The Influence of Cluster Mind Map on ESL University Students' Writing Skills

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ABSTRACT

In academic writing, harnessing creativity and effectively organizing thoughts are pivotal for producing coherent content. Cluster mind mapping is a useful tool that can aid students' writing skills from the beginning such as drafting to the final stages of writing. Therefore, this research investigates to what extent planning, brainstorming, and idea matching can influence students' writing. This research specifically examines the application of the cluster mind map in student's academic writing. This study involves a total of 60 participants from the institutions of higher education in the state of Perlis. A quantitative research approach was employed to evaluate the effectiveness of Cluster Mind Map using inferential statistics through Statistical Package for Social Sciences (SPSS). The findings of the study highlight that effective planning, brainstorming, and idea generation were the key categories that significantly influenced students' writing performance in a cluster mind map. This study also points out that cluster mind map acts as a valuable resource for educators seeking to improve students' academic writing and seeking to enhance students' learning outcomes. It is useful in aiding English language practitioners in equipping students with metacognitive processing skills particularly in the area of academic writing.

Keywords: *academic writing, brainstorming, cluster mind map, pre-writing, writing skills*

INTRODUCTION

Writing is often understood to be the expression of thoughts, ideas, and concepts through defined symbols that provide meaning in writing pieces (Karim et al., 2016). The exponential growth of knowledge in our digital society and the massive amounts of information that students must analyze and learn independently present ongoing challenges, particularly in writing. Academic writing is a crucial factor in success in higher education, with graduation requirements regularly involving students employing their academic writing abilities to produce well thought written assignments, reports, and documents. This form of writing requires students to expand their thoughts while incorporating

resources from reliable sources and justifying opinions to develop a coherent academic text. To adequately prepare students for the twenty-first century, the Malaysian Education Blueprint 2013-2025 has identified several crucial aspects, including creativity, critical thinking, and abilities in cooperation and communication. Thinking critically and creatively are important skills for the future workplace, making problem-based learning equally essential in this era of digital transformation. Mastering academic writing in English is one of the most essential skills for students' academic success (Akhtar et al., 2019; Karim et al., 2016; Singh, 2015). As such, this paper examines the impact of strategic planning, brainstorming, and the alignment of ideas on students' academic writing.

Students of English as Second Language (ESL) often face difficulties in developing and sequencing their ideas (Abbas & Herdi, 2018). One of the main challenges is a lack of content, as students find it challenging to organize and convey their thoughts coherently. This can result in poorly developed content due to inconsistencies and lack of cohesion in the area of writing. Malaysian students, in particular, struggle with exams when they are required to write using English in the writing component (Azman, 2016). Many national stakeholders have voiced concerns about this issue (Li & Razali, 2019), citing reasons such as cognitive difficulties and limited English language proficiency as factors that contribute to the above mentioned. These challenges hinder students' to understand, conceptualize, and articulate their ideas effectively when it comes to writing (Ghulamuddin et al., 2021).

Therefore, by utilizing a cluster mind map, it can actively engage students in productive thinking when writing in English. This method facilitates the establishment of relationships and associations between words, allowing students to expand their ideas and achieve a deeper comprehension of the articles read (Sudirman, 2023). According to Buzan (1993), a cluster mind map serves as a technique for organizing ideas related to a specific topic and identifying the connections between them (Buzan, 1993). Despite its potential benefits, the impact of the cluster mind map on students' ability to generate and organize ideas, remains underexplored. This study aims to investigate the influence of the cluster mind map on students' abilities to plan, brainstorm, and generate ideas in the context of academic writing. The findings of this research are intended to assist educators and educational planners in equipping students with a tool that would empower students to write effectively.

