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ANALYSIS OF LEARNING STYLE AS A MEDIATOR OF THE INFLUENCE OF LOGICAL INTELLIGENCE AND INTERACTIVE MEDIA ON MATHEMATICS RESULTS

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Abstract

This study aims to analyze the role of learning style as a mediator in the relationship between logical intelligence and the use of interactive media on students' mathematics learning outcomes. By paying attention to students' learning preferences, this study seeks to explain how interactive media can be optimized to support the development of logical intelligence and improvement of achievement in mathematics. This study aims to analyze the role of learning style as a mediator in the influence of logical intelligence and the use of interactive media on mathematics learning outcomes research uses a survey method with a quantitative approach. The respondents consisted of 65 grade IV students from MI Kresna. Data were collected through a questionnaire based on the Likert scale and analyzed using a descriptive approach and regression analysis. Testing the relationship between variables was carried out using the PLS-SEM technique. The results of the study showed that logical intelligence and learning style had a non-significant influence on mathematics learning outcomes, both directly and through interactive media. However, learning styles were found to play a role as mediators in the relationship between interactive media and logical intelligence on mathematical outcomes, although the effect was not significant. These findings emphasize the importance of a holistic approach involving logical intelligence and interactive media to improve mathematics learning outcomes. The practical implications of this study include the need for training for teachers to increase awareness and skills in using interactive media effectively. This approach is expected to support the development of students' logical intelligence and indirectly improve mathematics learning outcomes.

Keywords: logical intelligence, interactive media, mathematical results, learning styles

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INTRODUCTION | مقدمة

Education is one of the fundamental elements in shaping the quality of individuals and society. Among various subjects, mathematics occupies an important position because it trains logical and analytical thinking skills which are needed in various aspects of life. However, achieving mathematics learning outcomes is often influenced by various factors, including logistical intelligence, the use of interactive media, and individual learning styles. This research aims to analyze the role of learning style as a mediator in the influence of logistics intelligence and interactive media on mathematics learning outcomes.

Logistics intelligence, which includes the ability to think abstractly, problem-solving, and mathematical reasoning, is one of the main predictors of success in learning mathematics. Students with high logistical intelligence tend to more easily understand mathematical concepts and apply logic in solving problems. However, this intelligence does not stand alone; Its effectiveness in the learning process is influenced by the way students process information, known as learning style (Haetami et al., 2020).

In today's digital era, interactive media such as educational software, applications, and e-learning platforms have become important tools in education. Interactive media not only offers a more engaging way to learn mathematical concepts but also allows for a more personalized and adaptive approach to each student's learning needs. The use of interactive media can increase student engagement and motivation, which in turn can influence their learning outcomes (Daryanes et al., 2023)..

Learning style, which refers to an individual's preferences in receiving, processing, and managing information, plays an important role in how students utilize logistical intelligence and interactive media in learning. This research examines whether learning styles can be an effective mediator in improving mathematics learning outcomes through logistical intelligence and interactive media. By understanding this relationship, it is hoped that more effective and targeted learning strategies can be found, that not only maximize the potential of logistical intelligence and the use of interactive media-, but also suit each student's learning style. This research contributes to the development of more inclusive and adaptive educational methods, in order to improve overall mathematics learning outcomes (Teli et al., 2021).

Previous research has examined the influence of logistical intelligence on mathematics learning outcomes and the role of interactive media in improving these outcomes. However, very few studies have explored how learning styles mediate the relationship between logistics intelligence and interactive media with mathematics learning outcomes. Most previous research only focused on the direct relationship between these variables without considering the role of learning style as a potential mediator variable.

This research fills the main strength by investigating the role of learning style as a mediator in the relationship between logistical intelligence and interactive media on mathematics learning outcomes. Previous research has not included much learning style as a variable that can influence the dynamics between logistical intelligence, interactive media, and learning outcomes, so this research offers novelty in its approach and analysis.

The aim of this research is to investigate the role of learning style as a mediator in influencing the relationship between logistical intelligence and the use of interactive media on students' mathematics learning outcomes. This research seeks to reveal the extent to which logistical intelligence contributes to mathematical understanding and performance, as well as how interactive media can strengthen the learning process through an adaptive and engaging approach. In addition, this research emphasizes the importance of individual learning styles in maximizing the effectiveness of logistics intelligence and interactive media. By uncovering this mediation mechanism, it is hoped that educational strategies that are more effective and appropriate to individual student needs can be formulated, which will ultimately improve mathematics learning outcomes significantly (Polya, 2020).

