

Effectiveness of Think Pair Share Learning Model Using Baamboozle Media on Understanding of Science Concepts in Grade V of Elementary School

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Abstract

This study aims to analyze the effectiveness of the Think Pair Share learning model using Baamboozle media on the understanding of science concepts in grade V of Elementary School. The research method uses quantitative with a quasi-experimental research design post-test only control group. The population used was all fifth grade students while the research sample was 40 students in grades VA and VB in elementary schools. Data were collected by observation and testing. Data analysis used prerequisite tests, namely the normality test with Shapiro Wilk, the homogeneity test with Kolmogorov-Smirnov, and the hypothesis test (independent sample t-test) with the help of SPSS version 25. The results showed that the application of the Think Pair Share learning model using Baamboozle media was effective in understanding science concepts in grade V of Elementary School, this was evidenced by the normality test in the experimental class obtaining 0.639 while in the control class obtaining 0.255. Then the homogeneity test obtained is greater than 0.05 and based on the sample t-test test obtained 0.010 so it can be concluded that there is effectiveness in using the learning model using baamboozle media on understanding the concept of IPAS.

Keywords: Think Pair Share Learning Model; Baamboozle Media; Natural and Social Sciences

INTRODUCTION

In basic education, especially in elementary schools, there are several subjects that must be mastered by students, one of which is natural and social sciences. Natural and Social Sciences (IPAS) is a science knowledge that studies living things and inanimate objects in the universe and their interactions, and studies human life as individuals as well as social beings who interact with their environment (Septiana & Winangun, 2023). In this learning, students are expected to be able to develop their curiosity to study the phenomena that exist around their lives. In the implementation of teaching and learning activities in schools, there are often problems that arise where these problems usually occur when the implementation of learning activities takes place. Problems that occur such as lack of focus and lack of enthusiasm of students, when the teacher delivers the material (Fadholi & Mahmud, 2024).

Students need to be directed to expand their thinking skills and strengthen their understanding of concepts so that they are able to have the competencies and skills needed in the 21st Century (Khusna et al., 2023). In this regard, one of the educational formats that has been adjusted to the 21st Century Learning partnership competency is accelerated learning or expanding the ability to understand concepts (Chusni et al., 2021). Students who have an understanding of concepts will have more effective learning abilities because students build their own knowledge and are more easily directed to have 6C skills (character, citizenship, critical thinking, creativity, collaboration, and communication) (Yolantia et al., 2021). Students' conceptual understanding is formed when students interpret the concepts they learn, construct their own understanding starting from basic concepts to more complex ones. This is what makes students' conceptual understanding influential in the learning process and the key to achieving good learning outcomes (Hafidhoh, 2021).

Students who understand the concept will find it easier to use their knowledge to create solutions or innovations for a problem. The ability to innovate and use their knowledge will make students become more qualified human resources. Lack of understanding of students' concepts hinders the learning process and has an impact on low educational achievement in Indonesia (Hamida & Haryati, 2024). Students who do not have a good understanding of concepts will generally have the habit of memorizing material to meet the assessment but cause students to forget easily and have difficulty using their knowledge (Maruâ, 2020). Conversely, when students have an understanding of the concept, students will be able to use their knowledge to solve modified questions or problems.

Therefore, the aspect of conceptual understanding needs to be improved and is important to emphasize in science learning. Students' conceptual understanding is still low due to several factors. The first factor is the habit of students in learning activities who prefer to be silent, are not confident when answering questions and are reluctant to ask when they encounter obstacles in learning (Purwanto, 2021). For some students, asking questions in learning activities is scary because it will make learning activities stalled, considered only to get grades and embarrassed because it will look less smart (Liriwati, 2023). Students who are not active in learning will make it difficult for teachers to read whether or not students' understanding is correct, because through communication teachers can find out the understanding that students have (Fahma & Purwaningrum, 2021). The second factor is the use of inappropriate learning models (Ali, 2021). Although it has been recommended to apply a learning model with a dominant student role in learning, its application in the field still finds the use of learning models that do not direct conceptual understanding and are active in the learning process.

