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The Influence of the Children Learning in Science (CLIS) Learning Model and Students' Learning Styles on Improving Students' Conceptual Understanding and Motivation to Learn Mathematics

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Abstract: The Children Learning in Science (CLIS) learning model emphasizes the process of reconstructing students' understanding by directing changes in initial misconceptions towards a more accurate scientific understanding. This study aims to: (1) analyze the influence of the CLIS learning model on improving conceptual understanding and mathematical learning motivation simultaneously; (2) analyze the influence of students' learning styles on improving conceptual understanding and mathematical learning motivation simultaneously; (3) analyze the influence of the CLIS learning model and students' learning styles simultaneously on improving conceptual understanding and mathematical learning motivation; (4) determine the influence of the CLIS learning model on improving conceptual understanding and mathematical learning motivation partially; (5) determine the influence of students' learning styles on improving conceptual understanding and mathematical learning motivation partially; and (6) determine the influence of the interaction between the CLIS learning model and students' learning styles on improving conceptual understanding and mathematical learning motivation partially. This study uses a quantitative approach with a quasi-experimental research type. The research population was all eighth grade students of SMP Negeri 2 Abung Semuli, North Lampung, with sample determination using cluster random sampling technique. The data collection instruments included a learning motivation questionnaire, a learning style questionnaire, and a mathematical concept comprehension ability test. The data obtained were analyzed using a MANOVA test with a significance level of 5%. The results of the study showed that: (1) the CLIS learning model had a significant effect on students' conceptual understanding and mathematical learning motivation, with the highest achievement in conceptual understanding; (2) learning styles had a significant effect on students' conceptual understanding and mathematical learning motivation, where in conceptual understanding the auditory learning style showed the best results compared to visual and kinesthetic learning styles, while in learning motivation the kinesthetic learning style obtained the highest results compared to visual and auditory learning styles; (3) the CLIS learning model and students' learning styles simultaneously had an effect on improving students' conceptual understanding and mathematical learning motivation; (4) the CLIS learning model partially had an effect on improving students' conceptual understanding and mathematical learning motivation; (5) learning styles partially had an effect on improving students' conceptual understanding and mathematical learning motivation; and (6) there is an influence of the CLIS learning model and students' learning styles on increasing conceptual understanding abilities, but there is no influence on mathematical learning motivation partially.

Keywords: Children Learning in Science (CLIS) Learning Model; Learning Style; Conceptual Understanding Ability; Learning Motivation.

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Introduction

Mathematics is a universal science that plays an important role in the development of science and technology and in solving various problems in everyday life.(Haratua et al., 2025)Therefore, improving the quality of mathematics learning is a key focus in efforts to improve education in Indonesia. Mathematics is also a subject that receives a relatively larger portion of time than other subjects in schools, making it strategically important at both the elementary and secondary levels of education.

The development of education in various countries is taking place very rapidly, along with the awareness that the level of education is one of the indicators of a nation's progress.(Satria et al., 2025)The success of the educational process is greatly influenced by the selection and implementation of the appropriate learning model.(Habibah & Fathurrahman, 2025)A learning model is a systematic design used as a guideline for implementing teaching and learning activities to optimally achieve learning objectives. Applying a learning model that aligns with the characteristics of the material and students is expected to create an effective, meaningful, and enjoyable learning process.

In the context of learning, educators are required to be able to convey material in a wise, communicative manner and encourage active involvement of students.(Nurhayati, Agnisa Ujliani Yuniar, 2025)A good learning process not only emphasizes the delivery of material, but also pays attention to how students build their own understanding through learning experiences.(Retno Setya Budiasningrum, Jajang Setiawan, 2025)This is in line with the view that learning is a lifelong process that is not limited by time and place, and is always marked by changes in knowledge, attitudes, and skills.

However, the implementation of mathematics learning in schools still faces various problems.(Devinta Fajar Lestari, 2022)One of the main problems is the low ability to understand concepts and motivation to learn mathematics among students.(Sari & Tarihoran, 2024). Teacher-centered learning results in students being less active in the learning process, resulting in shallow conceptual understanding that is easily lost. As a result, students have difficulty connecting mathematical concepts to the problems they face.

