT

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This study investigates the impact of a structured Peer Assessment Argumentative Writing Module on the writing proficiency and writing self-efficacy of Chinese college EFL learners. It further examines the mediating roles of metacognitive awareness, writing engagement, and feedback uptake to explain the cognitive-behavioral processes through which peer assessment influences writing outcomes. A quantitative research design was employed, involving 251 Chinese undergraduate EFL students. Data were collected using validated scales measuring peer assessment, writing self-efficacy, writing proficiency, metacognitive awareness, writing engagement, and feedback uptake. Structural equation modeling using SmartPLS 4.0 was applied to test direct and indirect relationships among these constructs within the proposed conceptual framework. Results revealed that the Peer Assessment Argumentative Writing Module significantly enhanced both writing proficiency and writing self-efficacy. Metacognitive awareness, writing engagement, and feedback uptake were confirmed as significant mediators, demonstrating that students' reflective regulation, sustained involvement, and effective use of peer feedback played crucial roles in transforming peer assessment experiences into improved writing outcomes. This study contributes to the literature by integrating social cognitive theory with multiple mediating mechanisms to explain how peer assessment supports argumentative writing development in EFL contexts. Practically, the findings offer evidence-based recommendations for designing structured peer assessment activities that strengthen students' writing ability, confidence, and self-regulated learning in Chinese higher education.

Contribution/ Originality: This research is original in its development of a structured Peer Assessment Argumentative Writing Module for argumentative writing and its integration of social cognitive theory with multiple mediating processes to reveal how metacognitive awareness, writing engagement, and feedback uptake jointly shape gains in writing proficiency and self-efficacy among Chinese EFL learners.

1. INTRODUCTION

Over the last several years, Chinese university students' English writing ability has attracted significant notice owing to the growing significance of English competence in global communication, tertiary education, and workplace skills. Argumentative writing, more specifically, has been an important skill since it necessitates students to

meticulously examine information, provide well-supported arguments in a reasonable fashion, and explain ideas clearly in a systematic approach, all of which are indispensable in academe as well as working circles (Allagui, 2024; Alnemrat, Aldamen, Almashour, Al-Deaibes, & AlSharefeen, 2025). In spite of a large amount of investment in English language teaching, most Chinese EFL learners remain challenged with writing high-level argumentative essays, which tend to pose difficulties in idea organization, clarity, and linguistic precision (Han, 2023). Practice in instructional strategies for encouraging learner activity, self-management, and peer assessment has thus become prominent as measures towards developing writing skills and learner confidence (Chen, Li, & Jong, 2025). Of these approaches, peer assessment has been found to be an exemplary pedagogy that allows students to critically reflect on each other's texts, reflect on their own work individually, and revise in cycles, which together all contribute to the achievement of higher-level writing competence and enhanced self-efficacy (Dang & Le, 2023; Le, Phuong, Phan, & Le, 2023).

Empirical research has shown the advantages of peer assessment in different learning contexts, such as enhanced writing quality, self-regulated learning, and motivation among students (Abo, Degefu, & Abeba, 2025; Phuong, Phan, & Le, 2023; Power & Tanner, 2023). In the Chinese EFL context, research has shown that when students engage in systematic peer assessment practices, they can better spot mistakes, improve arguments, and use correct linguistic rules (Li, 2023). In addition, research indicates that peer assessment not only increases writing skills but also fosters students' confidence in performing writing tasks or writing self-efficacy, which is highly correlated with motivation, persistence, and academic success (Abo et al., 2025; Johannes & Haase, 2022; Tao & Yu, 2024). It has also been pointed out in research that cognitive and behavioral mediators, including metacognitive awareness, writing engagement, and feedback uptake, are responsible for explaining how peer assessment interventions lead to these favorable outcomes, showing that peer assessment mechanisms are more than just straightforward error correction and involve elaborate reflective and strategic processes (Adinda, Purnomo, Amir, Nasution, & Siregar, 2023; Akcaoglu, Mor, & Kulekci, 2023).

Notwithstanding the increased number of studies, there still exist some gaps in the literature on peer assessment in Chinese EFL writing classes (Bano, Hamzah, & Hafiz, 2025; Hongxia & Razali, 2025). Secondly, although numerous studies have analyzed the direct effect of peer assessment on writing competence or self-perceived competence, relatively few studies have assessed empirically the mediating factors, such as metacognitive knowledge, writing motivation, and uptake of feedback, that would elucidate the mechanism and in what ways and to what extent peer assessment impacts these outcomes (Han, 2023; Listiani, Hódi, & Nikolov, 2025). Previous studies have mainly been conducted in Western or mixed educational settings, and the specific socio-cultural and pedagogical profiles of Chinese EFL learners have not yet been explored fully; hence, findings are restricted to generalizability (Jin, Jiang, Xiong, Feng, & Zhao, 2024; Le et al., 2023; Sun, Motevalli, & Chan, 2024). There is also a limited systematic investigation into structured peer assessment argumentative writing modules for argumentative writing as a sophisticated skill involving higher-order cognitive and linguistic abilities.

Second, past research mainly uses cross-sectional designs or limited sample sizes, which limit the reliability of their findings and the scope for tracking longitudinal writing proficiency and self-efficacy gains (Allagui, 2024). There is also a lack of research that combines multiple mediators within a single conceptual framework to provide an integrated perspective on the connections between peer assessment, cognitive-behavioral processes, and writing performance (Çini, Järvelä, Dindar, & Malmberg, 2023; Ho & Lau, 2025). Secondly, qualitative learner feedback is commonly reported, but there is little quantitative evidence based on validated scales to assess metacognitive awareness, motivation, and feedback uptake in peer assessment in China. These gaps call for an in-depth, theory-based study that explores both direct and indirect impacts of peer assessment on Chinese EFL students' writing performance and self-efficacy.

The present study suggests filling these gaps by developing a systematic Peer Assessment Argumentative Writing Module specifically for argument writing and examining its impact on Chinese university EFL learners'

writing competence and self-efficacy. To guide the investigation more explicitly, the present study sets out two core research objectives: (1) to examine the direct effect of the Peer Assessment Argumentative Writing Module on Chinese EFL learners' writing self-efficacy and writing proficiency; (2) to evaluate the mediating roles of metacognitive awareness, writing engagement, and feedback uptake in explaining how peer assessment influences these outcomes. By integrating social cognitive theory frameworks with empirical assessments of writing products and processes, the research aims to provide a clear understanding of how formal peer assessment might foster students' confidence and ability in completing argumentative writing.