The survey results also show that there is a gap between what is applied in the classroom and the lesson plans that have been made by teachers. Teachers often use a teacher-centered direct instruction model in learning activities. The use of a direct learning model, closely related to the lecture method, results in students contributing less to learning, as a result students will easily lose focus because the delivery of material is monotonous. Providing conceptual understanding by directing students to build their own understanding will be more effective than understanding that is taught directly through lecture activities that are not good. This is because in its implementation, the teacher acts as an information center while students are tasked with recording the teacher's explanation and cramming information without making adjustments to the knowledge that students previously had. The position of the teacher as the center in the learning process will also teach students to memorize the material presented. When memorizing, students' brains will be forced to only remember and collect information and concepts without trying to digest the information they get and connect it to everyday events. This is the reason why the use of direct learning models is less effective in directing students to have a deep understanding of concepts. Therefore, the existence of interactive learning media that prioritizes a collaborative approach can be a solution to help students not only remember, but also understand and apply concepts in real contexts, so that the learning process becomes more meaningful and effective.

Learning media has a very important role for the success of student learning. With the use of learning media will encourage student involvement in the learning process, and make it easier for students to understand the material being studied (Okvireslian, 2021). One of the media that can be used in learning for elementary school children is audiovisual media such as baamboozle, an interactive learning platform that combines game and education elements (M & Samsiah, 2023). Baamboozle is a digital educational tool that makes learning fun. We can find games on any topic or create games for free (Andriyani et al., 2021). Baamboozle is a game that resembles a quiz. Baamboozle media is very suitable for educators because it can facilitate learning activities and this baamboozle media can be accessed by all groups and only requires an email account to register (Sholihah, 2024). Therefore, the media can represent what teachers are less able to say through certain words or sentences. Even the abstractness of the material can be concretized with the presence of media. Learning using audiovisual media has an influence on understanding concepts where sometimes students tend to prefer learning using audiovisual media rather than using other media (Nurfadhillah et al., 2021).

Based on an interview with Mrs. F, the homeroom teacher of grade V at SDN 1 Way Galih, the understanding of the concept of science and natural sciences of grade V students is still low and she also said that there are still many students' scores below the Minimum Completion Criteria (KKM) where the KKM score that must be achieved is 70. The low ability to understand the concept of science and natural sciences of grade V students at SDN 1 Way Galih can be seen from the results of the mid-semester test scores and the low ability to understand the concept of science and natural sciences of grade V students at SDN 1 Way Galih can also be seen from the results of the concept understanding test for the science and natural sciences subject during the pre-research. The level of students' conceptual understanding has not fully understood the material presented so that the ability to understand the concept of students based on indicators is still incomplete in the science and natural sciences subject. Therefore, based on the existing problems, a learning model is needed that can improve students' understanding of the concept of science and natural sciences. The learning model is interpreted as a learning plan to achieve learning objectives and is implemented with a syntax or stages of learning (Muftiyah, 2024). Ramdani et al., (2023) defining a learning model is a description of the learning environment. Learning models have many uses, starting from learning planning and curriculum planning to designing learning materials, including multimedia programs (Octavia, 2020). It requires the

use of learning models that are used and adjusted to the characteristics of students and actively involve students in learning activities, one of which is using the Think Pair Share learning model. (TPS).

TPS is an effective way to create variations in the atmosphere of class discussion patterns. TPS is one type of cooperative learning model that in its implementation prioritizes students in doing to find their own concepts of learning materials by thinking, pairing, and expressing opinions (Megawati, 2023). In this TPS type of cooperative learning, students learn in pairs so that students have the opportunity to exchange ideas with their peers (partners). By thinking in pairs, students will be encouraged to find and understand concepts if they can discuss the problems with their partners (Ahmad et al., 2024).

Several previous studies have shown that the Think Pair Share learning model (TPS) can increase the activeness and understanding of student learning. This learning model can increase self-confidence and motivate student learning. Research Rahmawati & Fatmala, (2023) shows that the Think Pair Share learning model (TPS) can improve student achievement. Then the study Rachmawati & Erwin, (2022) found that there were differences in student learning outcomes using the Think Pair Share model. (TPS) in learning and those using lectures or conventional learning for students of SDN Sukamaju Baru 2. So it can be determined and seen that the learning outcomes using the Think Pair Share (TPS) model are more influential because they have higher results compared to those using conventional learning.