The ability to understand concepts is one of the basic abilities that students must have in learning mathematics.(Yani et al., 2022). A good understanding of concepts allows students to explain the concepts in their own words, provide examples and non-examples, and apply the concepts in different situations.(Wicaksono & Artha, 2022)Conceptual understanding is also an important foundation for developing higher-order thinking skills and mathematical problem-solving. However, the reality on the ground shows that students' understanding of mathematical concepts is still relatively low, resulting in learning objectives not being optimally achieved.

Based on the results of pre-research conducted on seventh-grade students of SMP Negeri 2 Abung Semuli, data obtained showed that most students had not achieved the Minimum Completion Criteria (KKM) in the mathematical concept comprehension test. Of the 139 students, 78.4% scored below the KKM, while only 21.6% of students achieved or exceeded the KKM. This data indicates that students' mathematical concept comprehension abilities are still low and require serious attention. This low ability is also influenced by the lack of student activity in the learning process.

Apart from the ability to understand concepts, another factor that influences success in learning mathematics is learning motivation.(Hidayana, 2022)Learning motivation acts as an internal driver that fosters students' enthusiasm, perseverance, and interest in participating in the learning process.(Ababil et al., 2025)Students with high learning motivation tend to be more active and enthusiastic in their learning, while those with low learning motivation exhibit a passive attitude and are less likely to participate in learning. The results of the learning motivation questionnaire indicate that students' motivation to learn mathematics is still relatively low.

Another problem is related to differences in students' learning styles.(DFP Women, 2022)Each student has different learning styles, such as visual, auditory, and kinesthetic. These differences in learning styles influence how students receive, process, and understand information. Learning that fails to address these differences in learning styles can lead to some students being less actively engaged in learning, resulting in low conceptual understanding and motivation to learn mathematics.

Observations and interviews with mathematics teachers at SMP Negeri 2 Abung Semuli revealed that students tended to be passive during mathematics lessons. The teachers also revealed that many students considered mathematics a difficult subject, resulting in low interest and motivation. This situation highlights the need for innovation in mathematics learning through the implementation of learning models that can engage students and help them develop conceptual understanding independently.

Various previous studies, such as research showing that the Children Learning in Science (CLIS) learning model is effective in improving students' conceptual understanding because it emphasizes changing initial erroneous conceptions towards correct scientific understanding.(Mulyani, 2025)Other studies have also found that learning styles influence student learning outcomes and motivation.(Nurnaifah, 2022)However, most of these studies still examine the influence of CLIS or learning styles separately, and are more focused on science subjects. Research that examines the influence of the CLIS learning model and students' learning styles simultaneously and partially on conceptual understanding and motivation to learn mathematics, especially at the junior high school level, is still limited.

Based on the problems and gaps in the research, this study provides a solution in the form of integrating the CLIS learning model with the characteristics of students' learning styles in mathematics learning, and analyzing its influence both simultaneously and partially on the ability to understand concepts and students' motivation to learn mathematics. This research is expected to provide theoretical contributions in the development of student-centered mathematics learning models, as well as practical contributions for teachers in designing more effective learning that is in accordance with the characteristics of students. Based on this description, researchers are interested in conducting research with the title "The Effect of the Children Learning in Science (CLIS) Learning Model and Students' Learning Styles on Improving Students' Ability to Understand Concepts and Students' Motivation to Learn Mathematics." So the purpose of this study is to determine the influence of the Children Learning in Science (CLIS) learning model and students' learning styles on improving students' ability to understand concepts and students' motivation to learn mathematics, both simultaneously and partially. This study also aims to analyze the influence of each variable, namely the CLIS learning model and students' learning styles, as well as the influence of both together on the ability to understand concepts and students' motivation to learn mathematics..

Method

This research uses a quantitative approach with a quasi-experimental design, because the researcher did not randomize the subjects individually, but instead used existing classes.(Jack R. Fraenkel, Norman E. Wallen, 2011). The research design applied was a pretest-posttest control group design, which involved two groups, namely the experimental class and the control class.(Sugiyono, 2020). The experimental class was given treatment in the form of the application of the Children Learning in Science (CLIS) learning model, while the control class used the expository learning model. The study was conducted at SMP Negeri 2 Abung Semuli, North Lampung, with the implementation time adjusting to the mathematics learning schedule in grade VIII. The independent variables in this study were the CLIS learning model and student learning styles, while the dependent variables included the ability to understand concepts and motivation to learn mathematics.