Implications of this research exist in the fact that the research has the ability to inform theory and practice in teaching English writing to Chinese college students. Theoretically, the research encourages insight into processes whereby peer assessment impacts performance in writing, metacognitive consciousness, willingness to write, and feedback uptake as intervening variables. In reality, the study can be applied in teaching methodology and curriculum design to guide the use of A formal Peer Assessment Argumentative Writing Module with evidence-based recommendations to improve not only the writing ability but also learner confidence and self-regulated learning (Kumar, Soozandehfar, Hashemifardnia, & Mombeini, 2023; Zhu, Yang, & Yan, 2024). In addition, through emphasis on argumentative writing, which is essential for academic and professional discourse, the research caters to a vitally important target area in Chinese higher education, enabling learners to build necessary capabilities for achieving success in both local and global settings (Yang, 2024).

2. LITERATURE REVIEW

2.1. *Peer Assessment Argumentative Writing Module and Writing Self-Efficacy*

Writing self-efficacy refers to students' confidence in their ability to effectively perform specific writing tasks, and it significantly affects both writing quality and motivation to engage with the writing process (Abo et al., 2025). In EFL contexts, where writing can be considered demanding in grammatical and rhetorical terms, enhancing self-efficacy is essential if progress is to be made in the long term (Abo et al., 2025; Zhao, Tian, & Carhill-Poza, 2025). Peer assessment, as a procedure in which students provide and receive feedback on each other's work, offers opportunities for mastery experiences, social persuasion, and observational learning, three mechanisms for enhanced self-efficacy (Chen et al., 2025). Through involvement in peer assessment, students do more than make judgments about writing based on established standards; they also reflect on their own writing, which fosters greater confidence in their abilities as writers (Jin et al., 2024).

Empirical research consistently verifies the effectiveness of peer assessment as a tool for facilitating self-efficacy among EFL learners (Le et al., 2023). Zou, Xie, and Wang (2023) also found that Chinese university students who received peer assessment demonstrated higher confidence in writing compared to peers receiving teacher feedback alone.

Similarly, Phuong et al. (2023) explained that continued exposure to peer assessment protocols rendered students more resilient in writing challenges, thereby increasing their self-efficacy. The study supports Bandura's assertion that good performance on a task with positive encouragement enhances confidence. Consequently, based on evidence that peer feedback offers valuable social interaction, constructive comments, and support for writing skills, it is reasonable to expect that the Peer Assessment Argumentative Writing Module will significantly impact writing self-efficacy among Chinese college EFL students.

H: Peer Assessment Argumentative Writing Module has a significant impact on writing self-efficacy.

2.2. *Peer Assessment Argumentative Writing Module and Writing Proficiency*

Writing ability can be defined in broad terms as the ability to produce clear, coherent, and well-structured written texts that achieve communicative aims in a target language (Kumar et al., 2023). To develop writing ability in the EFL classroom, in addition to linguistic accuracy, it might be necessary to be able to organize arguments persuasively

and write for diverse audiences (Power & Tanner, 2023). Peer assessment has been a long-standing effective strategy to develop writing abilities, as it provides students with authentic opportunities to review texts, detect errors, and adopt revision techniques (Susanti et al., 2023). Reviewing and reading peer works enhances students' critical thinking and rhetorical awareness, which are essential elements of effective argumentative writing (Wang, Yu, Hwang, & Hu, 2023).

Empirical research has shown that peer assessment has a quantifiable impact on students' performance in writing. Zhang, Schunn, Chen, Li, and Li (2023) illustrated that Chinese EFL learners receiving mediated peer feedback produced more coherent and clearer argumentative essays than students receiving only teachers' comments. Zhao et al. (2025) also mentioned that peer assessment benefited not only the text quality but also increased higher levels of engagement with language and content. By exposing students to different perspectives, peer assessment helps them hone their own writing techniques, which leads to measurable gains in proficiency (Dang & Le, 2023). Based on this empirical evidence, it is arguable that the Peer Assessment Argumentative Writing Module enhances students' writing capacity significantly since it allows them to develop the ability to analyze and revise in order to produce more logical, accurate, and persuasive texts.

H₂: Peer Assessment Argumentative Writing Module has a significant impact on writing proficiency.

2.3. Metacognitive Awareness as Mediator

Metacognitive awareness, or the capacity of learners to plan, monitor, and reflect on their cognitive processes during learning, is crucial in promoting both writing ability and writing self-efficacy (Teng, 2025). In writing, it refers to setting goals, selecting strategies, monitoring the process, and reflecting on the effectiveness of implemented strategies, which helps learners regulate their learning more effectively (Pan & Rivers, 2023). Peer assessment activities provide a serious environment for the development of metacognitive consciousness because students must evaluate others' work as well as give opinions on their writing skills (Leasa, Rengkuan, & Batlolona, 2024). With this twin stimulation, students not only learn different styles of argumentative writing but also become more aware of their own weaknesses and strengths; hence, they develop more confidence in writing activities (Adinda et al., 2023). Empirical evidence indicates that students who are subjected to peer assessment protocols demonstrate more self-monitoring, planning, and reflective thinking than teacher-centered students, and this suggests that metacognitive awareness is a primary mechanism through which peer assessment activities are linked with higher levels of writing self-efficacy (Siena & Simons, 2024).

In addition to its impact on self-efficacy, metacognitive knowledge has far-reaching effects on writing capacity as it provides students with strategic skills to plan, revise, and write coherent and persuasive texts (Abdelhalim, 2024). Peer assessment encourages students to resort to critical analysis, idea comparison, and writing technique analysis, which enhance their skills in organizing their arguments, identifying linguistic mistakes, and improving the overall writing quality (Jin et al., 2024). Empirical studies have consistently shown that EFL students who take active roles in peer assessment and reflection on their own and peers' writing demonstrate measurable improvements in writing abilities, including better structural organization, argumentative coherence, and linguistic correctness (Alharthi, 2025; Dang & Le, 2023; Hongxia & Razali, 2025; Le et al., 2023). These findings confirm that the mediator of the relationship between the Peer Assessment Argumentative Writing Module and writing performance is metacognitive awareness because the reflection processes promoted through peer interaction enable learners to develop confidence in their abilities and acquire higher levels of writing skills.

