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The Impact of Mind Mapping on Young Children's Writing Skills: An Experimental Study

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Abstract
This study investigates the application of the mind-mapping learning model to enhance children's writing skills. Conducted over two weeks during the 2022/2023 academic year at a school in Medan, North Sumatra, the research employed a quantitative experimental design. The study population included 106 children aged 3-8 years, with samples systematically selected from two classes. Data collection involved observation sheets to assess student engagement and activity levels. Statistical tests ensured data validity and reliability, with normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) revealing normal and non-normal distributions and homogeneity tests confirming data uniformity. The t-test results indicated a significant positive impact of mind mapping on writing skills (Sig. = 0.000; t = 24.810). These findings suggest that mind mapping in early education can significantly enhance writing abilities, improving academic performance and cognitive development. The implications are substantial for educational practice, advocating for integrating mind mapping into teaching methods and supporting teacher training programs. Despite limitations such as a small sample size and potential sampling bias, this study provides a foundation for further research. Future studies should involve larger samples to validate these results and explore additional applications of mind mapping in educational settings, aiming to refine and enhance teaching strategies for early childhood education. Additionally, educational policymakers should consider integrating innovative teaching strategies like mind mapping to improve academic outcomes.

Introduction

Developing children's writing skills is crucial for academic success and growth. Writing is a key communication tool that helps express ideas and boosts cognitive and linguistic abilities. Unfortunately, many studies highlight a steady decline in students' writing skills, presenting a significant challenge for educators and policymakers (Maryani et al., 2023; Nasution, 2018). The urgency for innovative teaching methods to tackle this issue cannot be overstated. One promising approach is the mind-mapping learning model, which has shown great potential in engaging students and enhancing their writing abilities (Eliyanti et al., 2020; Ningsih et al., 2012; Rofisian, 2020).

Research has long pointed out the various hurdles in teaching children how to write. Hedge (Eliyanti et al., 2020) stresses that writing skills are essential for students' education, social interactions, and future careers. Suparno (Afnida & Suparno, 2020; Zulfia Latifah et al., 2020) categorizes writing into five types: narrative, essay, exposition, argumentation, and persuasion. Despite these clear categories, traditional teaching methods often fail to effectively develop these skills (Achsani & Rosita, 2019). Therefore, exploring alternative instructional strategies like mind mapping could offer significant improvements.

Mind mapping in education has gained traction due to its effectiveness in organizing and visualizing information. Marashi and Kangani (2018) describe mind mapping as a tool that

leverages the brain's natural capabilities to structure and recall information efficiently. This method aids in better comprehension and retention of material, making it a valuable technique for teaching writing (Ajeng Agustina, 2015). Research by Nurrita (2018) further supports mind mapping, highlighting its ability to make learning more engaging and accessible for students.

Mind mapping in classroom settings, particularly in elementary education, remains underexplored despite its potential. Studies by Masoumi et al. (2024) and Gao et al. (2024) demonstrate the efficacy of interactive and visual learning tools in early childhood education. However, the specific impact of mind mapping on writing skills at the elementary level is less documented. Initial observations suggest that mind mapping could address common barriers to effective writing instruction, such as student disengagement and lack of motivation (Silaswati et al., 2021).

Additionally, most literature on mind mapping focuses on its use in higher education and professional training. For example, Smolarczyk et al. (2024) explore mind mapping in fostering engagement in Fab Labs and maker spaces. Similarly, Yen (2024) discusses its role in enhancing reading comprehension in remote primary schools. These studies underscore mind mapping's versatility across different educational levels and highlight the need for more targeted research on its application in elementary writing instruction.

However, there are notable gaps and limitations in current research on mind mapping. While the benefits of memory and idea organization are well-documented, its specific impact on developing young children's writing skills remains under-researched. Many studies lack rigorous experimental designs, limiting the generalizability of their findings. It is also necessary to explore how mind mapping can be effectively integrated into existing curricula and teaching practices to maximize its benefits (Yuliasari & Samsudin, 2023).