METHOD | منهج

Research Design and Participants

This research applies a quantitative approach with survey research methods. The survey method was chosen because this research aimed to examine retrospectively the construction variables of student learning outcomes. This research uses non-probability sampling with a purposive sampling technique. The sample in this study was 65 grade IV students at MI Kresna, East Java, Indonesia. The inclusion criteria for sample selection are students who are enrolled in grade IV in the 2024 school year and are willing to participate in the study.(Saifudin, Basuki, and Daryono 2024).The research instruments used in data collection have been tested for validity and reliability. The validity test results showed that all items in the questionnaire had a validity value above 0.30, which indicates that the items are relevant and reliable. In addition, the results of the reliability test using Cronbach's Alpha showed a value above 0.70, which indicates that the instrument has good internal consistency(Muazamsyah, Daryono, and Ghafar 2024).

Measures

The data collection technique uses a questionnaire with four variables. The independent variables include Logical Intelligence (X1) and Interactive Media (X2), the mediator variable is Learning Style (Z), and the dependent variable is Mathematics Results (Y). This research uses a Likert scale consisting of 4 alternative answers from strongly disagree (1) to strongly agree (4) (Daryono et al., 2020; Widyastuti et al., 2023). Data collection was carried out using a direct field survey method. Research instrument variables are shown in Table 1.

Table 1. The Construct of the Research Variables

No	Variable	Indicator	Construct	Reference
1.	Logical Intelligence	Visual Strategy	IL1	**(BOGACHOV ET AL. 2020; DEARY 2020; GONZÁLEZ-TREVIÑO ET AL. 2020)**
		Auditory	IL2	
		Reading/Writing	IL3	
		Kinesthetic	IL4	
		Temporal	IL5	
		Strategy	IL6	
2.	Interactive Media	Analytical Ability	IM1	**(DONIAN, JR, AND MALIONE 2021; RACHMAVITA 2020; SAFARUDDIN ET AL. 2020)**
		Fixers	IM2	
		Math Skills	IM3	
		Logic And Argument	IM4	
		Creativity In Problem Solving	IM5	
		Accuracy Precision	IM6	
3.	Learning Style	Choice	LS1	(Sheromova Et Al., 2020; Suciani Et Al., 2022; Yi Et Al., 2020)
		Input	LS2	
		Adaptability	LS3	
		Social Interaction	LS4	
		Customization	LS5	
		Progress Tracking	LS6	
		Recovery	LS7	
4.	Mathematics Results	Numeracy Skills	MR1	(Das, 2020; Stephenson, 2020; Kamid Et Al., 2020)
		Understanding Mathematical Concepts	MR2	
		Mathematical Reasoning	MR3	
		Use Of Mathematical Tools	MR4	
		Mathematical Creativity	MR5	
		Precision And Accuracy	MR6	
		Personal Progress	MR7	

Data Analysis

Statistical analysis of this research uses the PLS-SEM measurement technique (Daryono et al., 2023; Mutohhari et al., 2023; Triyono et al., 2023). The outer model testing stage is a measurement model testing stage that aims to prove the validity and estimate the reliability of indicators and constructs. Several requirements that must be met are the indicator loading factor

>0.70, and the reflective construct AVE >0.50. Reliability estimates use Cronbach Alpha, Rho_A, and CR values >0.70. The goodness of fit model testing stage aims to test the predictive power of the model and the feasibility of the model. The criteria that must be met include predictive relevance to see the predictive power of the model on the blindfolding output. Model Fit is to see whether the model and data are suitable for testing the influence of variables. The conditions are SRMR <0.10 and NFI >0.50. The inner model testing stage is to test the significance of the direct (H-DIR_{1-5}) and indirect effects (the mediating role of H-IND_{1-2}).

RESULT | نتائج

Analysis: Evaluation of Measurement Models

(Evaluation of the measurement model is very important to ensure that the indicators used to measure the construct or latent variable are in accordance with the research objectives and have good quality. Checking the validity of the construct is the main purpose of the evaluation model measurement. Analyzing the relationship between the indicators and the construct that can be measured truly correctly reflects aspects of the desired construct. By analyzing factor loadings, reliability, and discriminant validity, researchers can decide which indicators should be included in the analysis and which should be removed.)

