



The Effect of Mind Mapping Learning Model on Student Cognitive Learning Outcomes in Natural Science Subjects in Grade IV Elementary School

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Abstract

This study aims to determine the effect of using the mind mapping learning model on the cognitive learning outcomes of students in the science subject of sound material. The results of this study indicate that; (1) There is an effect of student cognitive learning outcomes between the class that is given the mind mapping learning model and the class that is given direct learning on sound science subjects, the results of the hypothesis test show that the value of $t_{(count =)} 3.8330 > t_{(table =)} 1.6786$ for $\alpha = 5\%$ and $dk = 46$. (2) Mind mapping learning model has a high influence on students' cognitive learning outcomes on sound material, the result of calculating the effect size in this study is $E_s = 1.00 > 0.8$ are high criteria. (3) There is a positive response to the mind mapping learning model, the results of the calculation of the percentage of student responses show an average of 84% in the very good category. Thus it can be concluded that the mind mapping learning model can affect students' cognitive learning outcomes and make it easier for students to understand the material.

Keywords: learning model, mind mapping, student cognitive learning outcomes, science

Abstract

One of the interesting learning models and able to influence student learning outcomes is the mind mapping learning model. This study aims to determine the effect of using the mind mapping learning model on the cognitive learning outcomes of students in the science subject of sound material. This research was conducted at SD Negeri 12 Singkawang. The type of research used is quantitative with experimental methods. The research design used was a true experimental design with a posttest only control design. Samples were taken randomly, the number of each grouped into two classes, namely the experimental class using the mind mapping learning model and the control class using the direct learning model. The population in this study were all fourth graders of SD Negeri 12 Singkawang. The results of this study indicate that; $t_{hitung} = 3,8330 >$ for $\alpha = 5\%$ and $dk = 46. t_{tabel} = 1,6786$ (2) The mind mapping learning model has a high influence on students' cognitive learning outcomes on sound material, the result of calculating the effect size in this study is > 0.8 which is a high criterion. (3) There is a positive response to the mind mapping learning model, the results of the calculation of the percentage of student responses show an average of 84% in the very good category. Thus it can be concluded that the mind mapping learning model can affect students' cognitive learning outcomes and make it easier for students to understand the material. $E_s = 1,00$

Keywords: Learning models, mind mapping, student cognitive learning outcomes, science

PRELIMINARY

Education is a conscious effort made by educators and students as well as interactions in growing their potential in the learning process. The implementation of teaching activities systematically and guided by the rules and educational plans is formed in a curriculum. Today, education in Indonesia has undergone various curriculum changes. Currently the curriculum used is an integrated

or thematic-based curriculum and is known as the 2013 curriculum.

Curriculum 2013, is a thematic curriculum that contains Basic Competencies (KD) and indicators of Core Competencies (KI) and several subjects are linked into a single unit in one theme. In basic education curriculum, science is one of the compulsory subjects given to students at the elementary school education level. Science is a human effort in understanding nature through observation,

using procedures and explained by reasoning so as to get a conclusion (Susanto, 2013). Meanwhile, according to Prahita (2014), stated that science is a science that contains concepts related to nature as a result of experiments/experiments and observations. From what has been stated, it can be concluded that science is a subject in the form of concepts which can lead to scientific attitudes in students.

This subject invites students to get to know nature more closely, through observation and experimentation (Octavianingrum, 2019). This method is an activity carried out so that students more easily understand science lessons. Thus, student learning outcomes will be obtained in accordance with the objectives to be achieved, especially cognitive learning outcomes. Cognitive learning outcomes are a domain that includes all brain activity (Sudaryono, 2012). The indicators to be achieved in this realm according to Benjamin S. Bloom, et al., (Arifin, 2014) covers; knowledge, understanding, application, analysis, synthesis and evaluation.

