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The Influence of Discovery Learning Model on Motivation, Creative Thinking Ability, and Students' Learning Outcomes in Science Education for Grade V Elementary School

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ABSTRACT

The discovery learning model is one of the student-centered learning models that focus on active learning during the learning process. The purpose of this research is to analyze the differences in the influence of the discovery learning model on motivation, creative thinking ability, and student learning outcomes in Grade V Science Education in Elementary School. The research subjects were all Grade V students of SD Negeri 1 Lawela, Kec. Batuga, Kab. South Buton, a total of 58 students. This research used an experimental design with Nonequivalent Control Group Design. Data collection techniques in this study included observation, questionnaires, tests and documentation. The collected data were tested for normality and homogeneity as prerequisites for hypothesis testing. Hypothesis testing was conducted using the N-gain test and independent sample t-test using SPSS 25 software. The independent sample t-test for students' learning motivation showed a value of 0.000 < 0.05, the independent sample t-test for students' creative thinking ability showed a value of 0.000 < 0.05, and the independent t-test for students' learning outcomes showed a value of 0.000 < 0.05. Based on these results, it can be concluded that: (1) the discovery learning model has a significant influence on students' learning motivation; (2) the discovery learning model has a significant influence on students' creative thinking ability; (3) the discovery learning model has a significant influence on students' learning outcomes.

Keywords: Discovery Learning Model, Learning Motivation, Creative Thinking Ability, Student Learning Outcomes, Science Education in Elementary School.

INTRODUCTION

School is an essential educational institution that plays a crucial role in improving the quality of future generations of the nation. Within the realm of education, the teaching and learning process stands as the core activity. Learning is a process of behavioral change that occurs through mental or psychological activities, taking place through active interaction with the environment, resulting in changes in knowledge, skills, and attitudes (Prihatini, 2017; Yuwanita et al., 2020 & Rahmatiah, 2023). In the past, the learning process was very different from in the present century. The previous forms of learning were carried out without paying much attention to standards, whereas today standards are needed as a reference for achieving learning goals. Through the standards set, teachers as educators have clear guidelines about what should be taught and what is to be achieved (Adnyana et al., 2022).

Based on the Ministry of Education and Culture Regulation Number 22 of 2016 regarding the Standards of the Basic and Secondary Education Process, the learning process in educational institutions should be

conducted interactively, inspiringly, enjoyable, challenging, and motivating for students to actively engage. It should also provide sufficient room for initiative, creativity, and independence in accordance with the students' talents, interests, and physical and psychological development. This regulation emphasizes the importance of creating an engaging and student-centered learning environment that promotes active participation, critical thinking, and the holistic development of learners (Hidayat, 2019). According to Kalsum et al., (2022) fun and successful learning can be combined with the surrounding environment where students can try, search, think and find solutions to the problems they face. One lesson that can bring students closer to their environment is learning science.

Science learning in SD/MI is one of the lessons that has an important role in providing knowledge about the natural sciences, besides that it can provide a good learning experience for students. This is in line with the expressions (Juita, 2019) dan and Singh found in research (Abrogena & Lorenzo, 2023) that learning science is one of the most important lessons in school because its relevance relates to students' daily lives. The purpose of learning science in SD/MI is to shape the child's personality as a whole, so students can develop knowledge and understanding of science concepts that are useful and can be applied in everyday life (Istiana et al., 2016). In the science learning process students do not only listen, read and do assignments given by the teacher, but students are also given the opportunity to prove the truth of existing theories.

Based on the results of observations in the science subject of class V SD Negeri 1 Lawela, Batauga District, Buton Selatan Regency, Southeast Sulawesi, the researchers found data on test results at the end of the semester for students, especially learning Science, found that students only reached 67% with Minimum Mastery Criteria (KKM) 70. In addition, the low motivation and ability to think creatively was shown by the answers of students who were only fixated on books. One of the models used in the learning process is the conventional learning model in the form of transferring knowledge from the teacher/educator to students using the lecture method and giving assignments. Furthermore, the reality in the field found that students felt bored and less interested in learning science. This is because, in learning mastery of the material, students are still asked to memorize the material that has been given by the teacher

Based on the problems that occur the teacher must choose a model that is in accordance with the learning objectives to increase motivation, creative thinking skills, maximize student learning outcomes in science learning, and based on the fact that each student has different capacities and levels of thinking, because the model Appropriate learning will affect the success of students.

LITERATURE REVIEW

One of the appropriate learning models and can maximize student learning outcomes in science learning is the discovery learning model Research by Siswanti, (2019) shows that this model is effective in developing active learning, focusing on learning topics, and enabling students to explore and discover on their own. Learning outcomes obtained through this model tend to be more robust and can be remembered for a longer period of time (Sahrul & Yuanita, 2020). Discovery learning can also help students understand abstract concepts through the process of discovery. In addition, this model can also increase students' self-confidence, problem-solving abilities, creativity, motivation, and curiosity in learning Nazifah et al., (2022). This learning model also aims to encourage students to be active in seeking information, develop exploratory skills, and reduce dependence on the teacher in the learning process.