LITERATURE REVIEW

The popularity of visual thinking tools, such as the cluster mind map, is known to enhance students' comprehension skills. The cluster mind map provides a graphical representation of knowledge, enabling students to connect similar ideas, studies, and disagreements. This method allows students to make connections with minimal concern for errors when expressing their opinions after reading a piece of content. The mind map is increasingly used in instructional practice, often illustrated through various images and pictures (Abbas et al., 2018). Consequently, a cluster mind map, through its graphical portrayal, aids students in grasping and linking ideas to develop their writing. Given these characteristics, the cluster mind map has been acknowledged as a compelling visual tool for enhancing students' writing skills. This study aims to explore how a cluster mind map improves students' academic writing performance. By using such a mind map, students can organize their observations from readings, identify key ideas, and evaluate their writing (Sudirman, 2022). This approach enables learners to maintain the complexity of their viewpoints and refine their writing skills (Bae et al., 2020). This study employs Buzan's (1993) mind map technique to assist students in expressing their ideas both verbally and visually. The mind map is effective in developing and refining visual abilities and eye coordination. With practice, students can enhance their ability to create images, thereby elevating their mind map to a higher level of artistic excellence (Buzan, 1993).

Metacognitive skills are crucial for teaching students to generate and link ideas, particularly in writing, as these skills involve monitoring cognitive processes such as planning, observing, and assessing the learning process. Employing learning techniques that practice metacognitive skills can boost students' curiosity about learning independently and aid in knowledge acquisition. Metacognitive activities,

which involve thinking about thinking, include planning, predicting, reflecting, and evaluating actions accomplished (Karim et al., 2020). Training students in these skills is essential as they contribute to cognitive learning outcomes and overall learning success. Most writing assignments require students to read and skim articles to develop an understanding of the topic. However, students often lack the ability to establish and link ideas in their writing. Writing is a complex process that involves more than merely grouping linguistic units together. It entails extensive preparation, conceptualization, rewriting, and editing. The mind map can help students organize their thoughts before writing.

The writing process includes several stages, the first of which is the prewriting stage. During this stage, students can be provided with examples to assist them in creating a step-by-step hierarchy to remember concepts. This enables them to explore ideas and develop thoughts on the writing topic. Integrating mind-mapping techniques at this stage is beneficial as it allows students to connect visuals to concepts, fostering creative associations that encourage thinking rather than memorization. Studies have shown that students who visualize what they are learning retain information 40% better than those who rely solely on verbal learning (Adam and Mowers, 2007). According to McGriff (2007), a mind map is regarded as a potent tool that can assist students in overcoming issues related to organizing their ideas and thoughts. In other words, it is a valuable aid for helping learners organize knowledge, empowering them to better understand key concepts and principles in lectures, readings, or other instructional materials (McGriff, 2007). As such, Figure 1 below delineates the domains of planning, brainstorming and idea matching as independent variables and academic writing as dependent variable of this study
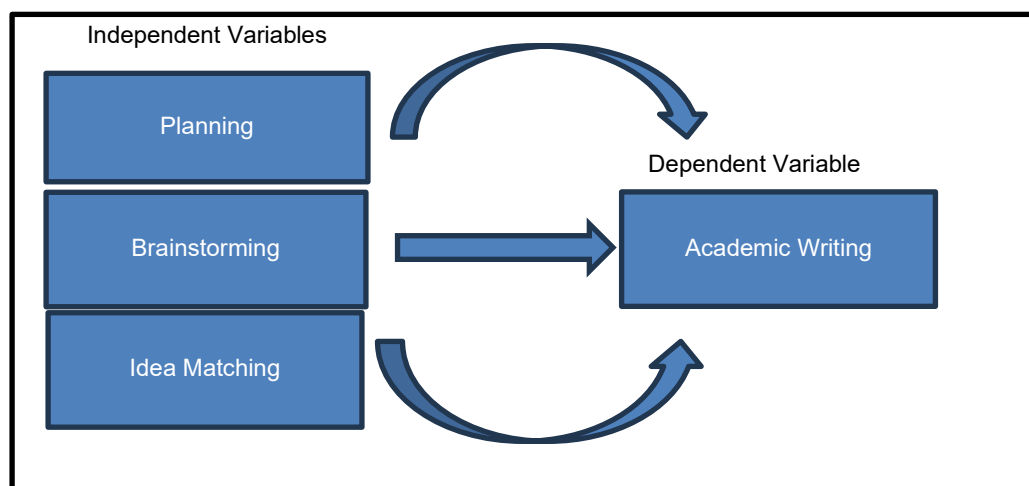

