

The Effectiveness of Essay Navigator in Supporting ESL Students' Essay Writing Development

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ABSTRACT

This study investigates the effectiveness of EssayNavigator in supporting ESL students' essay writing development. Academic writing remains a major challenge for many ESL learners, particularly in organizing ideas, developing coherent essay structures, and producing effective introductions, topic sentences, and conclusions. Guided by Cognitive Load Theory, Scaffolding Theory, Dual Coding Theory, Social Constructivism, and Self-Regulation Theory, this study explores how Essay Navigator assists students through step-by-step instruction, colour coding, peer comments, and evaluative review. A quantitative research design was employed, involving 61 respondents who completed a Likert-scale survey on academic writing difficulties, essay structure learning, and peer review activities. The findings revealed that students experienced moderate difficulties in organization and structure, especially in arranging ideas logically and connecting paragraphs smoothly. However, students responded positively to the features integrated in Essay Navigator. Step-by-step instructions were perceived as easy to follow and helpful in understanding the essay writing process, while colour coding improved students' understanding of essay structure and organization of ideas. In addition, peer comments and evaluative review were found to help students identify weaknesses, understand mistakes, and improve essay quality. The study concludes that Essay Navigator is an effective tool in supporting ESL students' academic writing development by integrating structured guidance, visual support, collaborative learning, and reflective evaluation. The findings provide useful pedagogical implications for enhancing academic writing instruction in ESL contexts.

Keywords: Academic Writing, ESL Learners, Essay Structure, Peer Review, Essay Navigator

INTRODUCTION

Background of Study

Academic writing is an important skill in higher education because it enables students to communicate ideas, construct arguments, and present knowledge in a clear and organized manner. However, many ESL students experience difficulties in academic writing, particularly in organizing ideas and developing proper essay structure. Studies by Aldayel et al. (2026), Pratiwi (2026), and Jimenez et al. (2024) revealed that students often struggle with arranging ideas logically, writing coherent paragraphs, and producing effective introductions and conclusions. These challenges are commonly influenced by limited vocabulary, grammar difficulties, lack of confidence, and weak understanding of academic writing conventions. As academic writing requires learners to process multiple forms of information simultaneously, students may experience cognitive overload, which further affects their ability to produce well-structured essays.

To address these issues, various writing strategies have been introduced to support students' essay writing development. Past studies by Anyau et al. (2024), Indira (2025), and Subandowo et al. (2025) emphasized the importance of structured writing strategies, peer feedback, revision, and guided learning processes in improving

academic writing performance. In line with these studies, Essay Navigator is designed to support ESL students through step-by-step instructions, colour coding, peer comments, and evaluative review. The use of scaffolding, dual coding, social constructivism, and self-regulation theories provides theoretical support for these strategies in facilitating academic writing development.

Although many studies have examined academic writing difficulties and writing strategies separately, limited research has focused on integrating step-by-step instruction, colour coding, peer comments, and evaluative review into a single academic writing template for ESL learners. Furthermore, there is limited research exploring students' perceptions of the effectiveness of such integrated strategies in supporting essay writing development. Therefore, this study aims to investigate the effectiveness of Essay Navigator in supporting ESL students' essay writing development and to examine learners' perceptions of academic writing difficulties, essay structure learning, and peer review activities.

Objective of the Study and Research Questions

This study is carried out to explore the effectiveness of Essay Navigator in supporting ESL students' essay writing development. Specifically, this study is done to answer the following questions;

1. How do learners perceive academic writing difficulties?
2. How do learners perceive the learning of essay structure?
3. How do learners perceive the learning through peer comments?