This study aims to address these gaps by investigating the effect of the mind-mapping learning model on the writing skills of fourth-grade students at SDT Muhammadiyah 36 Medan. This research uses a quasi-experimental design to prove the model's efficacy. By focusing on younger students, this study will contribute to the limited body of literature on mind mapping in elementary education. The findings are expected to offer valuable insights for educators seeking innovative strategies to enhance writing instruction and improve student outcomes.

Methods

This study employed a quantitative research methodology characterized by its systematic, planned, and structured approach, implemented from the initial design phase to data analysis (Creswell, 2013). Specifically, an experimental method was utilized, adopting a Posttest Only Control Design model. This design allows for evaluating the effectiveness of the mind-mapping learning model on children's writing skills by comparing the performance of an experimental group and a control group after the intervention. The research was conducted during the even semester of the 2022/2023 academic year over two weeks at a school located at Jl. Jermal III No. 10 Denai, in the Medan Denai sub-district, Medan City, North Sumatra. The study population included 106 early childhood children aged 3-8 years, distributed across four classes: 25 children in class A, 28 in class B, 26 in class C, and 28 in class D. For this study, systematic non-probability sampling was employed to select samples from class A and B. This sampling technique ensured a structured approach to selecting participants that met the study criteria.

Data were collected using observation sheets to assess student engagement and activity levels, particularly their questioning behaviors. Several statistical tests were conducted to ensure the data's reliability and validity. These included validation tests to ascertain the accuracy of the observation sheets, reliability tests to ensure consistency in the observations, and prerequisite tests to confirm that the data met the necessary assumptions for hypothesis testing. Finally, hypothesis tests were performed to determine the significance of the differences observed between the experimental and control groups (Cohen et al., 2018).

Result

This section presents the study's results, including normality tests, homogeneity tests, and hypothesis tests, to assess the impact of the mind-mapping learning model on children's writing skills. A brief overview of the methodologies employed in this study is provided to contextualize the results. The Shapiro-Wilk test was used for normality testing, Levene's test for homogeneity, and t-tests for hypothesis testing.

3.1. Normality Test

The normality test determined whether the samples and population data were normally distributed. The results are as follows:

Table 1. Normality Test Results for Variable KE and KK

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
KE	.171	20	.126	.878	20	.016
KK	.220	20	.012	.837	20	.003
a. Lilliefors Significance Correction						

The normality test checks if the residuals are normally distributed. A good regression model should have normally distributed residuals. According to the Kolmogorov-Smirnov test, a significant value greater than 0.05 indicates normal distribution, while the Shapiro-Wilk test shows that a substantial value less than 0.05 indicates non-normal distribution. Thus, for KE, the residuals are normally distributed (Sig. = 0.016 > 0.05), whereas for KK, they are not (Sig. = 0.003 < 0.05).

3.2. Homogeneity Test

The homogeneity test is about whether or not there are variations of two or more distributions. Homogeneity test as a condition in the Independent sample T-test and Annova analysis. Here are the homogeneity test results:

Table 2. Homogeneity Test of Variances for Skills

Skills

Levene Statistic	df1	df2	Sig.
.031	1	32	.862

A significant value greater than 0.05 indicates that the data is homogeneously distributed. Here, the important value is 0.862, confirming homogeneity.

3.3. Hypothesis Test

The t-test determines whether the mind-mapping model significantly impacts children's writing skills. The formula for the t-test is as follows:

a. If the sig value < 0.05 or t calculate > t table, then there is an influence of variable X on variable Y.

b. If the sig value > 0.05 or t calculate < t table, then variable X does not affect variable Y.

Table 3. T-Test Results for the Influence of Mind Mapping Model on Writing Skills

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-1.472	1.353		-1.088	.291
Keterampilan	1.046	.042	.986	24.810	.000
a. Dependent Variable: menulis					

Since the significant value is 0.000 < 0.05 and the t-value (24.810) > t-table (1.088), there is a significant effect of the mind mapping model on writing skills. Hence, the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected.