Figure 1: Conceptual Framework

Past Year Studies

Nurul and Syahban's (2020) research at Tomakaka University of Mamuju found that second-semester students were motivated to write using the mind-mapping approach. Similarly, Sapitri (2019) asserted that mind mapping not only motivates students to write but also increases their interest in the teaching and learning process. This demonstrates that using mind mapping, where students write based on the ideas they discover from their mind map, can inspire them to write better (Sapitri, 2019).Fahd and Arif (2021) reported that pre-test survey results showed English Foreign Language (EFL) students found it difficult to generate ideas and organizing these ideas under sub-topics (Fahd and Arif, 2021). However, with the integration of the online mind mapping tool XMind, students found the branches such as note-taking, pictures, and coloring options effective in helping them connect ideas and draw on their prior knowledge. Bukhari (2016) found that using a mind map during the pre-writing phase enabled students to create linked and more effectively connected concepts, organizing their ideas in a

hierarchical structure (Bukhari, 2016). Cluster mind map writing involves brainstorming and organizing ideas in a visual format, allowing students to make connections between different concepts and produce a more cohesive and structured piece of writing. Recent studies have highlighted the effectiveness of cluster mind map writing in enhancing ESL students' writing skills (Smith, 2020; Johnson et al., 2021).

Writing effectively shows how major and minor concepts are connected to the main theme, creating a seamless overall framework. This hierarchical framework facilitated the learners' progress in forming ideas and supporting details. Conversely, the control group in Bukhari's study showed no significant difference between their pre-test and post-test scores, indicating a lack of proficiency in producing a coherent writing structure. Zheng et al. (2020) stated that mind mapping stimulates cognition by demonstrating how thoughts are created around a central theme and the connections between ideas (Zheng et al., 2020). Therefore, mind mapping aids students in structuring their thoughts and developing their organizational creativity, boosting critical thinking and confidence when integrated in writing exercises. These studies found that using the cluster mind map not only improves the organization and coherence of students' writing but also helps them develop a deeper understanding of the content. Despite the demonstrated benefits of cluster mind mapping on ESL students' writing skills, there is a notable gap in the literature regarding its long-term impact and effectiveness among public university undergraduate students. Existing studies have primarily focused on specific contexts and short-term outcomes, with limited attention to the educational environments of public universities. Addressing these gaps can enhance our understanding of how cluster mind mapping can be optimally utilized to improve the writing skills of ESL university students in public institutions particularly in academic writing.

METHODOLOGY

This section outlines the research design, data collection methods, and sampling procedures employed in the study. The study utilizes a quantitative approach to investigate the influence of the cluster mind map on academic writing.

Sampling and Sample Size

The study employed a convenience sampling method, targeting undergraduate students from various programs at public universities in the state of Perlis, Malaysia. Participants were recruited through direct email invitations, ensuring equal access to the survey link and ample time to complete the questionnaire. A total of 60 undergraduate students participated in the study, including 24 male and 34 female students from programs in computer science, mathematics, and applied sciences.

Instrumentation

This study adopted a survey methodology for data collection. Questionnaires were distributed to the participants via a Google Form link. The questionnaire comprised demographic information such as gender, age, state, and program of study. Key sections of the questionnaire aimed to measure the domains of cluster mind mapping, particularly focusing on the aspects of a) Planning b) Brainstorming c) Idea matching. Each item within these domains was measured using a five-point Likert scale, ranging from Strongly Disagree to Strongly Agree. As demonstrated in research by Weijters, Millet, and Cabooter (2021), a Likert scale with five items is a reliable method for scaling opinions, behaviors, and attitudes.

The questionnaire was developed based on existing literature and validated scales. It underwent pre-testing with a small sample of students not included in the main study to ensure clarity and relevance. Feedback from the pre-test was used to refine the questionnaire before full-scale distribution.

Pilot testing also helped identify ambiguities or issues, allowing for necessary adjustments. Table 1 presents the reliability analysis of the variables.