H_{3a}: Metacognitive awareness mediates the relationship between peer assessment, argumentative writing module, and writing self-efficacy.

H_{3b}: Metacognitive awareness mediates the relationship between the Peer Assessment Argumentative Writing Module and writing proficiency.

2.4. Writing Engagement as Mediator

Writing engagement has been defined as students' consistent effort, attention, and persistence on writing tasks, including behavioral, emotional, and cognitive dimensions of engagement in writing (Hongxia & Razali, 2025). High levels of writing engagement allow students to allocate more time and mental effort to planning, writing, and revising texts, which are essential for learning writing skills and developing self-efficacy (Jin et al., 2024). Peer assessment activities are able to enhance writing engagement in that they provide an active and socially interactive setting, in which students are responsible not just to themselves but also to their peers (Qulmamatova, 2024). By viewing others' work, such as comments, students are more actively engaged in assessing writing strategies, proofreading drafts, and monitoring their learning progress, which enhances their engagement and persistence in writing tasks (Rad, Alipour, & Jafarpour, 2024). Empirical data show that the higher the level of participation of students in peer feedback activities, the more confident they claim to be in the power of effective writing, and therefore, writing engagement is an intervening mechanism between peer assessment experience and increased writing self-efficacy (Yu, Jiang, & Zhou, 2020).

Writing engagement also impacts writing skills greatly because emotionally and intellectually committed students will plan well, revise cautiously, and use feedback adequately to improve the quality of their writing (Saeli, Rahmati, & Koltovskaia, 2023). Peer assessment encourages active participation and extended attention to writing assignments, exposing students to a variety of diverse opinions and initiating repeated revision cycles that maximize argumentative coherence and linguistic accuracy (Zhang, 2021). Studies have found that students who demonstrate higher levels of participation in peer assessment sessions consistently produce better written work and realize greater gains in writing over time (Castelló & Sala-Bubaré, 2025; Rad et al., 2024; Zhang et al., 2023; Zou et al., 2023). These findings validate the mediating role of writing engagement between writing performance and the Peer Assessment Argumentative Writing Module, due to the fact that students' participation and involvement in peer tasks enable them to develop stronger self-efficacy as well as enhanced writing ability.

H_{3a}: Writing engagement mediates the relationship between Peer Assessment Argumentative Writing Module and writing self-efficacy.

H_{3b}: Writing engagement mediates the relationship between the Peer Assessment Argumentative Writing Module and writing proficiency.

2.5. Feedback Uptake as Mediator

Feedback uptake is learners' ability to perceive, decode, and effectively use feedback to improve writing performance, including cognitive, behavioral, and motivational operations (Zou et al., 2023). For peer assessment, feedback uptake is critical because it determines whether peer recommendations turn into actual improvements and increased confidence in writing capability (Zhu et al., 2024). As students take an active role in working with peer feedback, they critically examine their own writing, determine areas where they need to improve, and revise to improve both linguistic accuracy and argumentation (Alnemrat et al., 2025; Mao & Lee, 2023). Empirical studies have shown that students who exhibit greater feedback uptake tend to report higher writing self-efficacy than other students, as increased use of quality feedback enhances their confidence in their ability to effectively accomplish writing tasks (Teng, 2025). In this way, feedback uptake is a highly essential process through which the Peer Assessment Argumentative Writing Module could positively affect the confidence and trust of learners in their writing abilities (Wang, Yu, Zheng, & Teo, 2022). Besides self-efficacy, the adoption of feedback also has a direct impact on writing skills since it allows students to transform assessing responses into tangible improvements in content, organization, and language application (Alharthi, 2025). The benefits of peer review include numerous opportunities to receive various inputs and recommendations, and students who successfully implement them are able to demonstrate specific advantages related to the quality of writing, such as the presence of arguments, clarity, and the reduction of grammatical mistakes (Johannes & Haase, 2022). Studies indicate that the absorption of feedback not

only aids in the gradual enhancement of skills but also results in autonomous learning because learners can directly control and apply feedback mechanisms (Saeli et al., 2023). These outcomes are comparable to the mediating effect of feedback uptake in the relationship between the Peer Assessment Argumentative Writing Module and writing performance, demonstrating that proper use of peer feedback by students not only enhances their self-efficacy but also improves their overall writing competence.

H_{5a}: Feedback uptake mediates the relationship between Peer Assessment Argumentative Writing Module and writing self-efficacy.

H_{5b}: Feedback uptake mediates the relationship between Peer Assessment Argumentative Writing Module and writing proficiency.

2.6. Theoretical Framework Supporting the Research

The research is based on the social cognitive theory developed by Bandura that highlights the interaction between personal and behavioral regularities and environmental factors in explaining learning achievements (Bandura, 1997). Self-efficacy in writing and writing competence in English are personal aspects in argumentative writing among students and are both created through cognitive and social processes. Biases among peers are among the primary environmental factors that influence us, within the scope of the three factors of social persuasion, observational learning, and mastery experiences aimed at the creation of self-efficacy (Chen et al., 2025; Shamsuddin & Raza, 2025). Moreover, the model also entails metacognitive awareness, engagement in writing, and uptake of feedback as intervening cognitive-behavioral mechanisms through which peer judgment influences writing performance. A metacognitive awareness of self could help learners to plan, regulate, and monitor writing strategies in order to improve self-efficacy and acquisition of skills (Schraw & Dennison, 1994). Engagement in writing involves persistence, endurance, and focus during writing activities by learners that illustrate the performance aspect of peer interaction (Fredricks, Blumenfeld, & Paris, 2004). By receiving feedback, an indicator of students' capability that results in the internalization of feedback and the implementation of evaluative feedback is the uptake of the feedback (Zhang & Hyland, 2025). All of these theoretical frameworks collectively compose the hypothesized relationships in the study, as illustrated in Figure 1, in which the independent variable is the Peer Assessment Argumentative Writing Module, the dependent variables are writing self-efficacy and writing proficiency, and the mediating variables are parallel and could explain how these relationships take place. When these cognitively and behaviorally mediative constructs are combined with the social cognitive theory, the integration leads to a solid explanation of the effectiveness of structured peer assessment interventions in influencing the confidence and ability of learners at the same levels in terms of writing an argument, which is especially effective when applied in Chinese EFL classrooms.