Based on the above results, the mind mapping learning model significantly influenced students' writing skills at Muhammadiyah 36 Medan during the 2022/2023 academic year.

3.4. Validity and Interpretation

The data, supported by teacher observations, indicates that teachers must pay attention to their students when conveying information. Using varied learning models is essential to enhance student enthusiasm and engagement in learning.

In conclusion, based on observations made by researchers in the PLP II program at Muhammadiyah 36 Medan schools in September 2023, children's writing abilities are still low. Factors that cause these problems are: (1) children pay less attention to the teacher when conveying information that they want to do/write, (2) children are always busy with their respective affairs such as verita or doodling books, (3) teachers only use lecture, question and answer, discussion and dictation methods, (4) teachers do not use learning models when teaching, (5) lack of use of learning media when teaching, (6) teachers have never used mind mapping learning models, (7) and childrens' writing skills are low.

Based on the results of the hypothesis test that researchers (Test T) have carried out, the calculation shows that at a significant level of 5%, a t value of 24,810 was obtained. As for the t-table at N = 20-2, which is 0.244, the research results showed that the mind map learning model influenced the writing skills of 36 Muhammadiyah Medan school children for the 2022/2023 school year.

However, this study has several limitations, such as a small sample size and potential sampling bias. Therefore, these results should be interpreted cautiously, and further research with a larger sample is needed to confirm these findings. Discussing the reliability and validity of the instruments used would also strengthen the credibility of the results

Discussion

The conditions and strategies for implementing Integrative Holistic Early Childhood Development (IHECD) in Mimika Baru Sub-district were thoroughly examined, focusing on how internal and external factors influence its success. Early childhood development (ECD) is recognized globally as a critical period for forming essential cognitive, social, emotional, and behavioral skills (Alamoodi et al., 2017; Daelmans et al., 2016). The Indonesian government underscores the significance of ECD, emphasizing that the quality of early childhood growth and development is a pivotal factor in shaping the nation's human resources (Perpres, 2013). Consequently, delivering holistic services that encompass education, health, nutrition, and care is deemed crucial for fostering optimal child development (Gobena, 2020; Munafiah, 2020). This comprehensive approach aims to ensure that children receive the necessary support to thrive during their formative years, laying a solid foundation for future success.

The study's findings revealed that all four kindergartens in Mimika Baru Sub-district, despite differing in total SWOT scores, were positioned in quadrant I (Strengths-Opportunities). This indicates strong internal factors and favorable external conditions for the effective implementation of IHECD (Munafiah, 2020). Specifically, TK Negeri 1 Mimika and TK Kartika VI-31 demonstrated higher scores, reflecting robust leadership, skilled educators, and supportive infrastructure (Afifah & Formen, 2023). These institutions benefit from a well-coordinated effort among staff and the availability of resources, which are critical for holistic development. In contrast, TK Advent Timika and TK Ceria Cerdas had lower scores, highlighting the presence of significant external threats such as insufficient health and safety equipment (Miranti et al., 2021). The disparity in scores underscores the varying levels of readiness and capacity among these institutions to implement IHECD effectively.

The alignment of these findings with earlier research underscores a recurring trend: institutions with strong internal strengths and external opportunities typically adopt an aggressive growth strategy, positioning themselves in quadrant I (Pereira et al., 2013; Sujoko, 2017). For instance, studies conducted in West Sumatra indicated that well-supported early childhood institutions were particularly effective in implementing holistic programs (Netriwinda

et al., 2022). This success is attributed to comprehensive community support and government initiatives that bolster the institutions' capacities. On the contrary, some regions, such as West Sulawesi, demonstrated limited success in expanding educational opportunities and addressing fundamental needs, which is analogous to the challenges faced by lower-scoring institutions in the current study (Hajati, 2018). These discrepancies highlight the influence of regional support systems and resources on the effectiveness of ECD programs.