Table 1: Reliability Analysis

Variables	Cronbach Alpha	Accepted/Rejected
Planning	0.932	Accepted
Brainstorming	0.959	Accepted
Idea Matching	0.926	Accepted
Academic writing	0.890	Accepted

Cronbach alpha was used to determine the internal consistency of the questionnaire items. Alpha values range between 0 and 1; higher values indicate that the questionnaire items reliably measure the intended constructs. The composite reliability of all items should exceed 0.70 to be considered reliable (Hair et al., 2014). As shown in Table 1, the composite reliability of the independent variables is greater than 0.8, indicating acceptable reliability. To ensure the validity of the instrument, content validity was established through expert review, and construct validity was assessed using exploratory factor analysis. These steps ensured that the questionnaire accurately captured the constructs of interest and provided reliable data for analysis.

Data Analysis

The data collected in this study will be analyzed using SPSS version 28. Descriptive and inferential statistical analyses will be conducted to examine the data, in line with the quantitative research approach.

Potential Biases

Potential biases in this study include selection bias. This was mitigated by using a convenience sampling method and ensuring the inclusion of participants from diverse programs.

Ethical Considerations

Ethical considerations were carefully addressed in this study. Participants were provided with detailed information about the study's purpose, procedures, and their rights, including the right to withdraw at any time without penalty. Informed consent was obtained from all participants before they completed the questionnaire.

RESULT AND DISCUSSION

This section delves into the findings of the study and interprets their implications for understanding the influence of Cluster Mind Maps on various aspects of academic writing among ESL students. The analysis focuses on three key components: Planning, Brainstorming, and Idea Matching, and their relationship with students' overall writing performance. The subsequent correlation and regression analyses provide quantitative insights into how these elements interact and contribute to the improvement of academic writing skills.

The Pearson Correlation Analysis

Based on Table 2 as shown below, the correlation results of this study offer valuable information on the impact of cluster mind map on the various aspects of writing, specifically focusing on planning, brainstorming, and idea matching.

Table 2: Correlation Test Result between Academic Writing, Planning, Brainstorming and Idea Matching

		Planning	Brainstorming	Idea_Matching	Academic Writing
Planning	Pearson Correlation	1	.753**	.796**	.689**
	Sig. (2-tailed)		.000	.000	.000
	N	60	60	60	60
Brainstorming	Pearson Correlation	.753**	1	.775**	.709**
	Sig. (2-tailed)	.000		.000	.000
	N	60	60	60	60
Idea_Matching	Pearson Correlation	.796**	.775**	1	.860**
	Sig. (2-tailed)	.000	.000		.000
	N	60	60	60	60
Academic_writing	Pearson Correlation	.689**	.709**	.860**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	60	60	60	60
**. Correlation is significant at the 0.01 level (2-tailed).					

The Pearson correlation analysis reveals significant positive relationships between Planning, Brainstorming, Idea Matching, and Academic Writing performance as shown in Table 2. According to the scale used in this study, an R-value below 0.3 is considered weak, 0.3 to 0.5 is moderate, 0.5 to 0.7 is strong, and above 0.7 is very strong. In this study, all R-values exceed 0.5, indicating strong to very strong correlations among the variables. Specifically, the correlation coefficient between Planning and Academic Writing is .689 ($p < .001$), suggesting that effective planning significantly enhances students' writing skills by providing a clear structure and direction.

The correlation coefficient between Brainstorming and Academic Writing is .709 ($p < .001$), indicating that brainstorming sessions play a crucial role in improving writing performance among ESL students by fostering creative thinking and generating diverse ideas. Furthermore, the correlation coefficient between Idea Matching and Academic Writing is .860 ($p < .001$), highlighting it as the most influential factor in this study. This suggests that idea matching, which involves aligning and integrating various concepts coherently, is critical for enhancing writing skills and ensuring the logical flow of arguments in academic work. These findings underscore the importance of strategic planning, creative brainstorming, and effective idea matching in improving the academic writing performance of students.

Overall, the results indicate that the use of cluster mind maps significantly benefits ESL university students' writing skills. Planning, brainstorming, and idea matching are all strongly correlated with academic writing performance. Idea matching, in particular, demonstrates the strongest influence, underscoring its importance in the writing process.

