PLS-SEM MULTI GROUP ANALYSIS: UNCOVERING THE INTERPLAY OF FACTORS AFFECTING ACADEMIC WRITING SELF-EFFICACY OF EFL POSTGRADUATE STUDENTS

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Abstract: This cross-sectional study investigates the factors influencing writing self-efficacy among EFL postgraduate students in Indonesia. It employs a quantitative analysis facilitated through partial least squares-structural equation modeling (PLS-SEM). The study engaged 150 master's and doctoral EFL students as participants, examining the variables of writing enjoyment, research literacy, and teacher clarity and teacher immediacy in feedback, in relation to writing self-efficacy. The findings revealed that research literacy significantly improves writing self-efficacy, particularly among doctoral students. This demonstrates the crucial role of research literacy in building students' confidence in their writing abilities. Furthermore, writing enjoyment was found to be a key factor in enhancing writing self-efficacy, especially for master's students. This pinpoints the necessity to nurture joy in the writing process. Teacher clarity was found to be essential for enhancing research literacy, whereas teacher immediacy had a lesser impact. This suggests a reduced reliance on teacher guidance during postgraduate studies. The study highlights the critical roles of research literacy and enjoyment in developing writing self-efficacy and illuminates the nuanced role of pedagogical strategies. These insights are valuable for educational institutions and policy-makers in strengthening the EFL postgraduate learning environment. The differences observed between master's and doctoral students call for further research to develop educational practices tailored to the different needs of these academic stages.

Keywords: Academic writing, EFL postgraduate students, PLS-SEM, multi-group analysis, writing self-efficacy

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Academic writing is typically a cognitive process involving the processing of rational and intellectual knowledge (Prihandoko et al., 2024; Sun et al., 2021). It is a complex process requiring the sequential nature of idea generation, planning, outlining the conceptual framework of what to write, drafting, proofreading, and revising (Csizér & Tankó, 2017). In EFL education, academic writing is critical to a successful postgraduate program (Gupta et al., 2022). For master's and doctoral students, academic writing is generally associated with research-based writing, in which the students are expected to write their theses and articles for scholarly publications. In doing so, previous research revealed that EFL postgraduate students encounter

a unique set of challenges when it comes to developing their writing abilities, such as language barriers, lack of writing experience, and lack of confidence in their writing skills (Li, 2023; Nurkamto et al., 2022).

A plethora of studies has investigated the factors of students' academic writing competence, such as writing anxiety, growth language mindset, metacognition, writing self-regulation, and writing self-efficacy (Karlina & Pancoro, 2018; Prihandoko & Nurkamto, 2022; Schunk, 2023). Among the factors, writing self-efficacy is one of the central constructs that researchers have been increasingly interested in (Golparvar & Khafi, 2021; Rahimi & Fathi, 2022; Sun & Wang, 2020; Teng & Wang, 2023). Writing self-efficacy is an individual's belief in their ability to produce successful writing outcomes (Bruning et al., 2013). It is crucial in determining students' writing performance and motivation to engage in writing activities. A higher level of writing self-efficacy can lead students to have positive emotions, such as enjoyment and confidence, rather than negative emotions, such as stress and anxiety (Cahyono et al., 2024; Zhang & Dong, 2022). In turn, those positive emotions will help students to enhance their academic writing competence.

In the context of Indonesian higher education, postgraduate students pursuing master's and doctoral degrees are mandated to publish research-based articles in national or international journals as a prerequisite for their graduation. This policy imposes significant demands on students, who must navigate both academic and non-academic challenges to meet these requirements. Academically, doctoral students face heightened expectations compared to master's students, as they must demonstrate a deeper systematic understanding and comprehensive knowledge of their research topic, methodological approaches, and the significance of their findings (Azizah & Budiman, 2017; Lathif et al., 2021). Doctoral candidates are required to publish in reputable international journals, such as those indexed by Scopus or Web of Science (WoS), whereas master's students are only required to publish in nationally accredited journals.

The pressure to meet these publication standards often results in significant stress, anxiety, burnout, and frustration among students (Liu et al., 2023). The demands are not limited to the academic realm but also encompass non-academic pressures, such as balancing research with personal responsibilities and coping with the emotional toll of the publication process. Additionally, writing different genres such as research articles, literature reviews, narratives and descriptive, presents unique and different challenges (Yoon, 2021). Each genre follows its own set of conventions and requires different skills and approaches, complicating the writing process and contributing to students' difficulties.

To meet such a demand, postgraduate students spend a considerable time researching and writing articles. In this case, writing self-efficacy will positively impact students' confidence in their writing ability (Sun & Wang, 2020) and improve their writing competence. Given the importance of writing self-efficacy in research article writing for academic success and professional development, understanding the factors influencing EFL students' writing self-efficacy is paramount. Moreover, investigating potential differences between master's and doctoral levels can yield valuable insights into the unique challenges encountered by each level and inform the development of interventions designed to improve writing self-efficacy.

As writing self-efficacy refers to students' beliefs and confidence in their academic writing competence, several internal and external factors can impact EFL postgraduate students' writing self-efficacy. The internal aspect is student-related variable, such as writing enjoyment and research literacy, while the external factor is teacher-related variable, such as teacher clarity and immediacy. Writing enjoyment is the level of pleasure and satisfaction students experience while writing (Tahmouresi & Papi, 2021). Students who enjoy writing are more likely to engage in writing activities, resulting in improved writing outcomes and higher writing self-efficacy. Research literacy is the ability to critically analyze, evaluate, and synthesize information from various sources, a key component of research article writing (Bhatt & Samanhudi, 2022). Research literacy is predicted to have a positive relationship with writing self-efficacy, where students with research literacy skills demonstrate improved writing outcomes and a higher level of writing self-efficacy. Teacher clarity refers to how a teacher communicates information, instructions, and concepts to their students clearly and understandably regarding their research writing (Nurkamto et al., 2022). In addition, teacher immediacy is defined as teachers' behaviors and communication strategies to foster psychological proximity, approachability, and interpersonal affection with their students (Xie & Derakhshan, 2021). Clarity and immediacy in feedback may positively impact students' research literacy and writing outcomes, as students who receive clear and immediate feedback can better understand and apply it, leading to improved writing outcomes and higher levels of research literacy.