LITERATURE REVIEW

Theoretical Framework of the Study

Scaffolding

According to Vygotsky (1978), scaffolding refers to the support provided by teachers, peers, or more knowledgeable individuals to help learners accomplish tasks that they may not be able to complete independently. This concept is closely related to the Zone of Proximal Development (ZPD), which explains that students learn more effectively when guided through challenging tasks with appropriate assistance. In the context of academic writing, scaffolding plays an important role in facilitating students' learning process by breaking complex writing tasks into manageable stages. Teachers can guide students through brainstorming, outlining, drafting, revising, and editing to help them develop well-structured essays and coherent arguments. Scaffolding strategies such as modelling essay structure, providing step-by-step instructions, colour-coded examples, and giving constructive feedback enable students to gradually improve their writing skills and confidence. Peer review activities also support scaffolding by allowing students to exchange ideas, receive comments, and refine their work collaboratively. As students become more competent, the support can gradually be reduced, encouraging greater independence in academic writing.

Cognitive Load Theory and Dual Coding Theory

Cognitive Load Theory by Sweller (1988) explains that learners process information more effectively when complex tasks are broken into smaller and manageable steps. In academic writing, this theory supports step-by-step instruction by helping students focus on one writing component at a time, such as brainstorming, outlining, drafting, and revising. This gradual process reduces cognitive overload and enables students to develop clearer and more organized academic essays.

Dual Coding Theory by Paivio (1986) explains that learning becomes more effective when verbal and visual information are combined. In academic writing, colour coding helps students identify different parts of an essay, such as thesis statements, topic sentences, supporting details, and conclusions. By linking colours with writing components, students can better organize ideas, improve understanding of essay structure, and remember important writing elements more effectively.

Social Constructivism (Vygotsky, 1978)

Social Constructivism by Vygotsky (1978) emphasizes that learning takes place through social interaction, collaboration, and communication with others. According to this theory, students develop knowledge and understanding more effectively when they engage in meaningful discussions and cooperative learning activities. In academic writing, peer comments play an important role in facilitating learning because students can exchange ideas, provide feedback, and identify weaknesses in each other's writing. Through peer review sessions, students are exposed to different perspectives, writing styles, and strategies that can help improve the organization, clarity, and coherence of their essays. Constructive comments from peers also encourage students to reflect critically on their own writing and make necessary revisions. In addition, interaction with classmates can increase students' confidence and motivation in academic writing, especially for learners who may struggle to express their ideas independently. By working collaboratively, students can gradually develop stronger writing skills and become more independent writers, which reflects the principles of Social Constructivism and the importance of shared learning experiences in academic settings.

Self-Regulation Theory

Self-Regulation Theory by Bandura (1991) emphasizes learners' ability to monitor, control, and evaluate their own learning processes to achieve academic goals. In academic writing, this theory is closely related to evaluative review because students are encouraged to assess the quality of their writing critically and make improvements independently. Through evaluative review activities, students examine aspects such as essay structure, clarity of arguments, grammar, coherence, and the use of supporting evidence. This process helps learners identify strengths and weaknesses in their writing while developing greater responsibility for their own learning. Self-regulation also encourages students to set writing goals, reflect on feedback received from lecturers or peers, and apply revision strategies to enhance their academic work. In addition, evaluative review promotes critical thinking and decision-making skills as students learn to judge whether their writing meets academic standards and task requirements. By continuously reviewing and revising their work, students gradually become more confident, independent, and effective academic writers. Therefore, Self-Regulation Theory supports the importance of evaluative review as a strategy for improving academic writing performance and fostering autonomous learning.

Past Studies

Past Studies on Difficulties in Academic Writing

Past studies have highlighted that students commonly experience difficulties in academic writing, particularly in terms of organisation and structure. According to Aldayel et al. (2026), EFL students faced challenges in developing and structuring complex written arguments due to low motivation, lack of confidence, and limited mastery of academic grammar and vocabulary. The study further revealed that these linguistic and affective factors affected students' ability to produce coherent and formally appropriate academic texts. Similarly, Pratiwi (2026) found that undergraduate students struggled with organizing ideas, applying grammar accurately, and using suitable academic vocabulary in their writing. Students also encountered difficulties in maintaining clear academic structure and following referencing conventions effectively. In addition, Jimenez et al. (2024) reported that college students experienced problems in organizing information and creating coherent structures in academic writing. The study also identified difficulties in grammar usage, vocabulary selection, and managing time constraints, all of which negatively affected the quality and organization of students' written work. Overall, these studies demonstrate that organisation and structure remain among the major challenges in academic writing for EFL learners.