Furthermore, the study Hakim & Rizhardi, (2023) stated that there was a significant influence on the application of the Think Pair Share model assisted by power point on the learning outcomes of class V students of SDN 1 Lubuk Makmur. The influence can be seen from the difference in learning outcomes between the experimental class and the control class. The average value of the experimental class was 0.7581 while for the control class the average was 0.3417. Based on the results of the hypothesis testing, it was obtained that $t_{hitung} = 6.856 > t_{tabel} = 0.3550$ which indicates that there is a significant influence and H_a is declared accepted. So it can be concluded that the use of the Think Pair Share model assisted by power point is very effective for use in learning.

Research Nurjannah, (2019) shows that there is a significant influence of the think pair share learning model on the activeness and learning outcomes of science in grade III. Mayaningtyas et al., (2024) shows that there is an increase in the value of student learning outcomes with the criteria for achieving learning objectives (KKTP) which is ≥ 66 . This can

be seen from the results of student learning before the action, out of 27 grade IV students, only 12 students achieved completeness with a percentage of 44%. Then the action was carried out in the first cycle to 17 students who achieved KKTP with a percentage of 63%. In the second cycle, learning outcomes increased further, reaching KKTP 22 students with a percentage of 81%. So the use of the Think Pair Share (TPS) learning model can improve the learning outcomes of grade IV science at SDN Tanjungrejo 1.

This study has differences compared to several previous studies that show the effectiveness of the Think Pair Share (TPS) learning model on the activeness and understanding of student learning. While previous studies such as those that focus more on improving achievement and comparison between student learning outcomes using TPS with lecture methods or conventional learning, this study focuses on the use of Baamboozle media as a tool to improve understanding of science concepts in grade V of elementary school. In addition, utilizing PowerPoint media to assess the significant influence of the TPS model, while the study being discussed uses Baamboozle which is designed to create higher student interaction and involvement in learning. So the purpose of this study is not only to improve learning outcomes, but also to deepen the understanding of the concepts taught. Thus, specifically to analyze the effectiveness of the Think Pair Share learning model using Baamboozle media on understanding science concepts in grade V of elementary school.

METHODS

The research method used is quantitative with the type of Quasi Experimental research with the Post-Test Only Control Group Design research design. This form of experimental design is a development of true experimental design, which is difficult to implement (Arib et al., 2024). This is because this research design uses an experimental group and a control group where the conditions of the two classes are in a balanced state or can be said to be the same in terms of achievement. This design has a control group, but it cannot function fully to control external variables that affect the implementation of the experiment (Eliantari et al., 2020). The population of the study was all fifth grade students while the research sample was VA and VB classes totaling 40 students. Where class VA is the experimental class and class VB is the control class. The location of the study was at SD N 1 Way Galih, South Lampung. The reason for choosing this location is because the understanding of fifth grade students regarding the concept of science is still below the expected standard. Research on the use of the TPS model and Baamboozle media is still limited. The research was conducted during

the odd semester of the 2024/2025 academic year from July to November. Data was collected through observation and testing. For data analysis in the prerequisite test using the normality test with the Shapiro Wilk test and the homogeneity test with the Kolmogorov-Smirnov test. If the analyzed data is normal and homogeneous, it is continued with testing the average difference between two unrelated groups, namely the hypothesis test conducted with the independent sample t-test. In testing data analysis, assisted by the IBM SPSS version 25 application.

RESULTS

This research was conducted in an elementary school involving two classes of fifth grade students. Where class VA as an experimental class using the Think Pair Share learning model and class VB as a control class using the Direct instruction learning model. Both class samples used the same learning aids in the form of Baamboozle media. Based on the normality test with the Shapiro Wilk test, the level of significance is 5%. Table 1 describes the results of the normality test.

Table 1. Tests of Normality.

	Kolmogorov-Smirnov ^a			Shapiro Wilk		
	Statistics	df	Sig.	Static	df	Sig.
Experimental Class						
Control Class	.090	20	.200*	.965	20	.639
	.168	20	.142	.941	20	.255

*. This is a lower bound of the true significance
a. Lilliefors Significance Correction

The p-value obtained a score of 0.639 where $0.639 > 0.05$ for the experimental group and a score of 0.255 where $0.255 > 0.05$ for the control group. Of the two p-values, it is greater than 0.05, so the data is normally distributed. Then if the data is normal, Table 2 describes the results of the homogeneity test data.

Table 2. Homogeneity Test Results.