Despite the growing body of literature examining several factors affecting writing competence, research on what factors affect EFL students' writing self-efficacy remains less uncharted. Most existing studies have focused on individual variables, such as research literacy or writing enjoyment, rather than examining the interplay among the variables comprehensively and integratedly. A lack of attention to the factors affecting students' writing self-efficacy may result in difficulties enhancing their academic writing competence (Nurkamto et al., 2024). In addition, research comparing the factors influencing writing self-efficacy of master's and doctoral students remains scarce. A study by Ardi et al. (2024) explored the factors affecting EFL students' writing enjoyment using path analysis. However, their study did not deeply analyze the differences between master's and doctoral students in terms of the factors influencing writing self-efficacy. In contrast, the present study focused more on the intricate factors of students' writing self-efficacy and employed a multi-group analysis (MGA) to examine the differences between master's and doctoral students. Such kind of analysis provides a more nuanced understanding of how these factors vary between master's and doctoral students. Investigating the potential differences between these two levels can provide valuable insights into the unique challenges faced by each level and inform targeted interventions to improve writing self-efficacy. Hence, the current study aims to fill these gaps by examining the interplay factors affecting EFL postgraduate students' writing self-efficacy and tries to address the following research questions:

1. What is the relationship between writing enjoyment, research literacy, teacher clarity, teacher immediacy, and writing self-efficacy in EFL research article writing for master's and doctoral students?

2. Are there significant differences in the relationships between these variables for master's and doctoral students?

The following sections portray the theoretical framework underpinning the current study. It elaborates on key variables to derive hypotheses that align with the research objectives.

Writing Enjoyment

Writing enjoyment is a positive emotive experience a student has while engaging in writing activities (Dewaele & MacIntyre, 2016). It substantially impacts students' motivation and, consequently, their writing performance. For instance, a postgraduate student who enjoys the writing process is more likely to invest time and effort into their work, leading to higher quality outputs and a greater likelihood of publication success. As postgraduate students are required to publish research articles, experiencing pleasure while writing increases their engagement and success (Jin, 2023). Previous studies have highlighted the importance of writing enjoyment in academic writing achievement. Tahmouresi and Papi (2021) found that students who enjoy writing are more persistent and less likely to experience writer's block, contributing to their academic success. For example, a student who finds joy in crafting a literature review might delve deeper into the subject matter, resulting in a more comprehensive and insightful paper.

Despite this, little research has been conducted on the relationship between writing enjoyment and writing self-efficacy. This gap in the literature suggests that understanding how writing enjoyment influences writing self-efficacy could provide valuable insights into improving students' academic writing skills. Therefore, this study is positioned to investigate how writing enjoyment shapes writing self-efficacy. By exploring this relationship, we can better understand the emotional factors that contribute to writing success and develop interventions that enhance both writing enjoyment and self-efficacy.

Research Literacy

Research literacy is fundamentally the ability to critically evaluate and incorporate information from various sources (Badenhorst & Guerin, 2016), which is crucial for writing research articles. It also involves evaluation, reflection, and application of research findings to the research context (Groß Ophoff & Rott, 2017). Within the realm of academic writing, research literacy is paramount, guiding EFL students in information sourcing, assessment, and utilization. For instance, an EFL student with high research literacy can effectively identify credible sources, synthesize diverse perspectives, and construct well-supported arguments in their research papers. This skill set directly impacts the quality and credibility of their academic writing. Previous research has validated the correlation between research literacy and academic writing proficiency. Bhatt and Samanhudi (2022) demonstrated that students proficient in research are also proficient in academic writing. For example, a student who can critically evaluate sources and integrate them into their writing will likely produce more coherent and persuasive research articles. Despite the established link between research literacy and academic writing proficiency, there is a need to explore how research literacy influences other aspects of writing, such as writing enjoyment and self-efficacy. By investigating this relationship, we can develop targeted

interventions to enhance students' research literacy, thereby improving their writing enjoyment and self-efficacy.

Teacher Clarity

As EFL postgraduate students are required to write research articles under the supervision of their supervisors, students' writing self-efficacy may be predicted by teacher-related factors such as teacher clarity. Teacher clarity is a positive teacher communication behavior to convey ideas, concepts, and instructions clearly and comprehensively (Amalia et al., 2023; Xie & Derakhshan, 2021). For example, a supervisor who provides detailed, unambiguous feedback on a student's draft can significantly enhance the student's understanding and confidence in their writing abilities.

Some previous studies have underscored the significance of teacher clarity in amplifying students' understanding of course content, improving cognitive learning, and promoting students' success (Alles et al., 2018; Lazarides et al., 2021; Titsworth et al., 2015). Regarding academic writing, Kelly and Gaytan (2020) found that a lack of clarity given by teachers can lead to students' writing anxiety. An example of this is when students receive vague or inconsistent feedback, which can cause confusion and hinder their progress, ultimately affecting their self-efficacy and motivation to write. Moreover, it was found that clear feedback from their teachers revealed significant improvements in students' engagement and motivation (Zheng, 2021). Despite the recognized importance of teacher clarity, there is a dearth of research exploring its interplay with related variables to enhance writing self-efficacy. Understanding how clear communication from supervisors affects EFL postgraduate students' writing self-efficacy is critical for developing strategies to support students in their academic writing endeavors. The current study aims to explore this interrelationship, examining how teacher clarity, alongside other factors, can enhance EFL postgraduate students' writing self-efficacy.