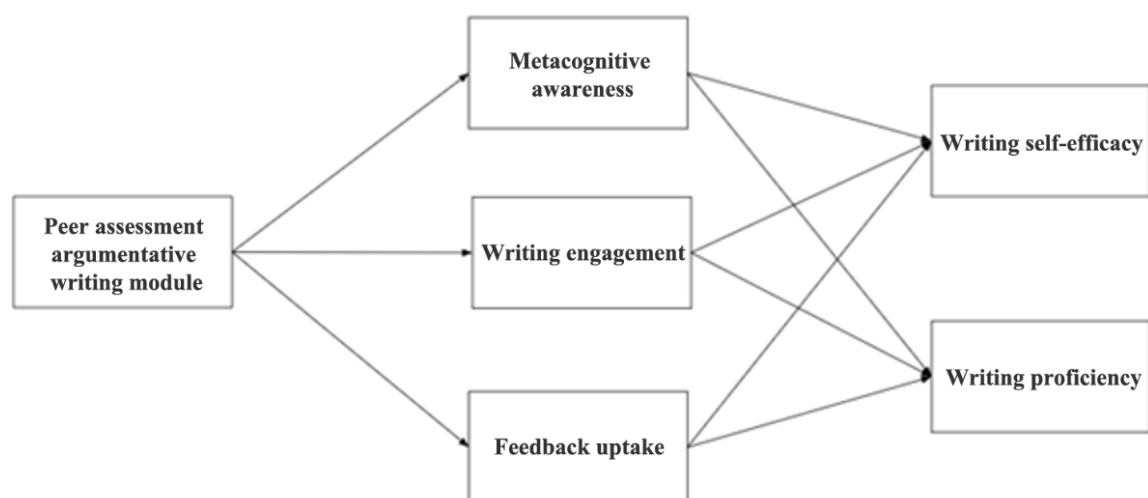


Figure 1. Conceptual framework.

3. METHODOLOGY

This study employed a quantitative design to examine the influence of the Peer Assessment Argumentative Writing Module on English argumentative writing, in terms of writing capability and writing self-efficacy among Chinese college EFL students. A survey-based, structured approach was applied in collecting data from the participants to facilitate the measurement of various variables simultaneously and the exploration of direct and indirect effects between the constructs. The research design was specifically chosen to enable the testing of hypothesized effects and mediating relationships using structural equation modeling in SmartPLS, which is most appropriate to investigate complex models involving latent constructs.

The population of this study was undergraduate students learning English language courses from universities in Hebei, China. The participants were sampled based on their active participation in argumentative writing activities as part of their course. 251 subjects participated in the study, which presented a sufficient sample size that is adequate for partial least squares structural equation modeling (PLS-SEM) analysis as per stated levels of recommendations. Purposive sampling was applied for all the participants to be experienced in English writing and to have the capability of completing the Peer Assessment Argumentative Writing Module, thereby collecting highly relevant and reliable data.

Measuring data were collected through a standardized questionnaire containing measurement scales adapted from previously validated instruments. Standard scales were employed for operationalizing writing self-efficacy, writing proficiency, Peer Assessment Argumentative Writing Module, metacognitive awareness, writing engagement, and feedback uptake for construct validity and reliability. Some examples of sample items include questions about students' confidence in carrying out writing tasks, frequency of usage of peers' feedback, and intensity of engagement and reflection on writing tasks. Answers were elicited on a five-point Likert scale, ranging from strongly disagree to strongly agree, as a quantitative basis for analysis.

Data collection was conducted through the distribution of the questionnaire to target participants during scheduled class sessions and electronically via the Wenjuanxing platform. The participants were required to complete the survey based on their tasks with the Peer Assessment Argumentative Writing Module and their self-perceived knowledge of writing skills. The collected data were subsequently assessed for completeness and consistency, resulting in 251 valid cases remaining for analysis. Descriptive statistics were first computed to provide an overall description of participants' demographic characteristics and the distribution of responses on the variables under measurement.

SmartPLS 4.0 was utilized in carrying out partial least squares structural equation modeling (PLS-SEM) during data analysis. This method was used because it can be applied when handling complex models with several mediators and latent variables, particularly in studies where sample sizes are similar to those of this study. Measurement model assessment was included in the analysis to establish reliability, convergent validity, and discriminant validity of the scales. Cronbach's alpha, composite reliability, and average variance extracted (AVE) were computed to determine internal consistency and construct validity. Once the measurement model was confirmed, the structural model was examined to confirm the hypothesized direct and mediating relationships. Path coefficients, t-values, and p-values determined the significance of Peer Assessment Argumentative Writing Module, writing self-efficacy, writing proficiency, and mediating factors, which were metacognitive awareness, writing engagement, and feedback uptake, in relation to these terms.

The methodological approach employed in this study demands rigorous examination of peer assessment, cognitive-behavioral mechanisms, and writing performance. Employing established measurement instruments, an appropriate sample size, purposive sampling, and PLS-SEM analysis, the research provides a strong framework to test the direct and indirect effects of peer assessment on Chinese college EFL learners' self-efficacy and argumentative writing performance. The method is best applied to robust empirical verification and yields results directly applicable to instructional design and curriculum development in teaching English argumentative writing.

4. RESULTS

Table 1 and Figure 2 show the reliability and validity measures of all the constructs captured by the study, namely feedback uptake, metacognitive awareness, Peer Assessment Argumentative Writing Module, writing engagement, writing proficiency, and writing self-efficacy. Outer loadings for most items were well above the prescribed rate of 0.70, certifying high item reliability and indicating that most indicators are good representations of the respective construct. Cronbach's alpha values ranged from 0.779 for writing skill to 0.904 for the Peer Assessment Argumentative Writing Module, indicating good internal consistency for all measures. Composite reliability ranges were above 0.85 for all variables, confirming the reliability and stability of the measurement scales. The average variance extracted (AVE) for each construct was greater than 0.50, with the maximum value being 0.723 for the Peer Assessment Argumentative Writing Module and the minimum value being 0.533 for writing proficiency, which confirms convergent validity and indicates that constructs explain most of the variance of their indicators. Overall, Table 1 validates the measurement model, which ensures that the constructs are measuring consistently and accurately, facilitating future structural analysis.