Past Studies on Strategies in Academic Writing

Previous research has shown that the use of academic writing strategies plays a crucial role in helping students construct well-structured and coherent essays. Anyau et al. (2024) highlighted that ESL undergraduate learners

frequently employed metacognitive writing strategies, which enabled them to plan, monitor, and regulate their writing process effectively. The study also found strong relationships between metacognitive, effort regulation, and affective strategies, suggesting that these strategies support students in organizing and developing their essays systematically. Similarly, Indira (2025) reported that high-achieving students applied several effective academic writing strategies, particularly in drafting and structuring arguments logically and coherently. The study further revealed that students improved their writing through revision, self-editing, and peer feedback, demonstrating the importance of peer review in enhancing essay quality. In addition, Subandowo et al. (2025) found that Indonesian graduate students employed numerous strategies across the pre-writing, writing, and post-writing stages of essay development. These strategies included consulting lecturers, creating source databases, revising drafts, and removing redundant paragraphs to strengthen essay structure and coherence. Overall, the studies indicate that essay structure and peer review play significant roles in improving students' academic writing performance.

Conceptual Framework of the Study

The conceptual framework (refer to Figure 1 below) highlights the relationship between difficulties in academic writing and the strategies used to improve students' writing performance. Cognitive Load Theory by John Sweller (1988) explains that students often experience difficulty in academic writing because writing requires learners to process multiple forms of information simultaneously, including grammar, vocabulary, organisation, and structure. When students are unable to manage these demands effectively, cognitive overload occurs, making it difficult for them to organize ideas and develop coherent academic essays. Difficulties in organisation and structure are therefore common among learners because they struggle to arrange arguments logically while also focusing on language accuracy and academic conventions. To address these challenges, Scaffolding Theory by Lev Vygotsky (1978) supports the use of step-by-step instruction in academic writing. Through guided learning processes such as brainstorming, outlining, drafting, revising, and editing, students can gradually build confidence and improve their ability to produce structured academic essays.

In addition, Dual Coding Theory by Allan Paivio (1971) justifies the use of colour coding in academic writing because combining verbal and visual information enhances understanding and memory retention. By using different colours to represent essay components such as thesis statements, topic sentences, supporting details, and conclusions, students are better able to identify and organize the structure of their essays. Furthermore, Social Constructivism by Lev Vygotsky (1978) emphasizes the importance of social interaction in learning and supports the use of peer comments in academic writing. Through peer feedback, students can exchange ideas, identify weaknesses, and improve the clarity and coherence of their writing collaboratively. Finally, Self-Regulation Theory by Albert Bandura (1991) supports evaluative review as it encourages students to monitor, assess, and revise their own writing critically. Evaluative review helps students reflect on their strengths and weaknesses, improve writing quality, and become more independent academic writers.