Teacher Immediacy

Teacher immediacy refers to the behaviors and communication strategies the teachers use to create a more dynamic and engaging learning environment with their students (Liu, 2021). It manifests through verbal and nonverbal actions communicating openness, sociability, and accessibility. As suggested by previous research, teacher immediacy correlates with improved student learning outcomes, class motivation, and participation (Zheng, 2021). Moreover, it was found that teacher immediacy influences cognitive and affective learning within the EFL context (Wang, 2021). In other words, students who perceive their instructors as more accessible tend to be more engaged in class and report greater learning satisfaction. For example, an EFL student who feels comfortable approaching their teacher with questions is more likely to understand complex grammatical structures and improve their language proficiency. In the context of academic writing, immediate teacher actions can significantly reduce students' writing anxiety. Kelly and Gaytan (2020) found that students who received timely and supportive feedback from their teachers experienced lower levels of anxiety and were more confident in their writing abilities. For instance, a student who receives prompt, constructive feedback on their writing assignments may feel more assured about their progress and be more motivated to revise and

improve their work. Given its implications, it is crucial that teachers employ immediacy behaviors consciously in giving feedback for students' research writing. This study examines the relationship between teachers' immediacy and students' research literacy in predicting writing self-efficacy. By exploring this relationship, the study aims to shed light on how teacher behaviors can support students in developing the skills and confidence needed for successful academic writing.

Writing Self-efficacy

Writing self-efficacy, defined as one's belief in the capacity to achieve desired writing outcomes, is critical to students' writing performance and motivation (Sun & Wang, 2020). It reflects the balance of external and internal factors, such as previous activities, feedback, and social cues (Mitchell et al., 2017). For instance, a student who has consistently received positive feedback on their writing may develop a stronger belief in their writing abilities, which can enhance their motivation and performance. In academic writing, Bruning et al. (2013) classified different dimensions of writing self-efficacy as ideation, convention, and self-regulation. First, ideation demonstrates self-efficacy in establishing and developing the concepts, principles, and reasoning that serve as a solid foundation for writing. Second, convention shows self-efficacy by enhancing linguistic skills, such as when authors express their perspectives through words, grammatical structures, and the organization of language discourse. Third, self-regulation assesses writing self-efficacy through affective and self-management control, which includes evaluations of the linguistic and cognitive qualities of the writing.

Although numerous studies have examined the impact of writing self-efficacy on various writing outcomes (Golparvar & Khafi, 2021; Sabti et al., 2019; Sun et al., 2021; Zumbrunn et al., 2020), research into its antecedents is limited. Understanding what contributes to writing self-efficacy is crucial for developing interventions that enhance students' writing abilities. For example, Golparvar and Khafi (2021) found that students with higher writing self-efficacy were more likely to engage in writing tasks and produce higher quality work. Given the limited research on the antecedents of writing self-efficacy, the current study aims to determine the contributions of writing enjoyment, research literacy, and teacher clarity and immediacy in predicting writing self-efficacy. By examining these factors, this study seeks to provide a comprehensive understanding of how emotional, cognitive, and instructional variables interplay to influence students' confidence in their writing abilities.

Hypotheses

In light of the preceding framework, the current study attempts to examine the following hypotheses:

H1: Research literacy (RL) is associated with writing self-efficacy (WSE).
H2: Research literacy (RL) is associated with writing enjoyment (WE).
H3: Teacher clarity (TC) is associated with research literacy (RL).
H4: Teacher immediacy (TI) is associated with research literacy (RL).
H5: Writing enjoyment (WE) is associated with writing self-efficacy (WSE).

METHOD

Research Design

This cross-sectional study utilized quantitative analysis using partial least squares-structural equation modeling (PLS-SEM) to investigate the interrelationships among writing enjoyment, research literacy, teacher clarity and immediacy, and their collective influence on writing self-efficacy in the context of EFL postgraduate students of both master's and doctoral levels. The conceptual model of the interrelationships among the variables is depicted in Figure 1.

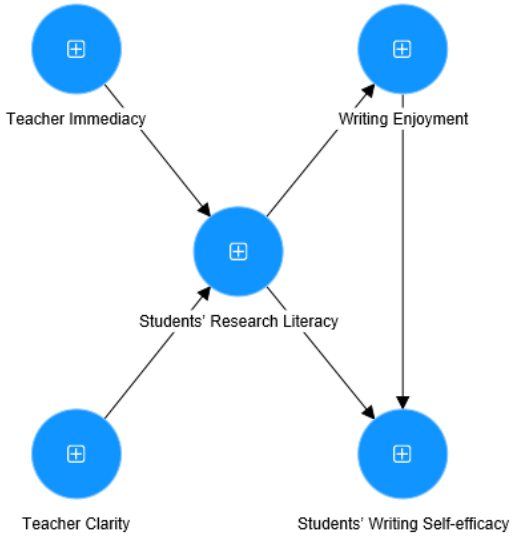

Figure 1. The Conceptual Model

Research Instruments

The instrument used for data collection was a structured questionnaire adapted from previous studies. It was comprised of questions designed to measure students' research literacy (Rockinson-Szapkiw, 2018), writing self-efficacy (Bruning et al., 2013), teacher clarity and immediacy (Kelly & Gaytan, 2020), and writing enjoyment (Jin, 2023). The questionnaire contains 40 items on a five-point Likert scale, where 1 = strongly disagree and 5 = strongly agree. The validity and reliability of the instrument were re-ensured through several stages, including face validation, pilot testing, and statistical verification to suit Indonesian EFL postgraduate students. First, two English Language Education and Linguistics professors performed face validation. One item on writing self-efficacy (WSE_5) and one item on research literacy (RL_3) were corrected. Second, pilot testing involves 30 candidate respondents filling in an online questionnaire via Google Forms. Lastly, researchers carry out reliability and validity tests on the data obtained. Results testing reliability show that Cronbach's Alpha = 0.942, and results testing validity show the R-Obtain figure is in the range 0.407-0.693 with R-Table =

0.349. The instrument has fulfilled valid and reliable criteria based on the acquisition of Cronbach's Alpha and R-Obtain numbers (Brown, 2002).