Based on the results of research conducted by Hadi (2019), Indonesia's achievements in the results of the 2015 Trend in International Mathematical and Science Study (TIMSS) conducted every 4 years, show that in the field of science, Indonesia is ranked 44th out of 49 countries, Indonesia's average score is 397 and far below the average. the international average is 500, so Indonesia's position is at a low level. Based on the results of pre-research conducted by researchers on Thursday, February 4, 2021 at SD Negeri 12 Singkawang in grade IV, it was found that students' understanding of the material was low, this situation had an impact on students' final grades. From the data from the analysis of the answers to the science test answers obtained from the fourth grade teacher, the students' science learning outcomes showed less than the KKM (Minimum Completeness Criteria) of 70 with an average value of 51 students, of all 24 students, 14 were known. students did not complete with a percentage of 58% and 10 students completed with a percentage of 42%. From these data it is clear that most of the students who did not complete were greater than the students who

completed the science subjects in grade IV. In addition, learning activities are still teacher-centered, the use of learning models that are less varied and interesting, the lack of student involvement in science learning activities makes students less enthusiastic in ongoing learning activities. So that the learning process activities are often not in accordance with the objectives.

Referring to the problem above, success or failure of students in achieving learning objectives. Learning is a change in behavior that is obtained from a meaningful learning process. To create meaningful and fun learning, the teacher must be more creative in the process of interesting learning activities so that students better understand the subject matter. It is realized by changing the learning atmosphere and carrying out variations in learning by updating both models, methods, approaches and techniques in the learning process. One of the efforts that researchers can do in this study is to use a mind mapping learning model in the learning process.

According to Kurniasih (2015) Mind mapping is a note-taking technique that develops a visual learning style by combining and developing the working potential of the brain contained within a person. Also according to Shoimin (2014), that mind mapping or mind mapping utilizes all parts of the brain by using an image so that an idea will appear. The brain will more easily remember an information in the form of images, symbols, colors and shapes. Meanwhile, according to Octavianingrum (2019), the mind mapping learning model is a brain-based learning model or intelligence with certain characteristics.

It can be concluded that mind mapping or commonly called a mind map is a learning model using techniques to make it easier for students to express all their ideas or ideas in the form of a pattern that is interrelated into detailed branches. The mind mapping learning model is carried out in accordance with the steps that have been determined both systematically and planned so that the learning objectives can be achieved. This model is expected to influence and generate cognitive learning outcomes of students in

science subjects, especially on the theme of one sound material and its characteristics in grade IV SD Negeri 12 Singkawang.

The results of research conducted by Nurhayati (2020), shows that the mind mapping learning model can improve student learning outcomes. In addition, the research results Octavianingrum (2019), shows that the mind mapping learning model has an effect on cognitive learning outcomes for fourth grade students in science learning in elementary schools. From the characteristics of the mind mapping learning model, it is very suitable to be applied by teachers, because it can foster a sense of pleasure in learning.

Based on the description of the background, the researchers are interested in conducting research on "The effect of mind mapping learning models on students' cognitive learning outcomes in science subjects in class IV SDN 12 Singkawang". The formulation of the problem in this research is; (1) Are there differences in students' cognitive learning outcomes between classes that are given a mind mapping learning model and classes that are given direct learning?, (2) How much influence does the mind mapping learning model have on students' cognitive learning outcomes?, and (3) How do students respond to the mind mapping learning model?. This study aims to determine the effect of using the mind mapping learning model on the cognitive learning outcomes of students in the science subject of sound material.

The theoretical benefit of this research is to develop scientific insight in the field of education, especially Elementary School Teacher Education (PGSD) which can help increase students' knowledge. While practically, this research is expected to provide benefits for students, teachers and principals.

RESEARCH METHODS

This research uses quantitative research with experimental methods. The research design used is a true experimental design with a posttest only control design. According to Kurniawan (2018), this research design is used to measure the independent variables (independent) based on the treatment given.

Quantitative research contains data in the form of numbers and is analyzed using statistical calculations (Sugiyono, 2015). The place of research to be carried out is in class IV SD Negeri 12 Singkawang which is located at Jl. Trident Ex. Bukit Batu, Central Singkawang.