The research population was all 139 students of class VIII of SMP Negeri 2 Abung Semuli in the 2023/2024 academic year, consisting of four classes, namely VIII A (33 students), VIII B (33 students), VIII C (30 students), and VIII D (33 students). The sampling technique used was cluster random sampling, which is random sampling based on homogeneous class groups. The sampling process was carried out by drawing lots of the four classes until two classes were selected as research samples. Based on the results of the draw, class VIII A was obtained as an experimental class that applied the CLIS learning model with a total of 33 students, and class VIII C as a control class that used the expository learning model with a total of 30 students. Thus, the number of samples in this study was 63 students.

Data collection techniques in this study used tests, questionnaires, and observations. Tests were used to measure students' mathematical concept comprehension abilities in the form of essay questions arranged based on conceptual understanding indicators and equipped with scoring guidelines. Questionnaires were used to measure students' mathematical learning motivation and learning styles, with a four-level Likert scale. Observations were conducted to ensure the implementation of the CLIS learning model syntax during the learning process. All research instruments were first tested through validity, reliability, difficulty level, and discriminatory power before being used in data collection. The data obtained were then analyzed using analysis prerequisite tests, such as normality and homogeneity tests, and hypothesis testing using two-way MANOVA to determine the effect of independent variables on the dependent variable both simultaneously and partially.

The hypothesis of this research states that there is an influence of the Children Learning in Science (CLIS) learning model and students' learning styles on improving conceptual understanding and mathematical learning motivation, both simultaneously and partially. Simultaneously, it is suspected that there is an influence of the CLIS learning model, students' learning styles, and the interaction of both on conceptual understanding and mathematical learning motivation. Partially, it is suspected that there is an influence of the CLIS learning model on conceptual understanding and mathematical learning motivation, there is an influence of students' learning styles on conceptual understanding and mathematical learning motivation, and there is an interaction effect between the CLIS learning model and students' learning styles on both variables.

Result and Discussion

This research was conducted at SMP Negeri 2 Abung Semuli, North Lampung, on seventh grade students. Student learning style data was obtained through a learning style questionnaire given to all students who were the research sample. Based on the analysis results in Table 4.1, it is known that in the experimental class there were 7 students with visual learning styles, 2 students with auditory learning styles, and 23 students with kinesthetic learning styles, while in the control class there were 12 students with visual learning styles, 15 students with auditory learning styles, and 6 students with kinesthetic learning styles. Overall, the number of students with visual learning styles was 19 people, auditory 17 people, and kinesthetic 29 people. The data shows that the kinesthetic learning style is the most dominant learning style in both the experimental and control classes, because it has the largest number compared to visual and auditory learning styles.

Before being used for primary data collection, all research instruments were first tested to determine their suitability through validity, reliability, level of difficulty and item discrimination tests.(Jack R. Fraenkel, Norman E. Wallen, 2011)The instruments tested included a mathematical concept comprehension test, a learning style questionnaire, and a mathematical learning motivation questionnaire. The instrument trial was conducted on eighth-grade students of SMP Negeri 2 Abung Semuli, North Lampung, with the aim of ensuring the instrument was able to measure the research variables accurately and consistently. The validity test used in this study was construct validity with the Pearson Product Moment correlation technique. The results of the validity test conducted by the researcher obtained the following results:

A validity test was conducted on 6 conceptual understanding questions involving 30 students outside the research sample. The test results showed that 5 questions (numbers 1, 2, 4, 5, and 6) were declared valid because the value was , while item number 3 was declared invalid. $r_{xy} \geq r_{tabel}$ .A reliability test was conducted to determine the consistency of the conceptual understanding test instrument. The calculation results showed a value of , thus the instrument was declared reliable and suitable for use.$r_{hitung} = 0{,}850 \geq 0{,}70$

Table 1. Results of Concept Understanding Validity Test

No. Questionnaire Item	r_{tabel}	r_{hitung}	Information
1	0.361	0.818	Valid
2	0.361	0.918	Valid
3	0.361	0.297	Invalid
4	0.361	0.813	Valid
5	0.361	0.811	Valid
6	0.361	0.794	Valid

The difficulty level test aims to determine the level of difficulty of each question. The analysis results show that the questions fall into the easy and medium categories, with no difficult questions.