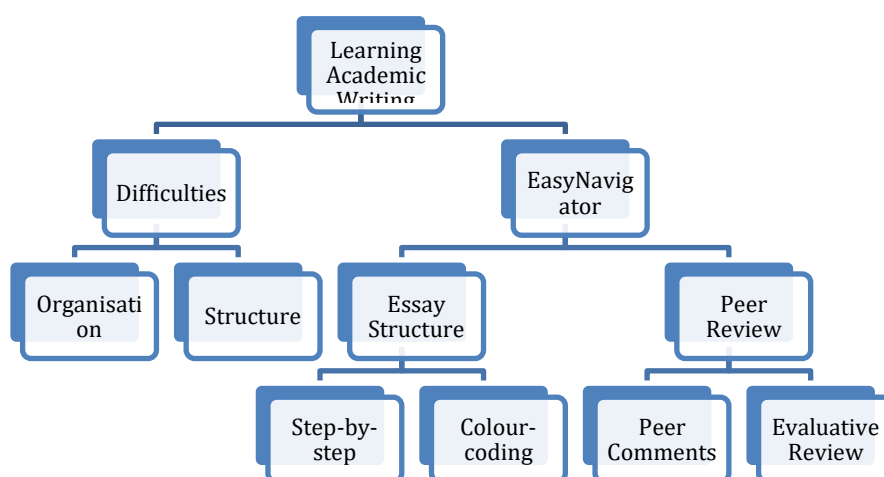


Figure 1: Conceptual Framework of the Study

METHODOLOGY

This quantitative study is done to explore the students' perceptions on the difficulties of academic writing and the use of EasyNavigator. A convenient sample of 61 participants responded to the survey. The instrument used is a 5 Likert-scale survey) to reveal the variables in table 3 below. Table 1 below shows the categories used for the Likert scale; 1 is for Never, 2 is for Rarely, 3 is for Sometimes, 4 is for Very Often and 5 is for Always.

Table 1: Likert Scale Use

1	Never
2	Rarely
3	Sometimes
4	Very Often
5	Always

Table 2: Distribution of Items in the Survey

	VARIABLE (KEYWORD)		CONSTRUCT/ SUB-HEADING		TO ITEM	Cronbach ALpha
B	DIFFICULTIES	(a)	Organization	2	5	.808
		(b)	Structure	2		
C	ESSAY STRUCTURE	(a)	Step-by-step instructions	3	6	.934
		(b)	Colour-coding	3		
D	PEER REVIEW	(a)	Peer Comments	3	6	.931
		(b)	Evaluative Review	3		
					17	.851

Table 2 presents the distribution of items in the survey instrument used in this study. The questionnaire was adapted from previous studies on academic writing difficulties and writing strategies (Anyau et al., 2024; Indira et al., 2025; Subandowo et al., 2025). The instrument consists of three main sections: Difficulties, Essay Structure, and Peer Review, with a total of 17 items. The overall reliability of the instrument is high, with a Cronbach's alpha value of .851, indicating good internal consistency.

The first section, Difficulties, comprises 5 items divided into two sub-constructs: Organization (2 items) and Structure (3 items). This section examines the challenges faced by ESL students when writing essays, particularly in organizing ideas and developing an appropriate essay structure. The Cronbach's alpha value for this section is .808, indicating good reliability.

The second section, Essay Structure, contains 6 items and is divided equally between two sub-constructs: Step-by-step Instructions (3 items) and Colour-coding (3 items). These items assess students' perceptions of the EssayNavigator features designed to guide essay writing through systematic instructions and visual cues. This section recorded a Cronbach's alpha value of .934, demonstrating excellent reliability.

The third section, Peer Review, also consists of 6 items distributed across two sub-constructs: Peer Comments (3 items) and Evaluative Review (3 items). This section evaluates the effectiveness of peer feedback in supporting students' essay writing development. The Cronbach's alpha value of .931 indicates excellent internal consistency. Overall, the high reliability values obtained for all sections suggest that the survey instrument is suitable for measuring the constructs investigated in this study.

Table 3: Reliability Levels, Cronbach's Alpha Ranges, and Their Interpretations

Reliability Level	Cronbach's Alpha range	Interpretation
Excellent	0.9 and above	Indicates very high internal consistency
Good	0.80-0.89	Reflects strong internal consistency
Acceptable	0.70-0.79	Indicates acceptable internal consistency
Questionable	0.60-0.69	Reflects questionable internal consistency
Poor	Below 0.6	Indicates poor internal consistency

In order to determine the internal reliability of the instrument, reliability analysis is conducted. Table 3 above shows the distribution and interpretation of Cronbach Alpha range. According to Ahmad,et.al. (2024), Cronbach Alpha scores between 0.7 to 0.9 is considered acceptable to excellent.