According to Setyaningrum et al., (2020); Safitri & Mediatati, (2021) that Discovery learning places more emphasis on

discovering knowledge concepts and as a teaching method that is structured in such a way that students acquire knowledge that they did not know before, not through notification, but partially or wholly discovered by themselves. Discovery learning in its application also involves the process of other physical activities, thus bringing students to learning that can increase their motivation and creativity (Juniarso, 2020). Discovery learning is part of a process-oriented teaching practice where students construct their own knowledge by conducting experiments to uncover the principles behind the experiment (Rahman, 2017; Primantiko *et al*., 2021). In this discovery-based learning model, students can make many discoveries from the theories and facts they encounter and have encouragement to build their cognitive abilities in learning. Drive, desire, and will are all components included in the term motivation

Motivation is an internal process that initiates, directs, and sustains behavior over time and is considered a psychological aspect within an individual (Indah & Nuraeni, 2021). In the context of teaching and learning, motivation is crucial for both teachers and students. For teachers, understanding students' learning motivation is essential for maintaining and enhancing their learning enthusiasm. Meanwhile, for students, a fundamental motivation to learn can cultivate a sense of enthusiasm that drives them to engage in learning activities. The motivation of students in learning will have a positive impact when they are provided with an appropriate learning environment. However, if students are faced with conditions that do not align with their learning motivation, they may not achieve optimal learning outcomes, leading to negative effects on their learning achievements (Primantiko et al., 2021).

In the learning process, an individual's creativity has a significant influence (Fatmawati, 2016). Creativity is not solely determined by genetic factors but can be developed through habits and practice (Oktiani, 2017). Therefore, teachers have the responsibility to provide more opportunities for students in learning activities to stimulate and nurture their creativity. The potential for students' creativity can be observed when they can use imagination and generate new ideas to solve problems or address specific situations. This indicates that a person's creative thinking ability improves when they can generate multiple relevant answers to a given problem. One reason for low creative thinking abilities is the lack of variation in the implementation of teaching models. Hence, understanding and mastery of various teaching models are crucial to achieve success and effectiveness in learning objectives.

One of the goals to achieve in learning activities is to improve students' learning outcomes. Learning outcomes refer to the level of success that a student can achieve after going through experiences and assessments. This is typically indicated by a specific grade or numerical value and leads to changes in cognitive, affective, and psychomotor aspects (Putri et al., 2017). The success of an educator in the learning process can be seen through the attainment of passing standards by the students (Rahman et al., 2019).

Based on the aforementioned issues, the objective of this research is to analyze the differences in the influence of the discovery learning model on motivation, creative thinking ability, and learning outcomes of students compared to the conventional model in Grade V of SD Negeri I Laweala, Kec. Batauga, Kab. Buton Selatan.

MATERIALS & METHODS

This study used a quasi-experimental research design involving two class groups, namely the experimental class and the control class. The experimental class group will apply the discovery learning model, while the control class group will apply the conventional learning model. The design used in this study is the Nonequivalent Control Group Design. In this design, the experimental class group and the control

class group were not randomly selected, but had existed before. Even so, this study still uses the control group as a comparison to see the difference in effect between the two learning models.

By using the Nonequivalent Control Group Design, this study will compare the effect of the discovery learning model with conventional learning models on the observed variables, such as motivation, creative thinking abilities, and student learning outcomes. In this study, data will be collected through observation, questionnaires, tests, and documentation to analyze the differences between the two class groups. The design of this study is presented in Table 1 below.

Table 1 Research Design Nonequivalent Control Group Design

group	Pre-test	Treatment	Post-test
A	O_1	X	O_2
B	O_3		O_4

Sumber: Sugiyono, (2019)

Information:

A : Experiment Group
B : control group
O_1, O_3 : Pre-test (observation before being given treatment)
X : Pemberian perlakuan
O_2, O_4 : Post-test (observation after being given treatment)

STATISTICAL ANALYSIS

In this study, before conducting the experiment, the researcher gave a questionnaire and a pre-test to the two predetermined class groups. After that, the two sample groups were given treatment according to their respective groups, and ended with giving a questionnaire and post-test. Data collection techniques used include tests and non-tests. The test instrument consists of multiple-choice tests and essays, while the non-test instrument involves observing the actions of teachers and students during the learning process. In addition, the questionnaire was also used to collect data related to students' learning motivation.