Table 2. Level of Difficulty in Understanding Concepts

Question No.	Difficulty Level	Criteria
1	0.62	Currently
2	0.65	Currently
3	0.75	Easy
4	0.55	Currently
5	0.58	Currently
6	0.73	Easy

The discriminatory power test was conducted to determine the question's ability to differentiate between high-ability and low-ability students. Most of the questions had good to excellent discriminatory power, making them effective in measuring student ability.

Table 3. Distinguishing Power of Concept Understanding

Question No.	Distinguishing Power	Criteria
1	0.703	Very good
2	0.865	Very good
3	0.126	Enough
4	0.705	Very good
5	0.718	Very good
6	0.689	Good

Based on the results of the item analysis, most of the questions met the eligibility criteria. Questions 1, 2, 4, 5, and 6 were deemed suitable for use.

A pilot test of the learning motivation and learning style questionnaires was conducted outside the research sample to ensure the instrument's feasibility. The results of the validity test showed that out of 24 learning motivation questionnaire items, 20 were valid and 4 were invalid, while the learning style questionnaire also had 20 valid and 4 were invalid. The reliability test showed that both instruments had high reliability values, namely 0.912 for the learning motivation questionnaire and 0.883 for the learning style questionnaire, so both were declared reliable and suitable for use in research.

Table 4. Summary of Item Analysis Results

No.	Validity	Difficulty Level	Distinguishing Power	Reliability	Information
1	Valid	Currently	Very good	Reliable	Used
2	Valid	Currently	Very good	Reliable	Used
3	Invalid	Easy	Enough	Reliable	Not used
4	Valid	Currently	Very good	Reliable	Used
5	Valid	Currently	Very good	Reliable	Used
6	Valid	Easy	Good	Reliable	Used

These results can be seen in Table 2 below: The results of student data collection using instruments that have been tested for validity, reliability, and discrimination power, were first tested for prerequisites, namely normality, homogeneity, and descriptive explanations of the samples used. The following are the results of the analysis to prove the hypothesis in the study:

Table 5. Conclusion of Questionnaire Trial Results

Questionnaire Type	Number of Grains	Valid Items	Invalid Item	Reliability Value	Information
Motivation to learn	24	20	4 (No. 3, 6, 10, 14)	0.912	Worth using
Learning Styles	24	20	4 (No. 1, 10, 12, 14)	0.883	Worth using

Table 6. Data Description

	N	Minimum	Maximum	Mean	Standard Deviation
Conceptual understanding	68	20	100	64.26	20,774
Motivation	68	27	80	52.84	17,122
Valid N (listwise)	68				

Based on Table 4. the average value of students' conceptual understanding ability was 64.26 (maximum value 100; minimum 20) and the average learning motivation was 52.84 (maximum value 80; minimum 27). This indicates that conceptual understanding is higher than learning motivation among students, although both aspects are still not optimal.

This finding is in line with research results showing that learning motivation plays an important role in improving mathematical conceptual understanding, where learning motivation and independence together have a significant influence on conceptual understanding.(Aisya et al., 2023). Other studies also show that innovative learning strategies can improve both conceptual understanding and learning motivation simultaneously.(Rahman, 2024). Thus, the average condition in this study reflects that although conceptual understanding is relatively higher, learning motivation needs to be increased so that both grow in balance.

Table 7. Normality Test

		Kolmogorov-Smirnova		
	Learning model	Statistics	df	Sig.
Conceptual understanding	Experiment	.138	33	.111
	Control	.138	35	.087
motivation	Experiment	.130	33	.169
	Control	.128	35	.157

a. Lilliefors Significance Correction

Based on Table 7, the results of the One Sample Kolmogorov–Smirnov test show that the Asymp. Sig (2-tailed) values for conceptual understanding ability in the experimental class (0.111) and the control class (0.087), as well as learning motivation in the experimental class (0.169) and the control class (0.157), are all greater than 0.05. This indicates that the data are normally distributed.