Table 1. Variables' reliability and validity.

Constructs	Items	Outer loading	Cronbach's alpha	Composite reliability	Average variance extracted
Feedback uptake	FU1	0.708	0.864	0.902	0.649
	FU2	0.754			
	FU3	0.822			
	FU4	0.830			
	FU5	0.900			
Metacognitive awareness	MA1	0.700	0.880	0.913	0.678
	MA2	0.822			
	MA3	0.864			
	MA4	0.848			
	MA5	0.872			
Peer Assessment Argumentative Writing Module	PAAWM1	0.878	0.904	0.929	0.723
	PAAWM2	0.831			
	PAAWM3	0.898			
	PAAWM4	0.829			
	PAAWM5	0.814			
Writing engagement	WE1	0.835	0.864	0.902	0.647
	WE2	0.796			
	WE3	0.809			
	WE4	0.813			
	WE5	0.769			
Writing proficiency	WP1	0.769	0.779	0.850	0.533
	WP2	0.689			
	WP3	0.789			
	WP4	0.657			
	WP5	0.737			
Writing self-efficacy	WSE1	0.833	0.888	0.918	0.691
	WSE2	0.849			
	WSE3	0.859			
	WSE4	0.787			
	WSE5	0.826			

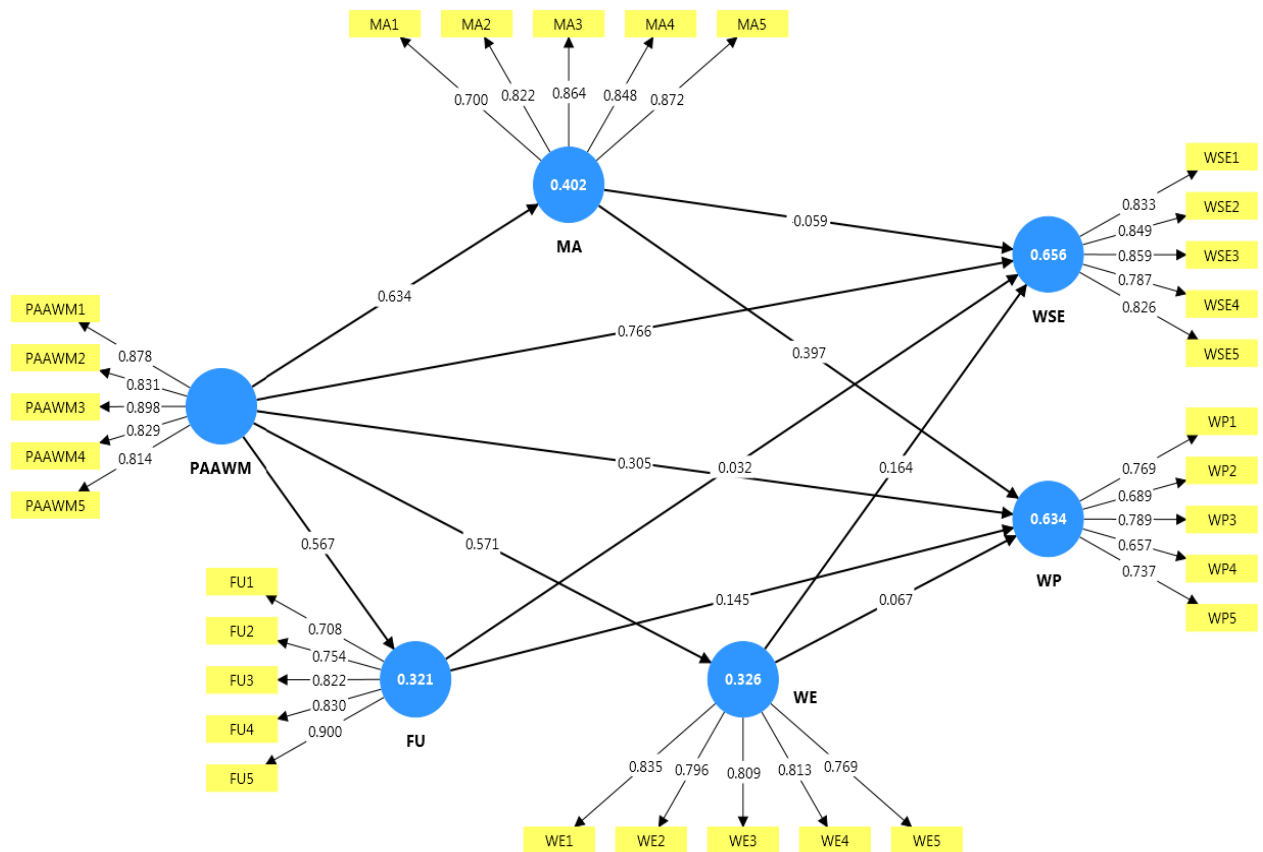


Figure 2. Estimated model.

The discriminant validity of the constructs with respect to both the heterotrait-monotrait (HTMT) ratio and the Fornell-Larcker criterion is provided in Table 2. All HTMT values were below the threshold value of 0.85, indicating that all constructs are distinct from each other and that multicollinearity is not a problem. The Fornell-Larcker criterion demonstrates that the square root of the AVE for all constructs is greater than their correlations with other constructs, again indicating that each variable measures its intended concept and that each one is distinct. For instance, the AVE square root of writing self-efficacy is 0.831, greater than its correlations with all other variables, an indicator that the construct is well differentiated. These cumulative results collectively establish discriminant validity to validate the measurement model as adequately distinguishing between latent variables.

Table 2. Discriminant validity.