Table 2 also shows the reliability of the survey instrument. The analysis yielded a Cronbach's Alpha value of 0.85, indicating good internal consistency based on the reliability levels presented in Table 3. Thus, the instrument used in this study can be considered reliable for data collection. Further analysis using SPSS was conducted to present the findings and answer the research questions of this study.

FINDINGS

Demographic Analysis

According to Zienefuss, et.al (2021), researches report demographic data in percentages to establish sample representatives, and allow for generalizability to a larger population. The reporting also provides an overview of participants' characteristics. Percentages offer a clear and understandable picture of the sample makeup.

Table 4: Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	30%
		Female	70%
2	English Proficiency	Competent	11%
		Average	85%
		Weak	4%

The demographic profile shows that the majority of respondents were female students, representing 70% of the participants, while male students accounted for 30%. In terms of English proficiency, most respondents identified themselves as having an average level of proficiency (85%). Meanwhile, 11% considered themselves competent in English, and only 4% reported having weak English proficiency. These findings indicate that the respondents generally possessed moderate English language ability.

Descriptive Statistics

Why is there a need to report the mean and standard deviation? According to Vetter (2017), Mean (M) represents the average, or centre of a data set. Standard deviation (SD) indicates the typical distance of individual observations from the mean which shows the data's variability or spread. A low SD means the data points are clustered close to the mean while a high SD indicates they are more spread out. It is good to have a high SD.

FINDINGS FOR DIFFICULTIES

This section presents data to answer research question 1: How do learners perceive academic writing difficulties? In the context of this study, this is measured by (i) organization, (ii) structure.

Table 5 Mean (M) and Standard Deviation for Organization

ITEM	M	SD
BDQ1I find it difficult to arrange my ideas in the correct order when writing an essay.	2.82	0.83
BDQ2I have trouble connecting my paragraphs smoothly in an essay.	2.61	0.80

The findings indicate that students experienced moderate difficulties in organising their essays. The highest mean score was recorded for difficulty in arranging ideas in the correct order when writing an essay ($M = 2.82$, $SD = 0.83$). Students also reported having trouble connecting paragraphs smoothly in an essay ($M = 2.61$, $SD = 0.80$). These results suggest that maintaining logical flow and coherence remains a challenge in academic writing.

Table 5 Mean (M) and Standard Deviation for Structure

ITEM	M	SD
BDQ3I find it difficult to write a clear introduction for my essay.	2.78	0.86
BDQ4I have trouble writing topic sentences for each paragraph.	2.50	0.91
BDQ5I find it difficult to write a good conclusion for my essay.	2.67	1.02

The findings show that students faced moderate difficulties in writing different parts of an essay structure. The highest mean score was for difficulty in writing a clear introduction ($M = 2.78$, $SD = 0.86$), followed by writing a good conclusion ($M = 2.67$, $SD = 1.02$). Students also reported challenges in writing topic sentences for each paragraph ($M = 2.50$, $SD = 0.91$). These results indicate that essay structure remains a challenge for many students.

Findings For Essay Structure

This section presents data to answer research question 2: How do learners perceive the learning of essay structure? In the context of this study, this is measured by (a) step-by-step instruction, and (b) colour-coding.

Step-by Step Instruction

ITEM	M	SD
CESQ1The step-by-step instructions in the EssayMadeEasy template are easy to follow.	4.20	0.68

CESQ2The EssayMadeEasy template helps me understand the essay writing process step by step.	4.28	0.80
CESQ3I can complete my essay more easily by following the instructions in the EssayMadeEasy template.	4.30	0.63

The findings indicate that students responded positively to the step-by-step instructions in the EssayMadeEasy template. The highest mean score was for the statement that the template helps students complete their essays more easily ($M = 4.30$, $SD = 0.63$). Students also agreed that the template helps them understand the essay writing process step by step ($M = 4.28$, $SD = 0.80$) and that the instructions are easy to follow ($M = 4.20$, $SD = 0.68$).