This decision is in accordance with the theory of inferential statistics which states that data are said to be normally distributed if the significance value of the normality test is greater than the 0.05 significance level, so that the data meets the requirements for further statistical analysis such as MANOVA.(Arikunto, 2019).

Table 8. Homogeneity Test

Box's M	**25,061**
F	1,472
df1	15
df2	3279.019
Sig.	.106

Table 9. Simultaneous MANOVA Test

Multivariate Testsa

Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**	**Partial Eta Squared**
Intercept	Pillai's Trace	.945	522,050b	2,000	61,000	.000	.945
	Wilks' Lambda	.055	522,050b	2,000	61,000	.000	.945
	Hotelling's Trace	17,116	522,050b	2,000	61,000	.000	.945
	Roy's Largest Root	17,116	522,050b	2,000	61,000	.000	.945
Learning model	Pillai's Trace	.504	30.963b	2,000	61,000	.000	.504
	Wilks' Lambda	.496	30.963b	2,000	61,000	.000	.504
	Hotelling's Trace	1,015	30.963b	2,000	61,000	.000	.504
	Roy's Largest Root	1,015	30.963b	2,000	61,000	.000	.504
Learning Styles	Pillai's Trace	.329	6,098	4,000	124,000	.000	.164
	Wilks' Lambda	.684	6.387b	4,000	122,000	.000	.173
	Hotelling's Trace	.444	6,666	4,000	120,000	.000	.182
	Roy's Largest Root	.399	12,358c	2,000	62,000	.000	.285
Learning Model * Learning Style	Pillai's Trace	.182	3.106	4,000	124,000	.018	.091
	Wilks' Lambda	.818	3.223b	4,000	122,000	.015	.096
	Hotelling's Trace	.222	3,336	4,000	120,000	.013	.100
	Roy's Largest Root	.222	6.873c	2,000	62,000	.002	.181

a. Design: Intercept + learning model + Learning Style + learning model * Learning Style

b. Exact statistics

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Based on Table 9, the results of the Two Ways MANOVA analysis show that the significance value for the influence of the CLIS learning model (ρ = 0.000), student learning styles (ρ = 0.000), and the interaction between the two (ρ = 0.015) are all smaller than α = 0.05, so that H_0rejected and H_1accepted. This indicates that the CLIS learning model and students' learning styles significantly influence students' conceptual understanding and learning motivation simultaneously. This finding aligns with constructivism theory, which states that learning will be more meaningful when students actively construct their own knowledge through learning experiences.(Subarjo et al., 2023)The CLIS model encourages students to express initial ideas, reconstruct concepts, and reflect on their understanding, thus contributing to improved conceptual understanding and learning motivation. Furthermore, differences in students' learning styles influence how they receive and process information, thus impacting learning outcomes, as confirmed by previous research which states that the suitability of learning strategies to learning styles can improve students' understanding and motivation.(Wulandari et al., 2024). Therefore, the combination of implementing the CLIS model and paying attention to students' learning styles simultaneously has a significant impact on improving conceptual understanding and motivation to learn mathematics.

Table 10. Partial MANOVA Test

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Conceptual understanding	13042.591a	5	2608,518	10,190	.000	.451
	motivation	4750.383b	5	950,077	3,956	.004	.242
Intercept	Conceptual understanding	196769.911	1	196769.911	768,698	.000	.925
	motivation	144461.780	1	144461.780	601,486	.000	.907
Learning model	Conceptual understanding	10420410	1	10420410	40,708	.000	.396
	motivation	1650,870	1	1650,870	6,874	.011	.100
Learning Styles	Conceptual understanding	2202.220	2	1101.110	4,302	.018	.122
	motivation	3028.795	2	1514,398	6,305	.003	.169
Learning Model * Learning Style	Conceptual understanding	2602.142	2	1301.071	5,083	.009	.141
	motivation	191,341	2	95,671	.398	.673	.013