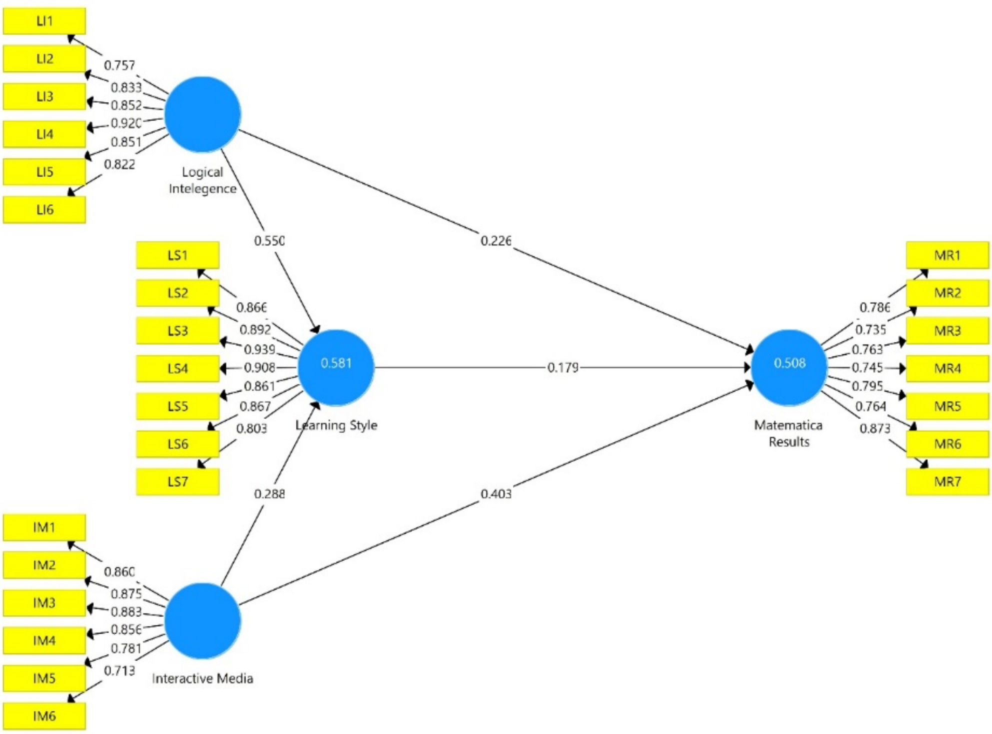

Figure 1. Evaluation of the Measurement Model

Convergent validity in PLS-SEM shows how well the indicators or manifestation variables used to measure the construct match the actual construct. The higher the convergent validity, the better the quality of the construct measurement. Researchers can test consistency between indicators used to measure the same construct with convergent validity measures. Convergent validity helps ensure that the interpretation of PLS-SEM analysis results truly reflects the construct you want to measure. This is important to ensure the accuracy and findings of the research. Table 1 below shows the results of testing convergent validity, reliability, and AVE on the PLS algorithm output.

Based on Table 2, the overall Loading Factor value for each subvariable is >0.70 (0.713 to 0.939). The average value of variance extraction (AVE) for each variable has a value of >0.50 (0.610 to 0.770). So it can be concluded that each subvariable and variable in the instrument has met the requirements for convergent validity. Based on the factor loading coefficient value, the most dominant statement item measuring the success of Interactive Media in grade 4 students is the concept understanding construct of 0.939 (IM5). This can be interpreted that the construct of conceptual understanding can measure students' self-intentions by 88.30%.

Meanwhile, the weakest item is the construct of the ability to search for information on learning resources at 0.713 (IL6 or 71.3%). A variable is declared reliable if it has CA, Rho A, and CR values >0.70. The SmartPLS output in Table 2 shows that all variables have CA values (0.893 to 0.950), rho_A (0.898 to 0.953), and CR (0.916 to 0.959). It can be concluded that the instrument's internal reliability consistency in 3 aspects has a value of >0.70 so it has good reliability in measuring Mathematics Results.