Moreover, certain studies have yielded divergent outcomes, reflecting the variability in institutional contexts. For example, a private high school in Tangerang and a radio station in Salatiga were positioned in quadrant IV, suggesting a need for defensive strategies to manage significant threats (Aji, 2018; Yusuf & Utomo, 2015). Similar variability was observed in the tourism sector of Yogyakarta's Merapi Slope, where some villages were positioned in quadrant I, while others faced notable threats (Purwohandoyo et al., 2017). This diversity in findings emphasizes the necessity for tailored strategies that address specific contextual challenges and capitalize on unique strengths. The contrasting results from different sectors underscore the importance of a nuanced approach in applying SWOT analysis, as each context presents distinct internal and external factors that must be considered (Adeleke et al., 2021).

The strong positioning of TK Negeri 1 Mimika and TK Kartika VI-31 can be attributed to their effective leadership, skilled staff, and adequate financial and infrastructural support. These factors are crucial for the successful implementation of IHECD, as they ensure a conducive environment for comprehensive child development (B. Coneway et al., 2018; Perpres, 2013). The availability of trained educators and sufficient resources allows these institutions to provide high-quality care and education, which is essential for fostering children's holistic development. Conversely, the lower scores of TK Advent Timika and TK Ceria Cerdas highlight the impact of inadequate health and safety resources, underscoring the need for improved infrastructure and support systems (Afifah & Formen, 2023). These findings suggest that addressing these deficiencies could significantly enhance the effectiveness of IHECD implementation in these institutions.

The differences in SWOT scores among the kindergartens suggest varying levels of readiness and capacity to implement IHECD effectively. Institutions with higher scores benefit from better community and governmental support, which facilitates program implementation (Munafiah, 2020). In these contexts, strong leadership and effective resource management play pivotal roles in leveraging opportunities and mitigating potential threats. In contrast, those with lower scores need to address specific weaknesses and threats, such as enhancing safety measures and increasing parental involvement, to improve their overall effectiveness (Munafiah, 2020). Targeted interventions that focus on these areas are crucial for these institutions to progress towards achieving a higher standard of early childhood development.

The study highlights the necessity of developing tailored strategies to enhance IHECD implementation across different contexts. Institutions positioned in quadrant I should focus on leveraging their strengths to capitalize on available opportunities, which includes enhancing teacher training and infrastructure development (Septiani, 2022; Yani et al., 2018). For institutions facing significant threats, targeted interventions are essential to mitigate these challenges and support holistic child development. This involves increasing funding, improving safety measures, and fostering stronger community and parental engagement (Aji, 2018; Purwohandoyo et al., 2017). By addressing these areas, policymakers and stakeholders can ensure that all institutions are equipped to provide high-quality early childhood education and care.

The research underscores the need for context-specific strategies to support IHECD implementation in Mimika Baru Sub-district. The varying SWOT scores among the kindergartens indicate that while some institutions are well-positioned for growth, others require targeted support to overcome significant threats. Policymakers and stakeholders should focus on enhancing internal strengths and external opportunities through comprehensive support and resource allocation. This approach will ensure that all children in the sub-district have access to

quality early childhood development services, ultimately contributing to improved human resource development in the region (Gobena, 2020). By adopting a holistic and strategic approach, the implementation of IHECD can be optimized, fostering better outcomes for children and the broader community.

Conclusion

This research determined the conditions for implementing Integrative Holistic Early Childhood Development (IHECD) in Mimika Baru Sub-district, highlighting that current conditions are suboptimal across education, nutrition, health, care, nurturing, protection, and welfare, though all kindergartens show strong potential with opportunities for maximization. The findings suggest that context-specific strategies are essential for enhancing IHECD, requiring policymakers and stakeholders to provide comprehensive support and resources to ensure equitable access to quality early childhood development services, thereby contributing to human resource development in the region. However, the study was limited to urban kindergartens, which may not fully represent conditions in rural or remote areas, and the reliance on questionnaire data introduces some subjectivity. Future research should explore IHECD implementation in more diverse settings and conduct longitudinal studies to assess the long-term impact of strategies and interventions, ultimately refining IHECD practices and ensuring all children benefit from holistic early childhood programs.

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