The population in this study were all fourth grade students of SD Negeri 12 Singkawang. The sampling technique used is the cluster random sampling technique. The sample used is a member selected from the population randomly, that is, there are 24 students as a sample of the experimental class and the rest as a sample of the control class, totaling 24 students at SDN 12 Singkawang. Data collection techniques in the form of tests and non-tests. The instruments in this study contained questions about learning outcomes and student response questionnaire sheets that had been validated by 2 lecturers and 1 teacher.

RESULTS AND DISCUSSION

Research result

Based on the results of research conducted regarding the influence of the mind mapping learning model on students' cognitive learning outcomes, it is obtained as follows:

1. Student cognitive learning outcomes

The results of data collection carried out during the study at SD Negeri 12 Singkawang obtained post-test data from students in the form of scores from the class taught the mind mapping learning model for the experimental class and direct learning model for the control class on students' cognitive learning outcomes on sound material and characteristics. -Its class IV. The post-test questions given to students are in the form of test questions describing students' cognitive learning outcomes which contain four indicators, namely; (a) knowledge, (b) understanding, (c) application, and (4) analysis. After the data was analyzed, the average value, standard deviation, variance and the number of students in the experimental class and control class were obtained. For

more details, the values are presented in table 1 below:

Table 1
Recapitulation of Student Grades in Experiment and Control Class

Class	Average (\bar{X})	Standard Deviation (SD)	Variance (S^2)	Number of students (n)
Experiment	79.79	16.58	274.95	24
Control	60.21	19.53	381.48	24

The recapitulation of the scores of the experimental and control class students is presented in the following form of bar chart 1:

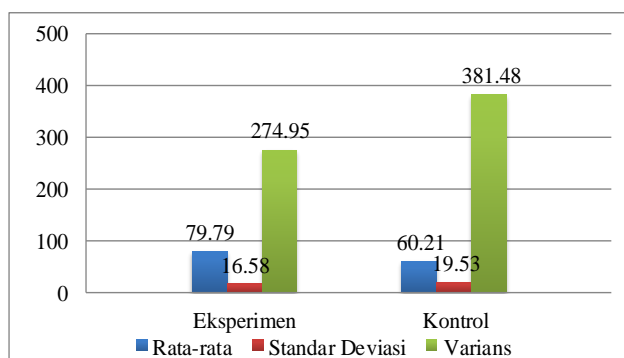


Image 1.
Student Grades Bar Chart

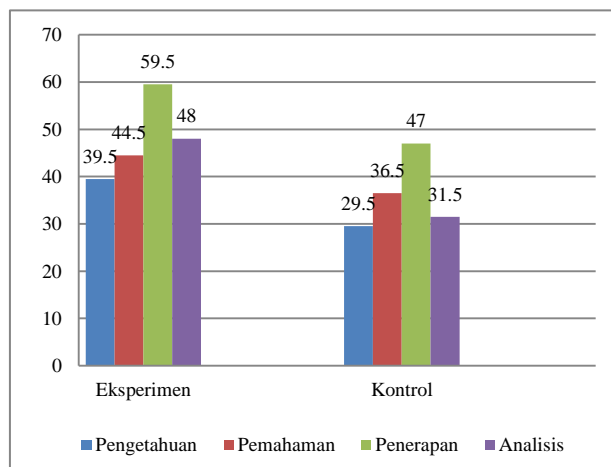
In the bar chart above, it is found that the average value of the experimental class is higher than the control class. While the standard deviation and variance in the experimental class is lower than the control class. So it can be seen that the post-test score data for the experimental class is different from the post-test score for the control class.

Furthermore, to see the average post-test results of students' cognitive learning in the experimental class and control class for each indicator, it is presented in table 2 below:

Table 2
Average Score for Each Cognitive Learning Outcome Indicator

Indicator	Average Score	
	Experiment	Control
Knowledge	39.5	29.5
Understanding	44.5	36.5
Application	59.5	47
Analysis	48	31.5

The average scores for each indicator of cognitive learning outcomes of



experimental class and control class students are presented in the following bar chart:

Figure 2.
Average Score Bar Chart for Each Indicator

Based on the bar chart above, there are four average indicators of student cognitive learning outcomes, namely knowledge, understanding, application and analysis of the experimental class and the control class. The average for each indicator in the experimental class is higher than the control class. Based on the results of the research above, there is an average difference for each indicator of student cognitive learning outcomes between the experimental class and the control class where the average score of the experimental class is higher than the average score of the control class. So furthermore, to determine the significant effect of cognitive learning outcomes between the experimental class and the control class, the following tests were carried out:

- Test the average of the experimental class and control class

To find out the differences in students' cognitive learning outcomes between the experimental class and the control class on the sound material for class IV SD Negeri 12 Singkawang using a two-sample t-test. But before that, normality and

homogeneity tests will be carried out first. Based on the normality and homogeneity test, it was found that the post-test data of the experimental class and the control class were normally distributed and had homogeneous variance. So to test the average similarity of the two classes using a two-sample t-test. The results of the two sample t-test calculations are:

Table 3
T . Test Calculation Results

Group	Dk	α	t_{hitung}	t_{tabel}	Decision
Experiment and Control	46	0.05	3,83 30	1.67 86	H_a received
Conclusion: There are differences in students' cognitive learning outcomes					

Based on table 3 above, it is known that $t_{hitung} = 3.8330$ and $t_{tabel} = 1.6786$ obtained that $3.8330 > 1.6786$ then H_a is accepted and H_o is rejected. So it can be concluded that there are differences in student learning outcomes between classes given the mind mapping learning model and learning directly on the sound material for class IV SD Negeri 12 Singkawang. Because there are differences, there is an influence on students' cognitive learning outcomes between the classes given the mind mapping learning model and direct learning. $t_{hitung} > t_{tabel}$

- b. Test the magnitude of the effect of the use of mind mapping learning model on students' cognitive learning outcomes. To find out how much influence the use of the mind mapping learning model has on students' cognitive learning outcomes, the Effect Size formula is used. The results of the calculation of Effect Size (Es) are as follows:

Table 4
Effect Size Test Calculation Results

Calculation	Class	
	Experiment	Control
Average (\bar{X})	79.79	60.21
Control class Standard Deviation (S_c)	19.53	
Effect Size (ES)	1.00	
Criteria	Tall	
Conclusion	The use of mind mapping learning model has a high effect on students' cognitive learning outcomes	

From table 4 it can be seen that $ES = 1.00$ and the criteria are high because they are at Tall. This means that the use of the mind mapping learning model has a high effect on students' cognitive learning outcomes in class IV sound material at SD Negeri 12 Singkawang. $E_s E_s > 0,8$

2. Questionnaire student responses to the mind mapping learning model

In this section, a student response questionnaire is presented to the mind mapping learning model carried out in grade IV SD Negeri 12 Singkawang. The student response questionnaire used in this study was in the form of positive and negative statements consisting of four indicators, namely relevance, attention, satisfaction and self-confidence. The questionnaire consists of 16 statements, each statement has two options, namely "yes" and "no".

The questionnaire sheet was filled out by 24 students. From the questionnaire sheet that has been filled in, then the data is displayed in tabular form. The table is presented by multiplying the number of students' answers who answered "yes" or "no" by 100, then dividing by the number of students who filled out the questionnaire. Furthermore, the percentage of student responses who answered "yes" and "no" will be accumulated will be accumulated. So that the results of the calculation of student response data to the learning model are obtained in table 5 below:

Table 5
Results of the Calculation of Student
Response Questionnaires on the Mind
Mapping Learning Model

Statement	Yes	Not	Note:
I easily understand the sound material delivered through the mind mapping learning model	88%	13%	Very well
I can use the mind mapping learning model for other materials.	88%	13%	Very well
I don't understand the material through the mind mapping learning model	79%	21%	Very well
The use of mind mapping models in science learning cannot be applied to other materials	88%	13%	Very well
I concentrate more on taking lessons with a mind mapping model	79%	21%	Very well
I feel from the beginning of learning, I have been interested in the mind mapping learning model	83%	17%	Very well
Using the mind mapping model in science subjects makes me sleepy and not concentrating	83%	17%	Very well
I am not interested in learning science using the mind mapping model	92%	8%	Very well
I enjoy learning with this mind mapping learning model, because it can express creative ideas and not be boring	83%	17%	Very well
With this mind mapping learning model, I feel no more difficulties in learning.	79%	21%	Very well
I don't like learning science using the mind mapping model	83%	17%	Very well
I am not satisfied with the mind mapping model in science learning	92%	8%	Very well
With the mind mapping learning model, I can measure the mastery of the material that I have obtained	83%	17%	Very well
With the mind mapping	71%	29%	Well

learning model, it is easier for me to apply it to other subjects.