Error	Conceptual understanding	15870.644	62	255,978
	motivation	14890.838	62	240,175
Total	Conceptual understanding	309750.000	68	
	motivation	209489.000	68	
Corrected Total	Conceptual understanding	28913.235	67	
	motivation	19641.221	67	

a. R Squared = .451 (Adjusted R Squared = .407)

b. R Squared = .242 (Adjusted R Squared = .181)

Based on Table 10, the partial MANOVA results show that the CLIS learning model significantly influences conceptual understanding and mathematical learning motivation, and students' learning styles also significantly influence both variables. However, the interaction between the CLIS model and learning styles only influences conceptual understanding and does not influence mathematical learning motivation. This condition can be explained because the CLIS model characteristically emphasizes students' cognitive processes through activities such as expressing initial ideas, group discussions, exploring concepts, and reflecting on findings, making it very effective in improving conceptual understanding. In this study, for example, students were asked to express their initial understanding of the concept of plane figures, then prove and revise their understanding through discussions and solving contextual problems, which directly impacted conceptual understanding. However, the partial increase in learning motivation was not significant because learning motivation is also influenced by other internal and external factors such as personal interests, the learning environment, and students' learning habits, which are not fully controlled by the learning model.

This finding is in line with research stating that constructivism-based learning models are more dominant in improving conceptual understanding than affective aspects.(Nadia Kusuma Dewi, 2025). And supported by research which found that learning styles have a significant influence on conceptual understanding and learning motivation, but the interaction of learning models and learning styles does not always have a direct impact on motivation.(Susanti & Susanti, 2023). Thus, the results of this study confirm that CLIS is effective in improving understanding of mathematical concepts, while increasing learning motivation requires additional affective strategy support beyond the application of learning models alone.

Table 11. Post Hoc Test

Dependent Variable	(I) Learning Style	(J) Learning Style	Mean Difference (IJ)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Conceptual understanding	Visual	Auditory	-3.17	5,282	.835	-16.42	10.07
		Kinesthetic	5.22	6,032	.689	-9.91	20.35
	Auditory	Visual	3.17	5,282	.835	-10.07	16.42
		Kinesthetic	8.39	4,650	.204	-3.27	20.06
	Kinesthetic	Visual	-5.22	6,032	.689	-20.35	9.91
		Auditory	-8.39	4,650	.204	-20.06	3.27
motivation	Visual	Auditory	-9.39	5.116	.194	-22.22	3.44
		Kinesthetic	-19.48*	5,843	.006	-34.13	-4.82
	Auditory	Visual	9.39	5.116	.194	-3.44	22.22

	Kinesthetic	-10.08	4,504	.090	-21.38	1.21
Kinesthetic	Visual	19.48*	5,843	.006	4.82	34.13
	Auditory	10.08	4,504	.090	-1.21	21.38

Based on observed means.
The error term is Mean Square(Error) = 240.175.
*. The mean difference is significant at the .05 level.

Based on the data in Table 11, there are significant differences in students' conceptual understanding and learning motivation, based on their visual, auditory, and kinesthetic learning styles. The analysis shows that students with an auditory learning style have the best conceptual understanding, as indicated by a higher mean difference in auditory learning styles compared to those with visual and kinesthetic learning styles. This occurs because auditory students are more optimal at absorbing and processing information through oral explanations, discussions, and intensive question-and-answer sessions. In this study, activities such as group discussions, presentations of problem-solving results, and peer explanations of concepts provide ample opportunity for auditory students to develop a deeper understanding of concepts. This finding aligns with DePorter and Hernacki's (2015) learning style theory, which states that auditory learners excel at understanding abstract concepts through verbal communication.(Wibisono et al., 2026). And supported by research) which found that auditory learning styles have a significant influence on understanding mathematical concepts(Hidayana, 2022). Meanwhile, in terms of learning motivation, students with a kinesthetic learning style showed the highest results compared to visual and auditory. This is because kinesthetic students tend to be more motivated when directly involved in physical and manipulative activities, such as using teaching aids, conducting simulations, and completing activity-based tasks. In this study, student involvement in exploration activities, simple experiments, and activity-based discussions encouraged the enthusiasm and learning motivation of kinesthetic students. These results are supported by research by Leoni Wilyam (2025) who concluded that direct involvement in learning increases the learning motivation of students with a kinesthetic style, because they learn optimally through direct experience and real activities.(Leoni Wilyam, 2025).