Test of Homogeneity of Variance				
	Levene Statistics	df1	df2	Sig.
Value Based on Mean	3.014	1	38	.091
Based on Median	2.675	1	38	.110
Based on Median and with adjusted df	2.675	1	33,267	.111
Based on trimmed mean	3,037	1	38	.089

The homogeneity of variance test uses the Levene test to test the equality of variances of several data groups. For the value based on the mean, the Levene statistical value obtained is 3.014 with a significance of 0.091. This result indicates that there is no significant difference in the group variance. Furthermore, for the value based on the median, the statistical value is 2.675 with a significance of 0.110, which also shows an insignificant result. Testing based on the median with adjusted degrees of freedom produces the same statistical value, namely 2.675 with a significance of 0.111. The statistical value for the trimmed mean is 3.037 with a significance of 0.089. All results show that the level of significance is greater than 0.05, which means that the data meets the assumption of homogeneity of variance. Furthermore, Table 3 explains the test of the average difference between two unrelated groups with a hypothesis test using the independent sample t-test.

Table 3. Results of the Independent Sample t-Test.

	Levene's Equality Variance	Test for	t-test for Equality of Means						
			F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference
Equal variances assumed value	3.014	.091	2,717		38	.010	8.250	3,037	95% Interval Difference Lower
Equal variances not assumed					2,717	33,776	.010	8.250	3,037
									2,077
									14,423

The results of Levene's Test for Equality of Variances show an F value of 3.014 with a significance of 0.091, which means that the variances of both groups can be considered the same because the significance value is greater than 0.05. Under the assumption that the variances are equal, the t-test for the difference in means shows a t-value of 2.717 with a significance of 0.010 and a degree of freedom (df) of 38. The average difference between the two groups is 8.250, with a standard error of the difference of 3.037. The 95% confidence interval for this difference in means ranges from 2.102 to 14.398. Meanwhile, for variances not assumed to be equal, the resulting t-value is 2.717 with a significance of 0.010 and a df of 33. The average difference remains 8.250, with a 95% confidence interval ranging from 2.077 to 14.423. These results indicate that there is a significant difference between the means of the two groups at a significance level of 0.05.

Figure 1 is the implementation activity of the experimental class with the Think Pair Share learning model using Baamboozle media, while Figure 2 is the implementation activity of the control class using the Direct Instruction learning model without using Baamboozle media. In Figure 1, several students face forward, showing curiosity and interest in the material presented. The use of Baamboozle media as a learning aid can make the learning process more interactive and enjoyable, so that students can better understand the concepts taught. Learning activities reflect the collaborative approach of the Think Pair Share model, where students are encouraged to discuss and share ideas with peers, which will contribute to the development of their understanding of science.

In contrast to Figure 2, which shows teaching activities in the control class using the Direct Instruction learning model with Baamboozle media. A teacher is seen standing in front of the class, presenting material using a display of Baamboozle media that attracts students' attention. The bright classroom atmosphere with yellow walls provides a warm nuance and invites enthusiasm for learning. Students who sit neatly on their chairs appear focused and involved, with some of them paying attention to the screen while taking notes on important information. The use of Baamboozle media in this learning creates more dynamic interactions, although the Direct Instruction model is usually more focused on teaching from the teacher. The presence of visual components from Baamboozle can strengthen conceptual understanding and make learning more enjoyable. This activity reflects an effort to combine traditional teaching approaches with technology, in order to improve student learning effectiveness.



Figure 1 Experimental Class Using Think Pair Share Model with Baamboozle Media



Figure 2 Control Class using Direct Instruction Model with Baamboozle Media

The experimental class that implemented the Think Pair Share model and the control class that used the Direct Instruction model with Baamboozle media had very different learning approaches. In the experimental class, the Think Pair Share model encouraged students to think independently first, then discuss in pairs, and finally share their ideas with the whole class. This approach emphasizes collaboration, interaction between students, and critical thinking, so that students are more active in the learning process. In contrast, the control class with the Direct Instruction model focuses on delivering information from the teacher directly, where students tend to play a more passive role and listen to explanations without much involvement in the discussion. Although the Baamboozle media used can add interesting visual elements, the learning process is still dominated by the direction of the teacher. Thus, the main difference lies in the level of student involvement and the interaction methods applied in the two learning models.

DISCUSSION

In the learning process, the role of the teacher is very important. Learning is not done carelessly but must be done with a planned effort so that the teaching and learning process occurs. This means that learning is an effort by educators to bring students into a good learning process to achieve the goals that have been formulated (Soraya, 2022). These goals will be achieved optimally if the teaching and learning process takes place using a learning model that is appropriate to the situation and condition of the students.