Heterotrait-monotrait ratio (HTMT)						
	FU	MA	PAM	WE	WP	WSE
Feedback uptake						
Metacognitive awareness	0.751					
Peer Assessment Argumentative Writing Module	0.634	0.703				
Writing engagement	0.827	0.808	0.644			
Writing proficiency	0.750	0.816	0.806	0.791		
Writing self-efficacy	0.546	0.597	0.847	0.606	0.839	
Fornell-Larcker criterion						
Feedback uptake	0.806					
Metacognitive awareness	0.654	0.824				
Peer Assessment Argumentative Writing Module	0.567	0.634	0.851			
Writing engagement	0.728	0.774	0.571	0.805		
Writing proficiency	0.627	0.731	0.677	0.654	0.799	
Writing self-efficacy	0.483	0.533	0.804	0.532	0.705	0.831

Table 3 displays the structural model's coefficient of determination (R-square), predictive relevance (Q^2), and model fit indices are critical for evaluating the model's effectiveness. R-squared measures indicate the explanatory power of the model, with writing self-efficacy and writing proficiency showing the highest values of 0.656 and 0.634, respectively. This suggests that the Peer Assessment Argumentative Writing Module and mediators significantly explain the variance in these dependent measures. Feedback acceptance, metacognition, and engagement have moderate R-square values of 0.321, 0.402, and 0.326, respectively, indicating that the model can predict these mediating variables. The positive Q^2 predictive relevance estimates for all constructs confirm that the model possesses adequate predictive power. Fit measures such as RMSE, MAE, and SRMR are within acceptable ranges, with SRMR at 0.076, demonstrating that the structural model has excellent overall fit and stability for hypothesis testing.

Table 3. R-squared statistics model goodness of fit statistics.

Constructs	R-square	R-square adjusted	Q^2 predict	RMSE	MAE	SRMR
Feedback uptake	0.321	0.319	0.312	0.836	0.666	0.076
Metacognitive awareness	0.402	0.400	0.393	0.786	0.642	
Writing engagement	0.326	0.323	0.317	0.833	0.660	
Writing proficiency	0.634	0.628	0.452	0.748	0.589	
Writing self-efficacy	0.656	0.651	0.640	0.610	0.450	

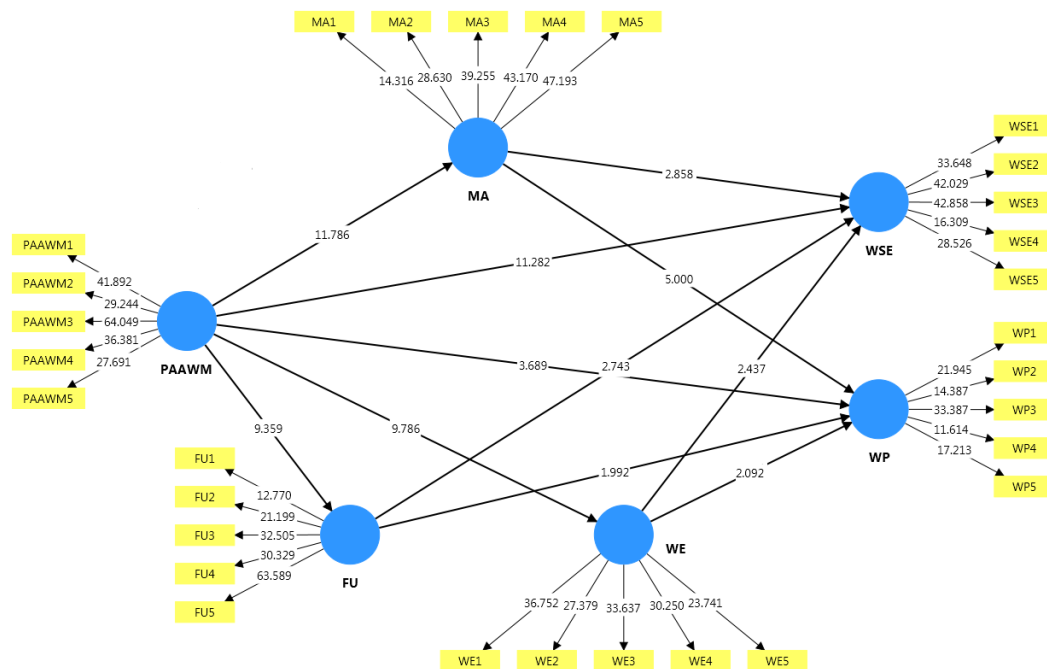


Figure 3. Structural model for path analysis.

Table 4 and Figure 3 indicate the structural model path analysis findings for direct and mediated effects among outcomes, mediators, and the Peer Assessment Argumentative Writing Module. All postulated paths were affirmed. The Peer Assessment Argumentative Writing Module had a significant positive impact on writing self-efficacy ($\beta = 0.766$, $t = 11.282$, $p < 0.001$) and a moderate impact on writing proficiency ($\beta = 0.305$, $t = 3.689$, $p < 0.001$), and therefore had support for H1 and H2. Mediation analyses revealed that metacognitive awareness significantly mediated Peer Assessment Argumentative Writing Module correlations with writing self-efficacy ($\beta = 0.137$, $t = 2.796$, $p = 0.005$) and writing proficiency ($\beta = 0.252$, $t = 4.463$, $p < 0.001$) in support of H3a and H3b. Writing engagement also acted as an effective mediator of both outcomes, with path coefficients of 0.193 and 0.139 for self-efficacy and proficiency, respectively, and thereby substantiating H4a and H4b. Feedback uptake also acted as a mediator of the relationships, with significant positive effects on writing self-efficacy ($\beta = 0.181$, $t = 3.481$, $p = 0.001$)

and writing proficiency ($\beta = 0.182$, $t = 1.875$, $p = 0.030$), substantiating H5a and H5b. These conclusions collectively indicate that the Peer Assessment Argumentative Writing Module not only exerts direct impacts on writing self-efficacy and writing performance but also indirect impacts through potent cognitive and behavioral mediators.

Table 4. Path analysis.