Data Collection Procedure

Data was collected using Google Forms during the first week of August 2023. An online questionnaire link was sent to the postgraduate head department of six universities (three public and three private universities) from three provinces (Yogyakarta, Central Java, and East Java). These universities were selected to represent a diverse range of academic settings, including public and private institutions, across different geographical areas within Java, a region known for its prominent role in Indonesia's higher education system. The selection aimed to capture a variety of postgraduate student perspectives in EFL contexts, ensuring the generalizability of the findings within similar settings. We included a consent form that clearly stated that all participants were assured of their anonymity and that the information collected would only be used for research purposes. Then, the online questionnaire link was forwarded to students' WhatsApp group. The demographic information of the respondents, including gender, university type, and academic major, is summarized in Table 1.

Table 1. Respondents' Demographic Information

		Masters		**Doctor**	
		frequency	%	frequency	%
Gender	Male	23	24.5	15	26.8
	Female	71	75.5	41	73.2
University	Public	57	60.6	53	94.6
	Private	37	39.4	3	5.4
Major	English Language Education	77	81.9	43	76.8
	Linguistics	5	5.3	4	7.1
	Applied Linguistics	1	1.1	1	1.8
	English Letters	5	5.3	2	3.6
	American Studies	4	4.3	0	0
	Educational Technology	2	2.2	0	0
	Language Education	0	0	4	7.1
	Literature	0	0	1	1.8
	Humanism	0	0	1	1.8

This research followed the minimum respondent number suggested by Wong (2013). One hundred fifty postgraduate EFL students in Indonesia from various public and private universities participated in this study. This represents the number of students who agreed to participate and completed the questionnaire, out of a target sample of 200 respondents. Among the participants, 94 were master's students (23 males and 71 females), and 56 were doctoral students (15 males and 41 females). The students represented various majors, including English

Language Education, Linguistics, Applied Linguistics, English Letters, American Studies, Educational Technology, Language Education, Literature, and Humanism.

Data Analysis

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.09 (Ringle et al., 2022). We use PLS-SEM as it is suitable to estimate complex models and operate as exploratory research (Hair et al., 2019). We conduct four analysis stages, including measurement model assessment, structural model assessment, multi-group analysis (MGA). First, the evaluation of the measurement model included checking the indicator loading, internal consistency reliability, and convergent validity value. Then, the Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT) were applied to examine the discriminant validity. Second, the structural model assessment included multicollinearity testing, path analysis, and the calculation of the coefficient of determination (R^2) and effect size (f^2). Lastly, MGA, including measurement invariance of composite models (MICOM), MGA bootstrap, parametric test, and Welch-Satterthwait test, were conducted to examine the measurement and structural model's invariance across master's and doctoral students.

FINDINGS AND DISCUSSION

Findings

This section presents the findings from the data analysis, organized around the two research questions to help readers easily locate the answers alongside supporting statistical calculations. The findings are structured in two parts: the first examines the relationships between writing enjoyment, research literacy, teachers' clarity, teachers' immediacy, and writing self-efficacy in EFL research article writing for master's and doctoral students. The second part explores significant differences in these relationships between master's and doctoral students using Multi-Group Analysis (MGA). To address these research questions comprehensively, the analysis includes the measurement model assessment (reliability and validity of constructs), structural model assessment (path coefficients, predictive accuracy, effect sizes), and a comparison of group-specific differences.

Measurement Model

This stage ensures the reliability and validity of the constructs. Indicator loadings are examined to confirm individual item reliability, internal consistency is assessed through Composite Reliability, and convergent validity is determined using the Average Variance Extracted (AVE). Discriminant validity is evaluated using the Fornell-Larcker criterion and Heterotrait-Monotrait Ratio (HTMT).

Indicator Loading, Internal Consistency Reliability, and Convergent Validity Value

This section evaluates the reliability and validity of the constructs used in the study to ensure that the variables accurately measure what they are intended to. The threshold suggested

by Hair et al. (2019) in carrying out measurement model assessments was used in analyzing the findings in Table 2.

Table 2. Indicator Loading, Internal Consistency Reliability, and Convergent Validity Value

Construct	Outer Loading	α	CR	AVE
RL_1	0.832	0.928	0.935	0.636
RL_2	0.765			
RL_3	0.734			
RL_4	0.821			
RL_5	0.719			
RL_6	0.809			
RL_7	0.836			
RL_8	0.792			
RL_9	0.860			
WSE_1	0.856	0.874	0.883	0.665
WSE_5	0.800			
WSE_2	0.821			
WSE_3	0.766			
WSE_4	0.833			
TC_1	0.843	0.908	0.924	0.729
TC_2	0.835			
TC_3	0.854			
TC_4	0.893			
TC_5	0.842			
TI_1	0.884	0.803	0.865	0.625
TI_2	0.771			
TI_3	0.776			
TI_5	0.722			
WE_1	0.870	0.930	0.935	0.672
WE_2	0.812			
WE_3	0.815			
WE_5	0.758			
WE_6	0.763			
WE_7	0.816			
WE_8	0.826			
WE_9	0.891			

RL = Research Literacy, WSE = Writing Self-efficacy, TC = Teacher Clarity, TI = Teacher Immediacy, WE = Writing Enjoyment