The cooperative learning model is a learning model with mutual cooperation where the teaching system provides opportunities for students to work together with fellow students in structured tasks, with the teacher acting as a facilitator (Abdillah et al., 2023; Musdalifah, 2023). In the application of this cooperative learning, students will learn in small groups, helping each other to understand a lesson, checking and correcting answers and other activities with the aim of achieving maximum learning outcomes. Each group consists of students who have diverse academic abilities, thus enriching the learning experience (Fiqry et al., 2024; Telaumbanua et al., 2024).

One example of the application of the cooperative learning model is Think Pair Share, where students are invited to think independently first before discussing in pairs, then share their ideas with the class (Lestari & Luritawaty, 2021; Rismayanti et al., 2020). The willingness to work together in groups in this learning has a positive influence because it can develop the ability to cooperate among students in solving the problems they face, while increasing the understanding of the material being taught.

The learning procedure used in Think Pair Share can give students more time to think, to respond and to help each other. Nuraini, (2021) said that Think Pair Share has advantages compared to the question and answer model, because Think Pair Share emphasizes aspects of independent thinking, responsibility for the group, cooperation with small groups, and can enliven the classroom atmosphere. Think Pair Share can optimize student participation. Students are given the opportunity to work alone and collaborate with others.

The implementation process of Think Pair Share will limit the emergence of student activities that are not relevant to learning because students must express their opinions, at least to their partners (Wiyoko et al., 2023). This learning model not only encourages student activity, but also improves the understanding of the concept of science in elementary school, because students will be more involved in discussions and exchange ideas. This involvement

helps ensure that learning takes place in a focused and directed manner, so that students can understand the material better and more deeply. In addition, the interactions that occur during the discussion can also strengthen their understanding of the concepts taught, making Think Pair Share an effective model in achieving learning objectives.

To provide a real picture of the Think Pair Share learning model and facilitate student understanding, it is necessary to use learning media that can help students understand the material, for example with Baamboozle media. Mariani et al., (2022) stated that Baamboozle media is a digital media that requires internet access in its use. This media is played in groups and each group will choose one of the numbers on the screen that contains the questions to be answered. Each number can also contain additional gift points or exchange points for the highest group value without answering the question. It can also contain a point reduction trap or can also get nothing (blank). Every group that can answer will get points, and vice versa, every student who cannot answer will not get points and there is no point reduction system.

In the implementation of the Think Pair Share learning model using Baamboozle media, the material taught is "Variety and Sources of Energy". Activities in this learning are divided into three parts, namely introduction, core activities and closing. In the introduction, the activities carried out are the class begins with greetings, asking for news and student attendance, and providing motivation to students to be enthusiastic with ice-breaking. After that, conveying learning activities, giving trigger questions about the initial concepts that students already know about the variety and sources of energy.

Next, entering the core activity, namely learning activities carried out by providing material about the variety and sources of energy through audiovisual media that has been prepared, and students observe the learning video carefully. After that, give a trigger question to build student thinking. Then give students the opportunity to think individually, after that ask students to form groups. Divide the group by counting 1 to 5 according to the order of the student's row, each group contains 4-5 people and each group is asked to discuss observations or questions that have been given. After the discussion is complete, students are asked to present the results of their discussion in front of the class.

Then in the closing section, students together with the teacher reflect on the lesson that has taken place, and students together with the teacher conclude the learning outcomes. In this learning model, teachers must have the skills to develop innovative and creative

learning to provide meaningful learning to students, such as the use of learning models. If the learning is given in a fun atmosphere, students will also find it easier to understand the learning material. Therefore, teachers in providing learning must emphasize understanding the concept, because with understanding the concept, students will find it easier to remember the material given. Students' reactions to learning by implementing the Think Pair and Share (TPS) learning model, namely from students who previously felt lazy and not confident when the learning process took place to students who were active and enthusiastic about learning. This change in behavior shows a positive response received by students.