The ANOVA and post hoc tests were not performed as one group has fewer than two cases. The reason for the error is that only one dependent variable is available in this case, and therefore the required information is already obtainable from the SPSS output without performing an additional post-hoc test.

Multiple Regression Analysis

A multiple regression analysis was conducted to determine the extent to which Planning, Brainstorming, and Idea Matching predict Academic Writing performance. The regression model produced significant results as shown in Table 3 below.

Table 3: Results of Multiple Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	242.558	3	80.853	54.447	.000[b]
	Residual	83.159	56	1.485		
	Total	325.717	59			
a. Dependent Variable: Academic_writing						
b. Predictors: (Constant), Idea_Matching, Brainstorming, Planning						

The regression equation produced from the data collected is $F_{(3,56)} = 54.447$, $p < .05$ (0001), with $R^2 = .731$ as shown in Table 3. Idea matching, brainstorming, and planning aspects where these predictions are equal to 1.268 + (- 0.035)+ 0.111+0.860. The results of the analysis indicated that planning, brainstorming, and idea matching significantly influence about 73% of students' academic writing performance.

Based on the findings from various studies, the cluster mind map emerges as a crucial tool in academic settings for effectively structuring and retaining information. It not only aids in organizing thoughts and fostering creativity but also enhances students' metacognitive skills (Astriani et al., 2020). Key elements such as planning, brainstorming, and idea matching play pivotal roles in predicting students' success in academic writing, facilitated by the cluster mind map's ability to organize and develop coherent arguments. Research by Stokhof et al. (2020) supports these benefits, showing that mind mapping facilitates a comprehensive understanding of key ideas within a topic, while also improving creativity, organization, productivity, and memory (Stokhof et al., 2020). The structured format of the cluster mind map makes information easy to recall and quick to review, contributing significantly to students' retention (He et al., 2023).

However, educators play a pivotal role in teaching the cluster mind map technique to students, facilitating effective organization and visualization of ideas in writing. By leveraging mind mapping in English teaching, educators enhance students' listening, speaking, reading, and writing abilities, while also fostering their interest in learning and cultivating autonomous learning skills (Chen, 2023). Educators can guide students by first introducing and explaining the purpose of cluster mind maps. They should then demonstrate how to create these maps, provide structured practice sessions, offer constructive feedback, and emphasize the integration of mind maps into the writing process. This systematic approach not only enhances students' idea generation and planning skills but also fosters a deeper engagement with the material, thereby promoting comprehensive learning outcomes (Rusdin & Tabise, 2020).

CONCLUSION

The cluster mind map emerges as a vital tool for enhancing ESL university students' writing skills through effective planning, brainstorming, and idea matching. This study highlights strong positive correlations between these aspects and students' academic writing performance, emphasizing the cluster mind map's role in organizing and structuring ideas. By integrating mind mapping techniques into educational practices, educators can significantly improve students' ability to generate and articulate coherent arguments. The findings underscore the importance of educators in teaching and implementing the cluster mind map technique, guiding students toward enhanced writing proficiency and fostering autonomous learning skills.

Looking ahead, as educational landscapes continue to evolve, visual tools like the cluster mind map will become increasingly essential in equipping students with the necessary skills for academic success

and beyond. Future research should further explore the long-term impacts of cluster mind mapping on ESL students' writing skills across diverse educational settings. By continuing to refine and integrate these methods into teaching practices, educators can better prepare students to navigate and excel in complex academic and professional environments.

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AUTHORS' CONTRIBUTION

Ganasan, M. led the study and was responsible for the planning of the study and Muhammad Iqbal worked on the data analysis. Suparmane, T., Weicong, Li, and Gazi, A. worked on the preparation of the report writing. All authors provided critical feedback and helped shape the research, analysis, and manuscript.

CONFLICT OF INTEREST DECLARATION

We certify that the article is the Authors' and Co-Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication nor has it been published in whole or in part elsewhere. We testify to the fact that all Authors have contributed significantly to the work, validity, and legitimacy of the data and its interpretation for submission to Jurnal Intelek.

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