Hypotheses	Path	Path coefficient	S.E	T value	P value	Decision
H1	PAAWM -> WSE	0.766	0.068	11.282	0.000	Accepted
H2	PAAWM -> WP	0.305	0.083	3.689	0.000	Accepted
H3a	PAAWM -> MA -> WSE	0.137	0.049	2.796	0.005	Accepted
H3b	PAAWM -> MA -> WP	0.252	0.056	4.463	0.000	Accepted
H4a	PAAWM -> WE -> WSE	0.193	0.041	2.268	0.023	Accepted
H4b	PAAWM -> WE -> WP	0.139	0.045	3.089	0.002	Accepted
H5a	PAAWM -> FU -> WSE	0.181	0.052	3.481	0.001	Accepted
H5b	PAAWM -> FU -> WP	0.182	0.044	1.875	0.030	Accepted

5. DISCUSSION

The results of the present research indicate that with peer assessment, there is a considerable influence on the writing proficiency and self-efficacy of Chinese college EFL learners, thereby demonstrating the various advantages of the systematic use of peer interactions in the writing classroom. While the activation of students in the reciprocal evaluation of argumentative essays boosts not only short-term performance achievement but also triggers processes of critical thinking and behavior, such as metacognitive awareness, writing engagement, and feedback acceptance. These processes enable students to track and regulate writing plans, maintain energy and focus throughout the task, and accept the propositions of other students during effective revision. Theoretically, social cognitive theory can adequately explain such effects because it emphasizes active interaction between individual, social, and behavioral factors in determining learning outcomes. The concurrent study of direct and indirect relationships in the research provides a holistic explanation of how peer assessment can serve both as a pedagogical method and a facilitator of learner growth, especially in argumentative writing among Chinese EFL students.

The results support the fact that the Peer Assessment Argumentative Writing Module can significantly influence Chinese college EFL students' writing self-efficacy, which aligns with the first hypothesis. It supports the social cognitive theory proposed by Bandura, emphasizing mastery experience, vicarious learning, and social persuasion as ways to develop self-efficacy, and peer assessment activities support all of them (Han, 2023). Making students assess their peers' argumentative essays and provide feedback enables students to be challenged by different approaches and opinions, share their own opinions, and learn to be confident in their performance. Peer assessment is also interactive, creating avenues for social reinforcement, as feedback and appreciation from peers make students feel capable of successfully completing writing tasks. Previous research has shown that the use of guided peer feedback improves students' motivation and self-concept, which can help increase confidence in writing activities and promote persistence in completing challenging writing tasks (Hongxia & Razali, 2025). The findings reveal that peer assessment is an effective approach to enhance learners' self-efficacy, supporting the theoretical assumption that cognitive and social interactions contribute to improving learners' self-efficacy.

Similarly, the findings confirm the importance of the Peer Assessment Argumentative Writing Module in the process of building writing proficiency and support the second hypothesis. The same outcome can also be described by social cognitive theory, which states that observational learning and reflective feedback are predictors of skill acquisition and performance improvement (Li, 2023). Peer assessment encourages students to critically evaluate

others' writing, recognize their strengths and weaknesses, and use the same evaluation criteria to assess their own work. This self-regulated process supports metacognitive control, strategic planning, and revision cycles, leading to the production of meaningful and well-constructed argumentative texts (Sun et al., 2024). Similar to previous empirical research, student participants engaged in peer assessment activities demonstrated improvements in content organization, argumentative clarity, and linguistic accuracy, confirming the dual role of peer assessment in fostering cognitive skill development and active participation in writing activities (Tao & Yu, 2024). The findings highlight the pedagogic advantages of structured peer assessment as an instructional method that not only aids in mastering argumentative writing but also enhances students' capacity for self-assessment and skill improvement. Consequently, this approach could contribute to long-term enhancement of students' overall writing proficiency within the Chinese EFL context.

Findings of this study indicate that the mediating role of metacognitive awareness on the relationship between the Peer Assessment Argumentative Writing Module, writing self-efficacy, and writing proficiency confirms research hypotheses H3a and H3b. Metacognitive knowledge, i.e., the skill of learners to predict, manage, and control their mental activities, is very important in facilitating students' ability to evaluate their own writing styles during peer assessment activities (Schraw & Dennison, 1994). The social cognitive theory states that students learn not only through direct experience but also through observing and communicating with others, and peer assessment is a formal way of learning through observation (Bandura, 1997). When assessing peers' argumentative essays and analyzing their work, students could gain a better understanding of effective writing strategies, which could boost their confidence and self-efficacy in the writing process. Along with this reflective dialogue, it also enhances students' planning and editing abilities. The above findings can be corroborated by past empirical studies that have shown that when metacognitive engagement is elicited by peer comments, it leads to a higher level of confidence among learners as writers and also improves the quality of their writing.

Moreover, the mediation of the writing engagement effects of the Peer Assessment Argumentative Writing Module on writing self-efficacy and writing performance was also supported, i.e., hypotheses H4a and H4b were both accepted. Writing engagement is a measure of the cognitive, affective, and behavioral commitment of students to writing activities, which indicates persistence, focus, and effort (Fredricks et al., 2004). Social cognitive theory focuses on active participation in the activity, where the chances to develop capabilities and enhance self-efficacy are possible, especially with social feedback and praise (Bandura, 1997). The Peer Assessment Argumentative Writing Module promotes active participation of students in the peer assessment process of argumentative writing and revision of their own writings. Therefore, there is constant investment and involvement in the writing process. This increased involvement helps students to participate more tactically, make use of feedback in a positive manner, and persevere despite adversity, which results in increased self-efficacy and improved writing skills. It has been found that students who are more engaged in peer feedback sessions are more motivated, more focused, and willing to revise, which consequently results in better writing outcomes (Kumar et al., 2023).

Finally, feedback uptake was a significant mediator between writing self-efficacy and the Peer Assessment Argumentative Writing Module, as well as writing ability, confirming hypotheses H5a and H5b. Feedback uptake is the ability of learners to read, understand, and apply evaluative feedback in order to enhance the quality of writing (Faiz, Bilal, Asghar, & Safdar, 2023). Theoretically, social cognitive theory underscores this process by the argument that observation and emulation of others' knowledge and reflective practice improve skill and confidence gain (Bandura, 1997). On peer assessment, students who learn to integrate peer comments appropriately can make tangible improvements to their essays, confirming their writing confidence and developing a more systematic process of planning and revising texts. Earlier research has also shown that successful uptake of feedback results in improved writing skills and increased self-efficacy since students learn how to self-regulate and use corrective criticism for themselves (Zhang et al., 2023). Collectively, the results highlight the most important mediating roles of metacognitive knowledge, writing engagement, and feedback uptake in explaining how peer assessment strengthens

Chinese EFL students' ability and confidence in English argumentative writing, with thorough theoretical and empirical support for the conceptual framework proposed.