This is in line with the opinion Hasanah et al., (2024); Magdalena et al., (2023) that learning can be interpreted as a process carried out by individuals to obtain new behavioral changes as a whole, as a result of the individual's own experience in interacting with their environment. When the learning process using the Think Pair Share (TPS) learning model can build interaction between students because the learning process at the pair stage (pairing) students are required to work together in groups to form an attitude of caring for each other so that an interaction is formed between students and other students and also between students and teachers (Wahyuni et al., 2025). Then the opinion Guntara, (2021); Yani, (2022) that the Think Pair Share (TPS) learning model or thinking in pairs sharing is a type of cooperative learning designed to influence student interaction patterns.

The Think Pair Share model using Baamboozle media can improve students' conceptual understanding, this can be seen from the posttest value from the statistical analysis calculation with the help of SPSS version 25, the significance value (2-tailed) in the Independent Sample T-test analysis is 0.010 through the hypothesis test criteria, if the significance value (2-tailed) > 0.05 , then H_0 is accepted. It turns out that the significance (2-tailed) < 0.05 is $0.010 < 0.05$ so that H_0 is rejected and H_1 is accepted. It can be concluded that there is effectiveness of the Think Pair Share learning model (TPS) uses Baamboozle media to understand the concept of science for grade V in elementary school.

The results of this study are supported by previous relevant research, namely in the study Nainggolan & Surya, (2024) that students' mathematical problem-solving abilities in solving story problems by applying the cooperative learning model of the think pair share (TPS) type increased. Furthermore, the study Faudzan et al., (2023) stated that the increase in mathematical communication abilities of students who received learning using the TPS cooperative model was better than students who received learning using the conventional

model. In addition, students' responses to the 'Think Pair Share cooperative learning model obtained an average percentage value of 71.79%, if converted into an interpretation table, the percentage score is included in the good interpretation criteria. Then the study Damanik & Nasution, (2024) stated that the application of the Cooperative Learning *Type Think Pair Share* (TPS) learning model assisted by Geogebra was able to improve the conceptual understanding ability of class VIII students at SMP Negeri 2 Pantai Labu.

In the study, Suaidah & Pasaribu, (2022) it was found that the results of the t-test calculation analysis carried out to determine students' communication skills obtained a significant value of $0.004 < 0.05$, based on the test criteria, H_0 was rejected and H_1 was accepted (there was an increase in students' communication skills taught with the *Think Pair Share (TPS) learning model* than an increase in students' communication skills taught with conventional learning models. In line with the study Tambunan, (2021), the t_{count} value did not meet the criteria of $t_{\text{table}} < t_{\text{count}} < t_{\text{table}}$ at a significance level of $\alpha = 0.05$, which showed that the average gain in mathematical understanding and communication skills of students in the experimental class was greater than that of the control class, so it can be said that there was an increase in students' mathematical understanding and communication skills who received a cooperative learning model with the Think Pair Share type technique higher than students who received conventional learning.

From several studies above, it is proven that the Think Pair Share model can improve students' conceptual understanding, but on the other hand there are limitations that can be used as updates in this study, such as a non-homogeneous learning environment, where external factors such as differences in student backgrounds and their capacity to use technology can affect the results of the study. In addition, this study was conducted in a limited time, which can affect the depth of student understanding. The importance of the findings of this study lies in the evidence provided regarding the effectiveness of the Think Pair Share method as a learning approach that can improve mastery of science concepts, and Baamboozle media can make the learning process more interactive and interesting.

CONCLUSION

The understanding of the concept of science in the experimental class students shows that the Think Pair Share (TPS) learning model has better values compared to the control class. Based on the Independent sample t-test test from the calculation results using SPSS

version 25, the sig. (2-tailed) value is 0.010 with a significance criterion of <0.05 , so it can be said that H_0 is rejected and H_1 is accepted, and it can also be concluded that there is an effectiveness in using the Think Pair Share learning model. (TPS) assisted by Baamboozle media towards the understanding of the concept of science for grade V in elementary school.

The limitations of this study are that it was conducted in the context of a specific learning environment, so the findings cannot be fully applied to other schools with different characteristics. In addition, the number of samples used in this study was limited, which may limit the statistical power and representativeness of the results. The short research time, which did not provide an opportunity for students to explore and maintain their understanding of the concepts learned. Suggestions for further researchers, to conduct further research involving more samples from various schools in order to reflect wider diversity in respondents, and to extend the duration of the study so that students have enough time to study the material. In addition, increasing the variety of learning media and investigating the combined use of various other cooperative learning models so that it can provide deeper insight into the effectiveness of students' understanding of concepts.

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