I find it increasingly difficult to use the mind mapping learning model	92%	8%	Very well
With the mind mapping model, I find it difficult to learn science	88%	13%	Very well

Based on table 5 above, the average value of the calculation of the percentage of student responses who chose "yes" was 84% which was in very good criteria. Meanwhile, the average score of students who chose "no" was 16%. This means that the percentage of student responses to the mind mapping learning model positive effect on students' cognitive learning outcomes on sound material in class IV SD Negeri 12 Singkawang.

Discussion

1. Differences in students' cognitive learning outcomes

Researchers conducted research in class IV SD Negeri 12 Singkawang which consisted of 2 classes, namely the experimental class and the control class. The experimental class came from class IV B which consisted of 24 students, while the control class came from class IV A which consisted of 24 students. The experimental class was given a mind mapping learning model while the control class was given a direct learning model. After conducting the research, the researcher gave post-test questions to students to see the effect of students' cognitive learning outcomes and how much influence the mind mapping learning model had on students' cognitive learning outcomes.

Based on the results of the calculation of the student's post-test data, it was found that there were differences in student learning outcomes between the classes given the mind mapping learning model and direct learning on the sound material for class IV SD Negeri 12 Singkawang. The difference in students' cognitive

learning outcomes in the experimental class and control class was caused by the difference in treatment between the two classes. $t_{hitung} > t_{tabel}$

This is in accordance with the results of research conducted by Nurhayati (2020), it is known that there is a significant difference, namely the percentage of learning outcomes in the control class is lower than the experimental class, meaning that the learning process using the mind mapping learning model is better and has an influence on learning outcomes.

The experimental class was given a mind mapping learning model. According to Swadarma (2013), that mind mapping is a way of taking notes that is effective, efficient, creative, interesting, easy and efficient to develop ideas and thoughts in accordance with the working mechanism of the brain so that it can unlock all the hidden potential and capacities of the brain. So that during the learning process students can pour all the ideas that are in their minds that are useful for increasing students' understanding of the material being studied.

In addition, the steps of the mind mapping learning model are related to the indicators of student learning outcomes. The linkage is found in the teacher's step in presenting the learning material. After carrying out learning activities, to find out whether or not students are successful in learning is done by giving test questions according to the indicators of learning outcomes, namely knowledge, understanding, application and analysis. Not only that, learning that is associated with the mind mapping learning model can improve students' cognitive learning outcomes because in the learning process they use concept maps to better understand the material.

2. How big is the influence of the mind mapping learning model on students' cognitive learning outcomes

Based on the results of the calculation of student post-test data consisting of four indicators of student cognitive learning outcomes, the Effect Size (Es) value is found to be high on the criteria. This shows

that the mind mapping learning model has a high influence on students' cognitive learning outcomes in class IV B sound material. It can be concluded that the large influence of the mind mapping learning model on students' cognitive learning outcomes is tall. This is in line with research conducted by Pradipta (2019), it is known that the mind mapping model has a great influence on the cognitive learning outcomes of students in the high category.

The cause of the influence of the mind mapping learning model on students' cognitive learning outcomes on indicators of knowing, understanding, applying and analyzing, because in the mind mapping learning model there is a link between the steps of the learning model and the indicators of student cognitive learning outcomes. This is in accordance with one of the advantages of the mind mapping learning model, namely maximizing the brain's working system (Swadarma, 2013).