Table 2. Outer Model: Convergent Validitas y and Reliability

NO	Variable	Indicator	Conver Validity		Consistency Reliability		
			FL (Λ>0.70	AVE (>0.50)	CA (A>0.70)	RHO_A (Φ>0.70)	**CR (Δ>0.70)**
1	Logical Intelligence (X1)	IL1	0.860	0.707	0.916	0.919	0.935
		IL2	0.875				
		IL3	0.883				
		IL4	0.856				
		IL5	0.781				
		IL6	0.713				
2	Interactive Media (X2)	IM1	0.757	0.689	0.909	0.921	0.930
		IM2	0.892				
		IM3	0.939				
		IM4	0.908				
		IM5	0.861				
		IM6	0.867				
3	Learning Style (Z)	LS1	0.866	0.770	0.950	0.953	0.959
		LS2	0.892				
		LS3	0.939				
		LS4	0.908				
		LS5	0.861				
		LS6	0.867				
4	Matematica Results (Y)	MR1	0,786	0.610	0.893	0.898	0.916
		MR2	0,735				
		MR3	0,763				
		MR4	0,745				
		MR5	0,795				
		MR6	0,764				
		MR7	0,873				

Analysis: Evaluation of Structural Model

Structural evaluation in testing on PLS-SEM has the main objective, namely assessing the accuracy of the predictions of the proposed model. This is done by evaluating the extent to which the model can explain variations in empirical data and predict endogenous variables well. Overall, structural evaluation aims to increase understanding of the phenomenon under study in the research context. By analyzing the relationships between variables, researchers can identify the factors that contribute to the phenomenon and develop deeper insight into the dynamics involved.

Tabel 3. Measurement of Structural Model: R2, F2.

Variable	R^2		F^2	
	Value	Decision	Value	Decision
Logical Intelligence	-	-	0.044	Small
Interactive Media	-	-	0.182	Medium
Learning Style	0.581	Moderate	0.027	Small
Mathematics Results	0.508	Moderate	-	-

Based on the table above, the R^2 coefficient for the Learning Style variable obtained a value of 0.581, this can be interpreted as Logical Intelligence, Interactive Media, and Mathematics Results which are influenced by other variables outside the research model. So the output effect size shows that the most dominant variable in influencing Matematica Results is Interactive Media (f^2 = 0.182) in the Medium category and the weakest variable is Mathematics Results (F^2 = 0.027) in the small category.

Analysis: Path Analysis and Hypothesis Testing

One of the main goals of hypothesis testing is to test the relationships between variables in a proposed model. This is done by analyzing the strength and significance of the relationships between the variables identified in the model. Evaluation of direct effects allows researchers to test the consistency between empirical findings and the theory supporting the model. In addition, this test analyzes the significance of the mediation effect in the research model. This is important to understand the mechanisms underlying the relationships between variables and how certain variables can mediate or change the relationships between other variables.

Analysis: Measurement of Direct Effect

Testing direct effects is an important part of the analysis to understand the direct relationship between the independent variables and the dependent variable in the model. Bootstrapping is a commonly used method to calculate standard estimates and confidence intervals for model parameters in PLS-SEM. The normalized path coefficient describes the strength and direction of the relationship between the independent variable and the dependent variable in the model. The larger the coefficient, the greater the influence of the dependent variable on the dependent variable.

The original sample value (B-value) shows how much influence the independent variable has on the dependent variable. The positive or negative sign of the path coefficient indicates the direction of the relationship between the independent and dependent variables. The T-statistic value is used to test the statistical significance of the direct effect. This statistical test allows us to determine whether the direct effect is significant. The P value is a measure that determines the statistical significance of a direct effect. A low p value (<0.05) indicates that the effect is statistically significant.