Overall, the findings of this study highlight the potential of peer assessment as a qualified instructional practice that promotes writing ability and confidence simultaneously. By confirming all the relationships that were postulated earlier, the research demonstrates that the benefits of peer assessment are not only in the proximate effect of performance improvement but also in attaining higher self-efficacy, strategic engagement, and exploitation of feedback. These results not only contribute to theoretical knowledge of the process of peer interaction as a facilitating factor in learning but also offer useful advice for teaching and curriculum development in the Chinese EFL context. Finally, the research confirms that the well-designed Peer Assessment Argumentative Writing Module has the potential to form a synergistic learning process to enhance students' argumentative writing proficiency and self-efficacy.

6. CONCLUSION

On the whole, the current study provides solid evidence that the use of the guided Peer Assessment Argumentative Writing Module is a significant contributor to the improvement of both self-efficacy and writing proficiency in Chinese EFL learners at the university level, and the evidence of the significant roles of metacognitive knowledge, engagement in writing, and feedback uptake. The results confirm that peer assessment is not a mere strategy of assessment and revision of argumentative writing but rather a facilitator of confidence, reflective thinking, and extensive writing in learners. This study demonstrates the development of skills through observation, thinking, and actively using feedback from the stimulus through observational, reflective, and proactive means as the theoretical synthesis of social cognitive theory and empirical evidence develops the process of facilitating peer interaction. The findings uncover the pedagogical significance of incorporating peer assessment in English writing courses and provide curriculum planning, teaching instructions, and student-centered learning suggestions in Chinese EFL settings. The research also contributes to the theoretical knowledge of peer assessment mechanisms by empirically supporting the existence of various mediators that explain the performance enhancement in the process of argumentative writing. In conclusion, the study confirms that properly designed peer assessment interventions could help yield an active and participatory learning community in which students not only enhance their argumentative writing skills but also acquire beneficial self-regulatory and metacognitive abilities that translate into sustained educational performance.

7. IMPLICATIONS

7.1. Practical Implications

Some practical implications for the teaching of English and curriculum design in Chinese higher education settings are provided by the findings of the current research. The first important implication is that the large effect size of the Peer Assessment Argumentative Writing Module on writing ability and self-efficacy means that the inclusion of structured peer assessment activities in argumentative writing courses can facilitate learner performance better than teacher-centered instruction. Teachers can shape activities that encourage students to give positive feedback, critically assess peers' arguments, and experiment with their own writing, to construct students' higher-order thinking, participation, and motivation. Secondly, the functions of metacognitive awareness, writing engagement, and feedback uptake suggest that students learn best when they are actively engaged in preparing, regulating, and revising through other peers' comments. The identification calls for open guidelines, training workshops, and peer-marking rubrics with scaffolding to help students learn marking criteria and make full use of feedback. Institutionally, encouraging a culture of collaborative learning and reflective practice can not only contribute to students' long-term improvement of writing ability throughout courses but also promote learners' confidence and autonomy necessary for study and work contexts. Findings indicate the need for ongoing monitoring

and enhancement of peer assessment tasks to meet pedagogically helpful, culturally sensitive, and need-specific peer assessment tasks for Chinese EFL learners.

7.2. Theoretical Implications

This research theoretically contributes through the explication of the application of social cognitive theory to Chinese EFL argumentative writing. The findings suggest that positive impacts of peer assessment on students' writing ability and self-perceived competence are not only direct but are mediated by metacognitive knowledge, writing engagement, and acceptance of feedback. These results lend empirical support to the theoretical rationale that learning is an emergent process stemming from the dynamic interaction of individual, behavioral, and social variables, illustrating the mediating role of cognitive and behavioral mediators in delineating the way peer interaction translates into acquiring skills and self-esteem. Furthermore, by integrating multiple mediators into a single theoretical framework, the present study provides a more advanced understanding of the underlying processes of peer assessment and thus makes a contribution to educational psychology and second language acquisition theories. The findings also identify that affective as well as cognitive variables should be taken into account in evaluating pedagogical interventions, thereby expanding current models of writing instruction and providing options for future scholars to explore other mediating variables that affect learning outcomes in EFL settings.

8. LIMITATIONS AND FUTURE DIRECTIONS

8.1. Limitations

In spite of the positive results offered by this study, a number of limitations must be mentioned. First of all, the study was carried out on a purposive sample of 251 Chinese undergraduate EFL students, which can restrict the generalizability of the results to other learning institutions or learners. Second, the research took a cross-sectional approach that only considers students' performances and perceptions at one point in time, perhaps not allowing us to account for the long-term effects of the Peer Assessment Argumentative Writing Module on writing ability and self-efficacy. Third, while validated instruments were employed to assess constructs like metacognitive awareness, engagement in writing, and feedback uptake, self-reported data are prone to response biases, e.g., social desirability or overestimation of skills. The study also limited itself to argumentative writing and, therefore, may not generalize to the impact of peer assessment on descriptive or narrative modes of writing activities. Lastly, whereas SmartPLS utilization enabled examination of mediating relations with rigor, qualitative evidence of students' experiences and the problems faced by them in peer assessment was not collected, limiting understanding of the practical use of the module.

8.2. Future Research Directions

Future studies, guided by the findings and implications of this study, could explore various pathways to expand knowledge on peer assessment in the EFL environment. Longitudinal research may examine the long-term effects of the Peer Assessment Argumentative Writing Module on students' writing abilities and self-perceived competence over multiple semesters, aiming to assess the consistency of observed improvements. Investigations involving diverse groups, such as students from different regions of China or at various university levels, would contribute to evidence regarding the generalizability of the findings and support culturally responsive teaching practices. Future research could also employ mixed-method designs, integrating quantitative data with qualitative interviews or reflective diaries, to better understand learners' subjective experiences, concerns, and awareness related to peer assessment. Additionally, examining peer assessment across different types of writing, such as narrative, expository, or descriptive essays, could determine its effectiveness in various contexts. Lastly, further studies might explore potential moderators, including students' prior writing ability, motivation, or language proficiency, to identify the conditions under which peer assessment is most effective and to inform the adaptation of teaching strategies accordingly.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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