The content validity in this study was evaluated by three expert assessors, namely science and language lecturers who determined the content validity of this study. Then to find the reliability of the instrument used the Cronbach's alpha method, where a research instrument is considered reliable if it has a value of $r_{11} > 0.6$ (Siregar, 2017). Furthermore, in analyzing the data, this study used prerequisite tests, namely normality and homogeneity tests. The normality test was carried out using the Kolmogorov-Smirnov test to determine whether the data is normally distributed or not. Meanwhile, the homogeneity test aims to ensure that the variance between groups is homogeneous or balanced. In this study, in addition to the prerequisite tests previously mentioned, the N-Gain test was also carried out to calculate the increase between the pre-test and post-test by using the formula (Hake, 1998) as follows.

$$\text{N-Gain} = \frac{posttest\ score - pretest\ score}{max\ score - pretest\ score}$$

The criteria for obtaining the N-Gain score can be seen in Table 2 below.

Table 2. N-Gain Criteria

Classification	Category
g > 0,7	high
0,3 ≤ g ≤ 0,7	medium
g > 0,3	low

After the prerequisite test is carried out, the next step is to test the hypothesis. The hypothesis testing used is the prametric statistical t-test of two independent samples (independent sample t-test) with the help of the SPSS 25 application which aims to find out the difference between the control group and the experimental group

RESULT & DISCUSSION

This study discusses the variables including; motivation, creative thinking skills and student learning outcomes using the discovery learning model in class V Elementary School. Before testing the hypothesis, the test instrument is tested for validity to ensure that the test instrument is suitable for use in research. The samples to be examined in this study were class VA and

class VB with a total of 58 students. The VA class consisted of 30 students as the experimental class and the VA class consisted of 28 students as the control class. After the instrument is declared valid, the next step is to find the reliability of the questionnaire instrument and the test items tested in different classes. Based on the reliability test of the questionnaire and test questions using Cronbach's alpha, the questionnaire obtained a value (r_{11}) of 0.612, while the test instrument for creative thinking ability and learning outcomes obtained values of 0.627 and 0.637. Based on the test criteria, if the instrument reliability value (r_{11}) > 0.6.

Before conducting data analysis, namely the prerequisite test, namely normality and homogeneity. The results of the normality test were obtained from data processing of motivational questionnaires, creative thinking abilities, and student learning outcomes. The data is considered to have a normal distribution if the significance value is more than 0.05 and if the significance value is less than 0.05 then the data is not normally distributed.

The first objective in this study used by researchers was a non-test instrument in the form of a questionnaire to analyze the differences in the effect of the discovery learning model on the learning motivation of students taught by conventional models. Student learning motivation questionnaires were distributed before and after learning in the experimental class and the control class. The results of the average score data for classes taught using the discovery learning model and conventional classes have very different values. Data on the average score of the pre-test and post-test of students' learning motivation can be seen in Table 3.

Table 3. Pre-test and post-test average score data of students' learning motivation in the experimental class and control class

Motivation Study	Average Score	
	Pre-test	Post-test
Experiment Class	66,64	91,23
Control Class	66,50	84,36

Based on Table 3 above, it shows that the results of the average value of students' learning motivation obtained a higher post-test score for the experimental class than the control class. This happens because the teacher uses a conventional approach which tends to make students bored and less enthusiastic so that it shows the learning motivation of students in the control class who are taught in the conventional model are less effective and innovative compared to the discovery class. This is similar to what was expressed by Murtiyasa & Al Karomah, (2020) that learning with the discovery model is more effective and innovative compared to the conventional learning model of the Control class.

The normality test of the post-test of learning motivation shows that the data is normally distributed if the significance value is more than 0.05 and if the significance value is less than 0.05 then the data is not normally distributed. The significance of the data in the experimental class learning motivation questionnaire was 0.106 and 0.200 in the control class. While the results of the homogeneity test obtained from the experimental class learning motivation questionnaire data were 0.646, because the significant level obtained was greater than 0.5, the data could be said to be homogeneous.

After carrying out the prerequisite tests (normality test and homogeneity test), the next step is to test the hypothesis. To test the hypothesis in this study, an independent sample t-test was used with the help of the SPSS 25 statistical application. An independent sample t-test was conducted to see if there was a difference in the post-test results of students from the experimental group and the post-test of students from the experimental group. control. The results of hypothesis testing are presented in Table 4.

Table 4. Test the difference in learning motivation of students in the experimental class and the control class

Independent Samples Test								
		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Motivation Study	Equal variances assumed	6.565	56	.000	6.876	1.047	4.778	8.974
	Equal variances not assumed	6.554	55.228	.000	6.876	1.049	4.774	8.979

Based on Table 4 above, the independent sample t-test data of the students' learning motivation questionnaire used with SPSS 25 obtained a sig. (2 tailed) of 0.00 <0.05, which indicates that H0 is rejected and H1 is accepted. So it can be concluded that there is a difference in the average learning motivation of students in the experimental class and the control class and has a significant difference.