The threshold value on the recommended loading indicator is > 0.708 (Hair & Alamer, 2022). In this study, several indicators include RL_10 (0.687), WSE_6-8(0.598, 0.661, 0.553), TI_4 (0.414), WE_4 and 10 (0.562, 0.554) were dropped as they were lower than the recommended threshold. Those indicators were dropped in order to increase the degree of reliability and validity of the model (Sarstedt et al., 2021). Then, based on the values of α and CR, the constructs fall between 0.803-0.935. Accordingly, internal consistency reliability is categorized at a good level since it exceeds the recommended threshold of >0.70 (Hair et al., 2019). Next, the convergent validity analysis was carried out to obtain the average variance extracted (AVE) value with a recommended threshold >0.50 (Hair et al., 2019). The AVE value obtained for the constructs in Table 2 is in the range of 0.625-0.729, which exceeds the recommended threshold. Thus, convergent validity of the constructs in the model has been achieved.

Discriminant Validity

This section evaluates the discriminant validity of the constructs, ensuring that each construct is distinct and measures a unique aspect of the study. Discriminant validity is critical for confirming that the constructs do not overlap conceptually and are sufficiently different from one another, which is essential for accurately testing the research hypotheses. To assess discriminant validity, two approaches were used: the Fornell-Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT). The discriminant validity result is summarized in Table 3 and Table 4.

Table 3. Fornell-Larcker criterion

	RL	**WSE**	**TC**	**IT**	**WE**
RL	**0.798**				
WSE	0.825	**0.816**			
TC	0.511	0.432	**0.854**		
IT	0.455	0.400	0.672	**0.790**	
WE	0.582	0.688	0.404	0.226	**0.820**

Table 4. Heterotrait-Monotrait Ratio (HTMT)

	RL	**WSE**	**TC**	**IT**	**WE**
RL					
WSE	0.807				
TC	0.539	0.463			
IT	0.497	0.450	0.77		
WE	0.602	0.738	0.433	0.297	

In evaluating the discriminant validity to ensure that each construct is genuinely distinct from the others, this study broadened the analysis by contrasting the AVE scores with the

Fornell-Larcker criteria scores with a threshold value exceeding 0.70 (Roemer et al., 2021) in the diagonal section between the constructs and Heterotrait-Monotrait Ratio with a threshold value does not exceed 0.850 (Hair et al., 2014). Table 3 (bold number) presents the Fornell-Larcker criterion value, which can be seen that the square root of the AVE (diagonal values) for each construct is higher than the correlation between that construct and any other, verifying discriminant validity. In addition, Table 4 presents the HTMT value, another measure of discriminant validity. All HTMT values are below the conservative threshold, confirming the discriminant validity. This data implies that each construct is unique and does not overlap. Therefore, the assessment of the measurement model confirms that our constructs are reliable (good internal consistency), valid (good convergent and discriminant validity), and well-represented by their indicators. Hence, we can evaluate the structural model and hypothesis testing with confidence that our constructs are accurately measured.

Structural Model Assessment

This stage focuses on evaluating the relationships between constructs. Multicollinearity is checked using the Variance Inflation Factor (VIF), while path coefficients are analyzed to test hypotheses. Additionally, the coefficient of determination (R^2) and effect size (f^2) are calculated to assess the model's explanatory power and the impact of individual constructs.

Multicollinearity Testing

This section begins the structural model assessment by addressing multicollinearity, which ensures that the relationships between predictor constructs in the model are not distorted by high intercorrelations. To assess multicollinearity, the Variance Inflation Factor (VIF) was calculated for each construct and it is displayed in Table 5.

Table 5. Variance Inflation Factor

	RL	**WSE**	**TC**	**IT**	**WE**
RL		1.512			1.000
WSE					
TC	1.825				
IT	1.825				
WE		1.512			

As a rule of thumb, Variance Inflation Factor (VIF) values should be less than 5, ideally below 3, to rule out multicollinearity issues (Hair et al., 2006). Table 5 presents the results of VIF values in the range of 1.000-1.825 that are comfortably below these thresholds. Thus, all indicating constructs have no concerns with multicollinearity.

Path Analysis

Path coefficients represent the strength and direction of relationships between constructs. The significance of these coefficients is tested using bootstrapping methods, with p-values or

confidence intervals determining the validity of the hypotheses. The path analysis result is summarized in Figure 2 and Table 6.

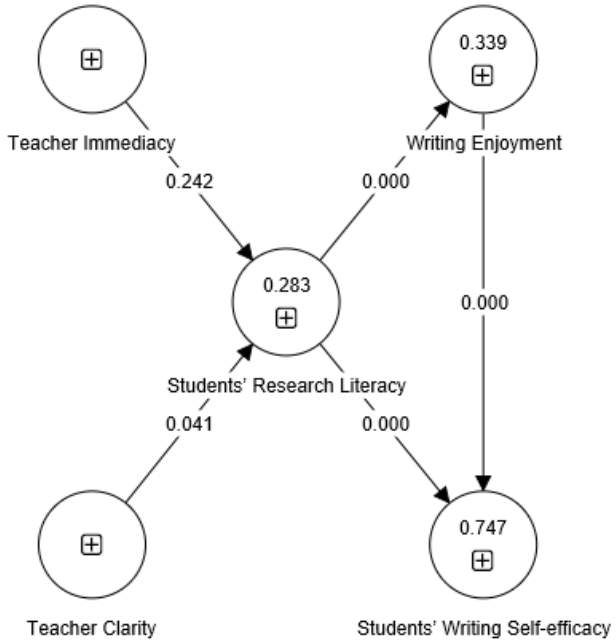

Figure 2. Path Coefficient

Table 6. Path Analysis Result

Hypotheses	Path	β	Mean	SD	T Values	P Values	Sig
H1	RL -> WSE	0.643	0.641	0.066	9.736	0.000	Supported
H2	RL -> WE	0.582	0.598	0.085	6.886	0.000	Supported
H3	TC -> RL	0.373	0.373	0.182	2.048	0.041	Supported
H4	TI -> RL	0.204	0.225	0.175	1.170	0.242	Not Supported
H5	WE -> WSE	0.314	0.316	0.077	4.080	0.000	Supported