The results of the study indicate that the CLIS learning model has a significant effect on improving students' conceptual understanding and motivation to learn mathematics, both simultaneously and partially. This occurs because in CLIS learning, students no longer act as passive recipients of information, but rather as subjects who actively construct their own knowledge. In the initial idea explicitation stage, students are asked to express their initial understanding of a concept, so that teachers can identify any misconceptions they may have. Furthermore, through exploration activities and group discussions, students are directly involved in solving contextual problems, exchanging opinions, and reflecting on their findings. This process makes it easier for students to understand mathematical concepts in depth because concepts are acquired through direct learning experiences, not simply by memorizing formulas. This finding is in line with Piaget's constructivism theory, which states that knowledge is formed through an active individual process.(M. Iskandar, 2015). And supported by research which found that the CLIS model is effective in increasing understanding of mathematical concepts because it emphasizes exploration and reflection of concepts.(DA Putri, 2025).

In addition to learning models, students' learning styles have also been shown to significantly influence conceptual understanding and learning motivation, both simultaneously and partially. Differences in learning styles lead to differences in how students receive, process, and respond to information during learning. In this study, students with auditory learning styles found it easier to grasp concepts during discussions, presentations, and oral explanations among peers, while kinesthetic students demonstrated higher learning motivation when involved in hands-on activities such as the use of visual aids, simulations, and active group work. This explains why learning styles contribute to variations in student learning outcomes. This finding aligns with DePorter and Hernacki's learning style theory, which states that matching learning strategies to students' learning styles can improve learning effectiveness.(Ahmad Muhammad Ramadhan, 2025). And strengthened by research results which concluded that learning styles have a significant influence on understanding concepts and motivation to learn mathematics.(Fasha et al., 2023).

Furthermore, the analysis results show that the combination of the CLIS learning model and students' learning styles significantly influences conceptual understanding, but does not partially influence mathematical learning motivation. This condition can be explained because CLIS is primarily designed to develop cognitive aspects through concept construction, while learning motivation is also influenced by other factors such as personal interest, learning environment, teacher support, and previous learning experiences. In this study, although students were cognitively active, not all students experienced the same increase in motivation because some students still considered mathematics a difficult subject. This is in accordance with the view of Schunk (2012) who stated that learning motivation is not only influenced by learning methods, but also by internal and external factors of students.(Firmansyah Ary, 2025). Thus, the results of this study indicate that CLIS is very effective in improving the understanding of mathematical concepts, but to optimally increase learning motivation, additional strategies are needed that specifically target students' affective aspects, such as providing reinforcement, a variety of fun activities, and more personalized learning.

Conclusion

Based on the research results and discussions that have been linked to the research hypothesis, it can be concluded that the CLIS learning model influences students' conceptual understanding and motivation to learn mathematics, with conceptual understanding showing better results than learning motivation. In addition, learning style also influences both variables, where students with an auditory learning style have the best conceptual understanding, while the highest learning motivation is shown by students with a kinesthetic learning style. These findings indicate that differences in student learning characteristics also determine the success of mathematics learning.

Furthermore, the results of the study indicate that the CLIS learning model and students' learning styles simultaneously influence the improvement of conceptual understanding and motivation to learn mathematics. Partially, the CLIS model and learning styles each influence conceptual understanding and learning motivation. However, the combination of the CLIS model and learning styles does not show a partial influence on mathematical learning motivation, indicating that learning motivation is not only influenced by the learning model and learning style, but also by other factors such as students' interests, learning experiences, and learning environment.

Based on these conclusions, mathematics teachers are advised to implement the CLIS learning model as an alternative learning method that encourages active student involvement and considers the diversity of learning styles in the classroom. Students are expected to be able to recognize their individual learning styles to optimally participate in learning, while schools need to support the implementation of innovative learning through teacher training and the provision of supporting facilities. For future researchers, it is recommended to expand this research with a broader sample size and context to obtain a more comprehensive picture of the effectiveness of the CLIS model in mathematics learning.

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