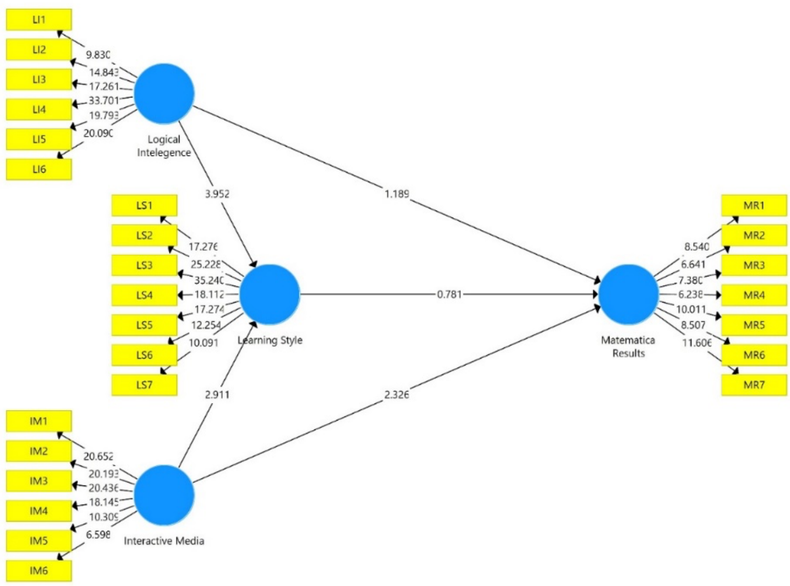

Figure 2. Evaluation of Path Analysis

A hypothesis can be accepted with significant criteria if it has a statistical T value above 1.96. Meanwhile, the hypothesis can be accepted with a positive or negative influence if the B coefficient value indicates a positive or negative direction of influence. Based on the table below, on the hypothesis. Hypothesis H-DIR1 (Logical Intelligence)(X1) → Mathematics Results (Y) results obtained β-values = 0.226, T-statistic = 1.140 (>1.96) and p-values = 0.255 (<0.05) . This shows that the Logical Intelligence variable (X1) has a positive and insignificant effect on Mathematics Results (Y). This can be interpreted as meaning that when the Logical Intelligence (X1) variable increases, the Mathematics Results (Y) variable will also increase, but not significantly.

The H-DIR2 hypothesis (Interactive Media (X2) → Matematica Results (Y) obtained β-values = 0.403, T-statistics = 2.278 (>1.96) and p-values = 0.023 (<0.05). This shows that the Interactive Media variable (X2) has a positive and significant effect on the Mathematics Results (Y). This means that when the Interactive Media variable (X2) increases, the Mathematics Results variable (Y) will also increase significantly.

Tabel 4. Results of Path Cooficient: Dirrect Effects

Hypothesis	Path Analysis	β-Values (+/-)	Sample Mean	SDV	T-Statistics (>1,96)	P-Values (<0,05)	Decision
H-DIR1	UM → ARQ	0.240	0.245	0.173	1.383	0.167	Rejected
H-DIR2	LI → ARQ	0.033	0.020	0.199	0.165	0.869	Rejected
H-DIR3	UM → SA	0.419	0.397	0.128	3,280	0.001	Accepted
H-DIR4	LI → SA	0.562	0.585	0.110	5.113	0.000	Accepted
H-DIR5	SA →ARQ	0.512	0.492	0.269	1.908	0.057	Rejected

Based on the table below, in the H-IND1 hypothesis, the results of testing the mediating effect of the Learning Style variable = e (Z) can be concluded that there is no positive influence (β-values = 0.052 and significant (T statistics 0.800 (> 1.96) and P value 0.424 (<0.05) between the Interactive Media factor (X2) on the Mathematics Results (Y) so that H-IND1 states "there is no positive and insignificant influence on the role of Learning Style in mediating Interactive Media on the Matematica -IND2 Results". , the results of testing the mediation effect of the Learning Style variable (Z) can be concluded that there is no positive influence (β-values = 0.099) and is significant (T statistic 0.649 (>1.96) and P value 0.517 (<0.05) between the Logical Intelligence (X2) and Mathematics Results (Y) factors so that H-IND2 states "there is no positive and insignificant influence on the role of Learning Style in mediating Logical Intelligence on Mathematics Results.

Tabel 5. Results of **Path** Coeficient: Indirect Effects

Hypothesis	Path Analysis	B-Values (+/-)	Sample Mean	Sdv	T-Statistics (>1,96)	P-Values (<0,05)	Decision
H-DIR$_1$	LI → MR	0.226	0,214	0,198	1,140	0,255	Rejected
H-DIR$_2$	IM → MR	0.403	0,382	0,177	2,278	0,023	Accepted
H-DIR$_3$	LI → LS	0.550	0,537	0,151	3,630	0,000	Accepted
H-DIR$_4$	IM→ LS	0.288	0,298	0,103	2,796	0,005	Accepted
H-DIR$_5$	LS → MR	0.179	0,203	0,242	0,740	0,459	Rejected

DISCUSSION | مناقشة

The concept of logical intelligence in the context of mathematics learning refers to the ability of students to think analytically and solve problems. Although the results of the study showed a positive influence of logical intelligence on mathematics learning outcomes, the influence was not significant. This suggests that while students with higher logical intelligence tend to have better potential in math, other factors may be more dominant in determining their learning outcomes. Previous research, such as those conducted by Kamid et al. (2020), also found that logical intelligence is not always directly proportional to mathematics learning outcomes. The implication of these findings is the need for a more holistic approach to mathematics teaching, which not only relies on logical intelligence but also considers other factors such as motivation and the use of interactive media. In conclusion, although logical intelligence has a role, the result of ignorance Students' mathematics is influenced by various variables that interact with each other.