Path analysis allows for the testing of the hypothesis. Figure 2 shows that each construct of the model has a positive relationship. In addition, Hair et al. (2017) recommends the threshold value of t-value is >1.96 to determine the significant positive relationship of each construct. Table 6 illustrates the results from the path analysis. The hypothesis tests, conducted with a 5% significance level, show that four of the five hypotheses are supported. H1 and H2 are supported with RL was significantly affected WSE (β = 0.643; t = 9.736; p = 0.000) and WE (β = 0.582; t = 6.886; p = 0.000). H3 is also supported, TC also has a significant positive effect on RL (β = 0.373; t = 2.048; p = 0.041). On the contrary, H4 is not supported, with a p-value of 0.242,

suggesting that TI does not significantly influence RL. Finally, H5 is supported (β = 0.314; t = 4.080; p = 0.000), indicating that WE is found to have a significant positive impact on WSE.

Coefficient of Determination (R^2) and Effect size (f^2)

Additionally, the coefficient of determination (R^2) and effect size (f^2) are calculated to assess the model's explanatory power and the impact of individual constructs. R^2 measures the proportion of variance in the dependent variable explained by the independent variables. Effect size examines the contribution of each independent variable to the R^2 of the dependent variable. The coefficient of determination and effect size values are presented in Table 7 and Table 8.

Table 7. Coefficient Determination (R^2)

Construct	R^2	R^2 Adjusted	Consideration
RL	0.283	0.256	Modest
WSE	0.747	0.737	Strong
WE	0.339	0.326	Moderate

Table 8. Effect Sizes (f^2)

Path	f^2	Effect size
RL -> WSE	1.079	Large
RL -> WE	0.512	Large
TC -> RL	0.106	Small
IT -> RL	0.032	Small
WE -> WSE	0.257	Medium

Table 7 presents each endogenous construct's Coefficient of Determination (R^2). Hair et al. (2019) classified the threshold of R2 into weak (0-0.10), modest (0.11-0.30), and moderate (0.30-0.50), strong (>0.50). RL exhibits modest explanatory power, WSE displays strong explanatory power, and WE exhibits moderate explanatory power. In addition, Table 8 shows each path's effect sizes (f^2). Hair et al. (2019) suggest that the threshold value categories of f^2 compromise small (0.02), medium (0.15), and large (0.35). The effects of RL on WSE and WE are large (f^2 values of 1.079 and 0.512, respectively), indicating a strong impact of RL on both constructs. The impact of TC and TI on RL is small (f^2 values of 0.106 and 0.032, respectively), suggesting a relatively minor influence. Lastly, the effect of WE on WSE is medium (f^2 value of 0.257), indicating a moderate impact.

Multi-group Analysis

This final stage investigates potential differences in path coefficients across groups (master and doctorate students), enabling researchers to explore variations in the model across different subpopulations. Differences are tested for statistical significance to determine if group membership influences relationships between constructs. This provides insights into potential

moderating effects of group-level characteristics. The multi-group analysis result is summarized in **Table 9** to **Table 11**.

Table 9. Measurement Invariance of Composite Models Analysis

	Original correlation	**Correlation permutation means**	**5.00%**	**Permutation p value**
RL	1.000	0.999	0.998	0.969
WSE	0.999	0.999	0.998	0.513
TC	0.996	0.997	0.992	0.215
IT	0.995	0.997	0.992	0.142
WE	1.000	0.999	0.998	0.505

This study advances the analysis to examine the in-depth path comparison between master's and doctoral students. The Multi-group Analysis (MGA) is performed to serve this purpose. First, Measurement Invariance of Composite Models (MICOM) analysis was conducted with the threshold of a permutation p-value <0.05 (Latan et al., 2017) to indicate significant differences. The permutation p-value in Table 9 shows that all constructs' value exceeds the threshold, further supporting the notion of invariance.

Table 10. Bootstrap MGA, Parametric Test, and Welch- Satterthwait Test (Master vs Doctor)

Path	**Difference**	**MGA Bootstrap**		**Parametric Test**		**Welch -Satterthwait Test**	
		1- tailed p-value	**2- tailed p-value**	**t value**	**p-value**	**t value**	**p-value**
RL -> WSE	-0.215	0.978	0.044	1.815	0.072	2.040	0.045
RL -> WE	-0.008	0.532	0.937	0.068	0.946	0.071	0.944
TC -> RL	-0.164	0.772	0.457	0.752	0.453	0.738	0.463
TI -> RL	0.235	0.135	0.271	1.098	0.274	1.089	0.280
WE -> WSE	0.204	0.044	0.088	1.555	0.122	1.725	0.089

Table 10 presents the results of the bootstrap-MGA. It shows that the path coefficients' difference between the two groups (master's vs. doctoral students) is statistically significant for the "RL -> WSE" path, as indicated by a p-value of 0.044 in the Bootstrap MGA (1-tailed), and a p-value of 0.045 in the Welch- Satterthwait Test. It means that the effect of students' research literacy on students' writing self-efficacy varies significantly between master's and doctoral students. For the remaining paths, the p-values are all above 0.05, indicating no significant difference in the relationships between the two groups (Latan et al., 2017).