Colour-coding

ITEM	M	SD
CCCQ4The colour coding in the EssayMadeEasy template helps me identify different parts of the essay easily.	4.42	0.78
CCCQ5The colour coding makes the essay structure clearer for me to understand	4.41	0.76
CCCQ6The different colours in the EssayMadeEasy template help me organize my ideas better.	4.32	0.79

The findings show that students responded positively to the use of colour coding in the EssayMadeEasy template. The highest mean score was for the statement that colour coding helps students identify different parts of the essay easily ($M = 4.42$, $SD = 0.78$). Students also agreed that colour coding makes the essay structure clearer to understand ($M = 4.41$, $SD = 0.76$) and helps them organize their ideas better ($M = 4.32$, $SD = 0.79$).

Findings for Peer Comments

This section presents data to answer research question 3: How do learners perceive the learning through peer comments? In the context of this study, this is measured by (a) peer comments, and (b) evaluative review.

Peer Comments

ITEM	M	SD
DPRQ1Peer comments help me improve my essay writing.	4.18	0.76
DPRQ2I can understand my mistakes better through peer comments.	4.52	0.67
DPRQ3Receiving peer comments helps me write my essay more clearly.	4.11	0.78

The findings indicate that students perceived peer comments positively in improving their academic writing. The highest mean score was for the statement that peer comments help students understand their mistakes better ($M = 4.52$, $SD = 0.67$). Students also agreed that peer comments improve their essay writing ($M = 4.18$, $SD = 0.76$) and help them write more clearly ($M = 4.11$, $SD = 0.78$). These results show the importance of peer feedback in enhancing writing skills.

Evaluative Review

ITEM	M	SD
DPRQ4The evaluative review in the EssayMadeEasy template helps me identify my weaknesses in essay writing.	4.30	0.72
DPRQ5The evaluative review helps me improve the quality of my essay.	4.28	0.72
DPRQ6The evaluative review gives useful feedback on my essay writing.	4.23	0.67

The findings show that students responded positively to the evaluative review in the EssayMadeEasy template. The highest mean score was for the statement that the evaluative review helps students identify their weaknesses in essay writing ($M = 4.30$, $SD = 0.72$). Students also agreed that the evaluative review improves the quality of their essays ($M = 4.28$, $SD = 0.72$) and provides useful feedback on their writing ($M = 4.23$, $SD = 0.67$).

CONCLUSION

Summary of Findings and Discussions

Academic writing is an important skill in higher education because it enables students to communicate ideas, construct arguments, and present knowledge in a clear and organized manner. However, many ESL students experience difficulties in academic writing, particularly in organizing ideas and developing proper essay structure. Studies by Aldayel et al. (2026), Pratiwi (2026), and Jimenez et al. (2024) revealed that students often struggle with arranging ideas logically, writing coherent paragraphs, and producing effective introductions and conclusions. These challenges are commonly influenced by limited vocabulary, grammar difficulties, lack of confidence, and weak understanding of academic writing conventions. As academic writing requires learners to process multiple forms of information simultaneously, students may experience cognitive overload, which further affects their ability to produce well-structured essays.

Implications and Suggestions for future research

To address these issues, various writing strategies have been introduced to support students' essay writing development. Past studies by Anyau et al. (2024), Indira (2025), and Subandowo et al. (2025) emphasized the importance of structured writing strategies, peer feedback, revision, and guided learning processes in improving academic writing performance. In line with these studies, EssayNavigator is designed to support ESL students through step-by-step instructions, colour coding, peer comments, and evaluative review. The use of scaffolding, dual coding, social constructivism, and self-regulation theories provides theoretical support for these strategies in facilitating academic writing development.