3. Student response questionnaire

At the end of the learning process using the mind mapping model, a student response questionnaire was given during the learning process. The student response questionnaire in this study consisted of 4 indicators, namely relevance, attention, satisfaction and self-confidence. Each of the four indicators has two positive statements and two negative statements. Based on the results of the calculation of student responses, the percentage is very good, namely 84%, meaning that the student's response to the mind mapping learning model shows a positive response so that it affects students' cognitive learning outcomes on sound material.

This is in accordance with the results of research conducted by Octavianingrum (2019), it is known that the mind mapping learning model can provide a positive response in learning activities. In this study, it was shown that the excellent category means that students like science learning, are easy to understand the material presented, are more concentrated,

are interested, enjoy learning, can measure mastery of the material, and this model can be used on other materials.

CONCLUSION

Based on the results of the calculation of research data and discussion, it can be concluded that the mind mapping learning model has a high influence on students' cognitive learning outcomes in class IV sound material at SD Negeri 12 Singkawang.

1. There is a difference between the class that uses the mind mapping learning model and the class that is given direct learning in class IV, from the calculation results show that the difference in student learning outcomes between the average experimental class is higher than the control class. Furthermore, the data obtained are normally distributed and homogeneous then the T test is carried out, in order to obtain $t_{hitung} = 3,8330 >$ then H_a is accepted and H_0 is rejected. $t_{tabel} = 1,67866$ Because there are differences, there is an effect of learning outcomes given the mind mapping learning model with classes given direct learning on sound material for class IV SD Negeri 12 Singkawang.
2. The mind mapping learning model has a high influence on students' cognitive learning outcomes in class IVB sound material at SD Negeri 12 Singkawang as shown by the results of the effect size calculation, namely $E_s > 0.8$ i.e. > 0.8 is in the high category. So that the learning model has a high influence on student learning outcomes. $E_s = 1,00$
3. Student responses to the mind mapping learning model show a high percentage of 84% with very good criteria, so this model can be used for sound material in class IV SD Negeri 12 Singkawang.

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BIBLIOGRAPHY

- Arifin, Z. (2014). Evaluation of Learning Principles, techniques, procedures. Rosdakarya Youth.
- Hadi, S., & Novaliyosi. (2019). TIMSS Indonesia (Trends in International Mathematics and Science Study). Proceedings of the National Seminar & Call For Papers, Masters Program in Mathematics Education, Siliwangi University, 562–569.
- Kurniasih, I., & Sani, B. (2015). Variety of Learning Model Development for Teacher Professional Improvement. Pen said.
- Kurniawan, A. (2018). Educational Research Methodology. PT Youth Rosdakarya.
- Nurhayati, A., & Widdy, SN (2020). The Effect of Mind Mapping Model on Student Learning Outcomes in Class IV Science Learning at SD Negeri Pananjung. Bale Aksara, 1(1), 1–14.
- Octavianingrum, A., & Syofyan, H. (2019). The Influence of Mind Mapping Learning Models on Science Learning Outcomes for Class V on the Material of Living Organisms Breathing. Education And Learning, 16(2), 139–148.
- Pradipta, D. (2019). The Effect of Mind Mapping Model on Social Studies Learning Outcomes in Elementary School. Journal of Equatorial Education and Learning, 1–9.
- Prahita, NPS, Jampel, IN, & Sudatha, IGW (2014). Results of the Application of the Mind Mapping Learning Model on

Science Learning Outcomes. Ganesha University of Education's PGSD Pulpit E-Journal, 2(1), 1–10.
<http://ejournal.undiksha.ac.id/index.php/JJPGSD/article/view/3811>

Shoimin, A. (2014). Innovative Learning Model in Curriculum 2013. Ar-Ruzz Media.

Sudaryono. (2012). Learning Evaluation Basics. Graha Ilmu.

Sugiyono. (2015). Methods of Educational Research Approaches Quantitative, Qualitative and R & D. Alfabeta.

Susanto, A. (2013). Theory of Learning and Learning in Elementary Schools Second Edition. Prenadamedia Group Kencana Division.

Swadarma, D. (2013). Application of Mind Mapping in the Learning Curriculum. Elex Media Komputido Kompas Gramedia.