The use of interactive media in mathematics learning has been proven to have a positive and significant influence on student learning outcomes. This concept emphasizes the importance of integrating technology in education, which can improve student engagement and facilitate understanding of complex mathematical concepts. The results of this study are in line with the findings of Husna et al. (2023), which show that interactive media can improve students' understanding of subject matter. With interactive media, students can learn in a more interesting and fun way, thereby increasing their motivation to learn. The implication of this study is that educators need to adopt and develop relevant interactive media to improve mathematics learning outcomes. In conclusion, the use of interactive media is not just a tool, but an important component in creating an effective and productive learning environment.

The results showed that although there was a positive influence between logical intelligence and learning style, the influence was not significant. This indicates that logical intelligence does not directly determine the preferences of students' learning styles. This concept is important to understand, as it shows that students with different levels of logical intelligence can have diverse learning styles. Previous research by Hydrie and Naqvi (2021) also noted that learning styles are more influenced by other factors such as learning experience and social environment. The implication of these findings is that educators should pay attention to the diversity of students' learning styles and not only focus on logical intelligence in designing learning strategies. In conclusion, while logical intelligence can contribute to the way students learn, other factors also play an important role in determining their learning style.

Although this study shows a positive influence of interactive media on learning styles, the influence is not significant. This shows that the use of interactive media does not directly change or determine the learning style of students. This concept is important because it indicates that students may use interactive media in different ways depending on their preferences and learning habits. Previous research by Muhammad et al. (2023) also showed that while interactive media can increase engagement, not all students respond in the same way. The implication of these findings is that educators need to understand that interactive media must be tailored to students' individual needs and learning styles to achieve optimal outcomes. In conclusion, although interactive media has the potential to support learning, its influence on students' learning styles cannot be considered significant without considering the facts.

The results of the study show that learning styles have a positive and significant influence on mathematics learning outcomes. This concept emphasizes the importance of understanding and accommodating students' learning styles in the learning process. Previous research, such as those conducted by Hamidah et al. (2022), also found that appropriate learning styles can improve students' understanding and learning outcomes. The implication of these findings is that educators must identify and implement teaching strategies that suit different learning styles of students to improve their learning outcomes. By understanding students' learning styles, educators can create a more inclusive and effective learning environment. In conclusion, learning styles are a key factor that can affect mathematics learning outcomes, and paying attention to the diversity of students' learning styles is essential in designing effective learning.

The results showed that social support played a negative but insignificant mediator role in the influence of spiritual intelligence on Islamic studies. This concept suggests that although social support can influence the learning process, in this context, the influence is not strong enough to indicate a significant relationship. Previous research has shown that social support often contributes positively to learning outcomes, but in the context of spiritual intelligence, other factors may be more dominant. The implication of these findings is the need for further research to understand the dynamics between spiritual intelligence, social support, and learning outcomes in Islamic studies. In conclusion, although social support has the potential to influence learning outcomes, in this context, its influence is not significant enough to be considered an effective mediator.

This study found that social support played a positive but not significant mediator role in the influence of students' morality on Islamic studies. This concept suggests that although social support can contribute to learning, its influence is not strong enough to show a significant relationship. Previous research has shown that student morality can affect learning outcomes, but in this context, social support does not function as an effective mediator. The implication of these findings is the importance of exploring other factors that may be more influential in the relationship between student morality and learning outcomes in Islamic studies. In conclusion, although social support has the potential to support learning, in the context of student morality, its influence is not significant enough to be considered a powerful mediator.

CONCLUSSION | خاتمة

The implications of improving learning styles in mediating the relationship between logical intelligence and interactive media with mathematical results in mathematics subjects, in class 4 of MI Kresna, emphasize the importance of paying attention to students' internal factors in the learning process. These findings highlight that students' motivation and intention to learn play a key role in achieving optimal learning outcomes. By understanding role learning styles, a holistic learning approach can be designed to increase effectiveness, maximize student potential, and create a stimulating and productive learning environment.

To improve learning styles in influencing intelligent and interactive logic media on mathematics learning outcomes, a holistic approach is recommended that integrates various learning methods according to the needs of students' individual learning styles. Teachers can adopt strategies that involve using interactive media that is relevant to the learning content, facilitating discussion and visual exploration for visual students, utilizing audio aids for auditory students, providing texts and written assignments for reading/writing students, as well as integrating practical and compression activities to kinesthetic students. Through this approach, it is hoped that students will be more engaged and gain a better understanding in both subjects, creating a diverse and inclusive learning environment to improve overall learning outcomes.

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