Although many studies have examined academic writing difficulties and writing strategies separately, limited research has focused on integrating step-by-step instruction, colour coding, peer comments, and evaluative review into a single academic writing template for ESL learners. Furthermore, there is limited research exploring students' perceptions of the effectiveness of such integrated strategies in supporting essay writing development. Therefore, this study aims to investigate the effectiveness of EssayNavigator in supporting ESL students' essay writing development and to examine learners' perceptions of academic writing difficulties, essay structure learning, and peer review activities.

REFERENCES

1. Ahmad, N., Alias, F. A., Hamat, M., & Mohamed, S. A. (2024). Reliability analysis: Application of Cronbach's alpha in research instruments. *SIG: e-Learning@CS*, 114–119. <https://appspenang.uitm.edu.my/sigcs/>
2. Aldayel, H. S., Pravitasari, H., & Fadillah, N. (2026). Factors affecting academic writing difficulties among English as a foreign language (EFL) university students. *Acta Psychologica*, 263, 106250. <https://doi.org/10.1016/j.actpsy.2026.106250>
3. Anyau, E., Habali, A. H. M., Abd Aziz, A. B., Rahmat, N. H., et al. (2024). A study of the use of strategies in ESL academic writing. *International Journal of Academic Research in Business and Social Sciences*, 14(5). <https://doi.org/10.6007/IJARBS/v14-i5/21344>
4. Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50(2), 248–287. [https://doi.org/10.1016/0749-5978\(91\)90022-L](https://doi.org/10.1016/0749-5978(91)90022-L)
5. He, L. (2024). The application of SPSS correlation analysis in the study of precision teaching of English in universities. *Applied Mathematics and Nonlinear Science*, 9(1), 1–13. <http://dx.doi.org/10.2478/amns-2024-1371>

6. Indira, A., Musdalifah, Rosmiana, S., & Asbar. (2025). Writing strategies used by high-achieving students in academic writing. *Jurnal Onoma: Pendidikan, Bahasa dan Sastra*, 11(2), 1551–1562. <https://doi.org/10.30605/onoma.v11i2.4435>
7. Jimenez, M. M. D., Comison, L. J. M., Dionio, B. B., Clarin, A. S., & Vallejo, J. H. (2024). Challenges encountered by college students in academic writing. *International Journal of Research and Innovation in Social Science*, 8(3), 1440–1451. <https://doi.org/10.47772/IJRISS.2024.803106>
8. Paivio, A. (1986). *Mental representations: A dual coding approach*. Oxford University Press.
9. Pratiwi, N. M. S. (2026). The struggle to write: Understanding and overcoming academic writing challenges in higher education. *Pubmedia Jurnal Pendidikan Bahasa Inggris*, 3(2), 1–11. <https://www.researchgate.net/publication/404971453>
10. Subandowo, D., Sárdi, C., & Thresia, F. (2025). An investigation of English academic writing strategies employed by Indonesian graduate students in an English medium instruction (EMI) context. *Asian-Pacific Journal of Second and Foreign Language Education*, 10(1), Article 38. <https://doi.org/10.1186/s40862-025-00345-w>
11. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257–285.
12. Vetter, T. R. (2017). Descriptive statistics: Reporting the answers to the 5 basic questions of who, what, why, when, where, and a sixth, so what? *Anesthesia & Analgesia*, 125(5), 1797–1802. <https://doi.org/10.1213/ANE.0000000000002471>
13. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
14. Ziegenfuss, J. Y., Casey, A. E., Jennifer, M. D., Meghan, M. J., Thomas, E. K., & Marna, C. (2021). Impact of demographic survey questions on response rate and measurement: A randomized experiment. *Survey Practice*, 14(1). <https://doi.org/10.29115/SP-2021-0010>