Table 11. Bootstrapping for Path Coefficients Comparison (Master vs Doctor)

Path	Masters		Doctor	
	t value	p-value	t value	p-value
RL -> WSE	5.134	0.000	9.736	0.000
RL -> WE	7.424	0.000	6.886	0.000
TC -> RL	1.608	0.108	2.048	0.041
TI -> RL	3.376	0.001	1.170	0.242
WE -> WSE	5.690	0.000	4.080	0.000

Table 11 provides further insights into the differences between the master's and doctoral groups. It shows the t-values and p-values for each path in the model for each group. The predetermined threshold we adhered to was at a value > 1.96 and a p-value < 0.05, as suggested by Kock (2018). Overall, the multi-group analysis indicates that while there are some differences in the effects of certain constructs between master's and doctoral students, the model is generally invariant across the two groups. For example, almost all paths have significant coefficient values for both master's and doctoral students. For master students, the path coefficients of TC -> RL had insignificant influence ($p < 0.108$). Meanwhile, the path coefficients of TI -> RL have insignificant effects for doctoral students ($p < 0.242$). In addition, the path coefficient of RL -> WSE ($t = 9.736$; $p < 0.000$) and TC -> RL ($t = 2.048$; $p < 0.041$) demonstrated a stronger influence for doctoral students. On the contrary, for master students, the path coefficient of RL -> WE ($t = 7.424$; $p < 0.000$); TI -> RL ($t = 3.376$; $p < 0.001$); WE -> WSE ($t = 5.690$; $p < 0.000$) have significantly affected value compared to doctoral students.

Discussion

The primary objective of this study is to explore the myriad factors influencing EFL learners' writing self-efficacy through the lens of PLS-SEM analysis. In addition, this study utilized multi-group analysis (MGA) to elucidate the factors affecting writing self-efficacy among EFL master's and doctoral students. This exploration provides valuable insights into the differing impacts on these two groups.

The first hypothesis revealed a significant connection between research literacy and writing self-efficacy ($\beta = 0.643$, $p = 0.001$). This finding suggested that when students become more skilled in conducting research and evaluating sources, they may feel more confident in writing. It is because research literacy can assist students in better comprehending the topics they are writing about and incorporating evidence from credible sources into their writing. This relationship aligns with previous findings that identify research literacy as a significant factor influencing students' academic writing self-efficacy (Li, 2022; Sun et al., 2022). Previous studies have also highlighted the importance of research literacy in enhancing students' writing performance. For instance, Majorano et al. (2021) found that students with higher research literacy skills were more adept at organizing their ideas and presenting well-supported arguments, which positively impacted their writing outcomes. Research literacy skills can support students in overcoming writing challenges by engaging them in related tasks, such as

reading and conducting research related to their writing assignments. Their ability to overcome such writing problems enhances their confidence in writing and their writing self-efficacy (Stavropoulou et al., 2023). This finding suggests that an EFL program can focus on providing intervention to improve students' research literacy before they are assigned an academic writing task.

A strong relationship was also identified between research literacy and writing enjoyment (β=0.582, p<0.001), supporting the second hypothesis. This result demonstrated that in addition to increasing students' writing confidence, research literacy also fosters students' positive emotions, making writing a more enjoyable experience for them. For example, a student who can efficiently find and incorporate relevant research into their writing is likely to feel a sense of accomplishment and satisfaction, thereby enjoying the writing process more. As EFL postgraduate students spend considerable time writing, a sense of enjoyment is essential since it can encourage learner autonomy and agency in taking ownership of their writing progress (Zhu et al., 2022). This sense of enjoyment can translate into more consistent and dedicated writing practice, leading to improved writing skills over time. For instance, Zhu et al. (2022) found that students who enjoyed their writing tasks were more likely to engage in self-directed learning activities, such as seeking additional resources and revising their drafts. This point partly supports Bergen et al.'s (2023) study, which found that literacy skills impact enjoyment and engagement in reading and writing. Hence, this finding underlines the significance of nurturing students' research literacy skills.

In addition, the data revealed a pronounced disparity between master's and doctoral students regarding the relationship between research literacy and writing self-efficacy. Specifically, doctoral students ($\beta = 0.632$, $p < 0.001$) exhibited a more profound relationship than master's students ($\beta = 0.376$, $p < 0.001$), underpinning the increased importance of research literacy for those immersed in more advanced research endeavors. This point has been highlighted by previous research that research literacy becomes increasingly important for individuals who are engaged in more advanced research endeavors, such as those undertaken by doctoral students (Ho, 2016; Stadtlander et al., 2020). Hence, there is a stronger relationship between research literacy and writing self-efficacy among doctoral students than among master's students. However, there was congruence in the link between research literacy and writing enjoyment across both student groups ($t = 7{,}424$ & $6{,}886$, $p < 0.000$), suggesting a universal influence of research literacy on their enjoyment of writing. It means that improving research literacy may be an effective way to increase writing enjoyment for all students.

From teacher-related variables, teacher clarity was observed to significantly bolster students' research literacy ($\beta = 0.373$, $p < 0.05$), resonating with prior arguments highlighting the centrality of clear instruction in literacy skill enhancement (Li, 2022). Since postgraduate students' research literacy varies and is influenced by their prior research experiences, teacher clarity and effective communication during supervision fosters students' research skills as they they enhance their understanding of research paradigms and methodologies in academic writing (Yahia & Egbert, 2023; Zheng, 2021). Supporting this point, a study by Nangimah and Walldén (2023) suggests that providing clear feedback and positive communication from teachers are essential for promoting students' development in academic writing. Teacher clarity can help students develop the academic skills needed to engage with the scholarly community, address

writing challenges, and produce higher-quality research and writing. (Jinowat & Wiboolyasarin, 2022; Zhang & Hyland, 2021). Given this point, it can be concluded that both teacher- and student-related variables are significant in enhancing students' research literacy.

The fourth result of this study showed a meaningful correlation between teacher immediacy and research literacy ($\beta = 0.204$, $p > 0.05$). Unlike teacher clarity, the influence of teacher immediacy was found to be negligible toward research literacy. In other words, there was insufficient evidence to support the hypotheses, as the relationship between these variables was not statistically significant. This finding offers a different perspective than previous studies on teacher immediacy. Teacher immediacy has been extensively studied and found to be a positive predictor of various student experiences, such as online engagement, learning, reduced foreign language anxiety, motivation, and academic engagement (Xie & Derakhshan, 2021; Zheng, 2021). As teacher clarity and immediacy differ in that teacher clarity arouses cognitive interest, whereas teacher immediacy arouses affective interest, the possible reason for our finding is postgraduate students may have already developed a strong foundation in research literacy and may not rely as heavily on their teachers for the emotional closeness (Böttcher-Oschmann et al., 2021). Additionally, the nature of postgraduate programs may play a role, often involving more independent research and less direct interaction with teachers (Lamon et al., 2020).

Moreover, the correlation between teacher immediacy and clarity with research literacy varied between master's and doctoral students. Teacher immediacy was more pronounced for master's students ($t = 3{,}376$, $p < 0.001$) compared to doctoral students ($t=1{,}170$, $p=0.242$), hinting at the higher significance of teacher approachability for master's students. One possible reason for this could be that master's students are at an earlier stage in their academic careers and may require more guidance and support from their teachers to develop their research skills (Vieno et al., 2022). On the other hand, the correlation between teacher clarity and research literacy for doctoral students was more pronounced ($t = 0.204$, $p = 0.242$) compared to master students. Doctoral students may need clarity in instruction as they are often engaged in complex, independent research projects. Clear communication from teachers can help them understand complex concepts, methodologies, and academic writing practices, leading to improved research literacy (Nurkamto et al., 2022; Zheng, 2021).

The final hypothesis uncovered a notable link between writing enjoyment and writing self-efficacy beliefs ($\beta=0.314$, $p<0.001$). The finding indicated that when postgraduate students find writing a more enjoyable experience, they may become more confident in their writing abilities. This is because enjoyment can influence individuals' motivation and persistence when faced with challenging tasks, such as writing. These findings suggest that when postgraduate students enjoy the writing process, they may be more likely to approach writing tasks with a positive attitude and to persist in the face of difficulties, leading to higher levels of self-efficacy for writing (Isen & Reeve, 2005). In addition, a noticeable difference was observed in the influence of writing enjoyment on writing self-efficacy. Master's students ($t = 5{,}690$, $p < 0.001$) were more influenced than doctoral students ($\beta = 4{,}080$, $p < 0.001$), with writing enjoyment emerging as a dominant factor for the master's group. Master's students may place a greater emphasis on the enjoyment of the writing process. It can be argued that writing enjoyment is a key factor in motivating master's students to engage in writing tasks. This could be because master's students are still developing their research and writing skills and may be more likely to persist in the face

of challenges when they enjoy the writing process (Castillo-Martínez & Ramírez-Montoya, 2021; Mickelson, 2018). In contrast, doctoral students may have already developed strong research and writing skills. They may be more focused on the outcomes of their writing, such as publishing their research or completing their dissertation. As a result, they may be less influenced by the enjoyment of the writing process and may be more motivated by other factors, such as the potential impact of their research or the desire to complete their degree (Belavy et al., 2020; Castillo-Martínez & Ramírez-Montoya, 2021; Gupta et al., 2022).

CONCLUSION

This study examined the various elements influencing EFL learners' writing self-efficacy. Utilizing the PLS-SEM analysis, it found that students' research literacy, teacher clarity and immediacy, and writing enjoyment were significant predictors of writing self-efficacy. Additionally, by applying the PLS-SEM MGA, distinct factors affecting writing self-efficacy among EFL master's and doctoral students were unveiled, underscoring varying influences for these cohorts.

This study extends the understanding of writing self-efficacy among EFL postgraduate students by highlighting the differential effects of research literacy, teacher clarity, teacher immediacy, and writing enjoyment across academic levels. A stronger link between research literacy and writing self-efficacy for doctoral students emphasizes the critical role of advanced research skills in shaping their academic confidence, paving the way for future investigations into specific aspects of research literacy and their influence mechanisms. Both master's and doctoral students exhibited similar connections between research literacy and writing enjoyment, confirming the universal role of literacy skills in fostering positive emotions toward writing.

Practical recommendations emerge for institutions and educators to address these findings. Curricula should cater to the distinct needs of master's and doctoral students by integrating advanced research literacy training for doctoral students while prioritizing writing enjoyment and teacher rapport for master's students. Professional development for educators should focus on enhancing teacher clarity and immediacy through tailored sessions on effective communication and rapport-building. Establishing writing centers and peer mentorship programs can further support students' unique challenges at each academic level. Regular monitoring and constructive feedback will enable educators to refine their teaching approaches, fostering a supportive academic environment that enhances students' writing self-efficacy and research article writing proficiency.

While recognizing the contributions of this research on writing self-efficacy among EFL postgraduate students, it is important to acknowledge its limitations. A notable constraint of this study is its cross-sectional design, which naturally hampers the capacity to determine causality between the variables under examination. As these relationships could change with time, a longitudinal study would offer a more precise understanding of such dynamics. Another limitation pertains to the sample's specificity; comprising students solely from three Indonesian provinces and particular universities, there's potential limitation in generalizing the outcomes to a wider EFL postgraduate demographic in varied contexts. Future research should adopt a

longitudinal design to gain a deeper understanding of the evolution of writing self-efficacy and its influential factors. Moreover, expanding the participant demographics to include students from various provinces or even countries would enhance the generalizability of the findings. Finally, integrating qualitative methods, such as focus groups or in-depth interviews, is recommended for a more nuanced understanding of the observed relationships.

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