The existence of a significant difference between the learning motivation of students in the experimental class and the control class cannot be separated from several factors. As stated by (Rubiana & Dadi, 2020) that there are two factors that influence learning motivation, namely intrinsic and extrinsic factors. Intrinsic motivation is motivation from internal factors that come from within the individual to do something he wants. While extrinsic motivation is the motivation of external factors caused from outside the individual. Motivation in teaching and learning is very important because learning motivation can encourage and move students to achieve the desired goals.

Using the discovery learning model, teachers can increase students' learning motivation, because the discovery model is learning that involves students in mental activity processes such as discussing, exchanging opinions, and trying to learn on their own. This is in line with the findings of previous research conducted by (Sari et al., 2021) showing the use of the discovery learning model in science learning can increase students' motivation to learn because students are more active in learning and more confident in expressing their opinions

The second objective of this research is the test instrument used by the researchers to analyze the differences in the influence of the discovery learning model on creative thinking ability compared to the conventional model. The analysis results of the students' creative thinking abilities in the experimental and control classes were obtained after 6 sessions. The pre-test was administered in the first session for both the experimental and control classes. The second and fifth sessions involved the implementation of the discovery learning model in the experimental class, while conventional learning was conducted in the control class. The post-test for creative thinking ability was administered in the final session for both the experimental and control classes. The results of the pre-test and post-test, including the average scores of creative thinking ability, are presented in Table 5.

Table 5. The data results of the average scores of creative thinking ability for the control class and the experimental class of students.

Creative Thinking Ability	Average Score	
	Pre-test	Post-test
Experiment Class	58,10	87.93
Kelas Kontrol	62,14	81.43

Based on Table 5 above, it can be seen that the average scores of creative thinking ability in the post-test for the experimental class are higher than those of the control class. This is because in the learning process of the control class, the teacher did not provide enough opportunities for students to practice their thinking skills in discovering the unknown, while according to Widiasworo and Fahrurrozi cited by (Setyaningrum et al., 2020; Safitri & Mediatati, 2021), the learning model that emphasizes the discovery of knowledge concepts and is designed in such a way that students acquire knowledge that they previously did not know, not through lectures, but through self-discovery, either

partially or wholly. Therefore, the creative thinking ability of students taught with the discovery learning model is higher than that of the conventional model, which is lecture-based.

The normality test for the post-test of creative thinking ability indicates that the data is normally distributed if the significance value is greater than 0.05, and if the significance value is less than 0.05, then the data is not normally distributed. The significance value for the creative thinking ability data in the experimental class is 0.142, and in the control, class is 0.110. Meanwhile, the homogeneity test results for the creative thinking ability data in the experimental class yield a value of 0.145. Since the obtained significance level is greater than 0.05, the data can be considered homogeneous.

Furthermore, the analysis of the differences in creative thinking ability of students taught through the discovery learning model and the conventional learning model is conducted using an independent sample t-test with the assistance of SPSS 26. The results of the hypothesis test are presented in Table 6.

Table 6. The test for the difference in creative thinking ability between the experimental class and the control class of students.

Independent Samples Test								
		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Creative Thinking Ability	Equal variances assumed	5.868	56	.000	6.505	1.109	4.284	8.726
	Equal variances not assumed	5.886	55.982	.000	6.505	1.105	4.291	8.719

Based on Table 6 above, the independent sample t-test or the test for the difference in average scores of post-tests creative thinking ability taught using discovery learning in the experimental class and conventional learning in the control class yielded a sig. (2-tailed) value of 0.000 < 0.05, thus rejecting the null hypothesis (H0). This indicates that there is a significant difference in the average scores of creative thinking ability between the experimental class and the control class.

The results of the classical mastery calculation show that the proportion of students who achieved mastery exceeded the predetermined criteria. This is due to the discovery learning approach that emphasizes the process of discovery conducted through group learning. As stated by Amiruddin (2019), group learning involves teamwork that encourages students to explore various opinions through collaborative problem-solving with their creative ideas, thereby achieving optimal learning outcomes.

These findings are supported by the research of Cintia et al. (2018), which showed that the discovery learning model can enhance students' creative thinking, with initial scores of 33.2% increasing to 81.2%. Similarly, Prastika et al. (2021) concluded in their study that creative thinking ability through discovery learning has a significantly more positive impact compared to the conventional learning model.

Furthermore, the final objective of this research is to analyze the difference in the influence of the discovery learning model on students' learning outcomes compared to the conventional learning model. The impact of the discovery learning model on students' learning outcomes aligns with one of the advantages of this model, which is to assist students in enhancing their skills and cognitive processes. The average scores of the learning outcomes obtained by the students can be presented in Table 7.

Table 7. Average scores of learning outcomes for the experimental class and the control class of students.

Learning Outcomes	Average Score	
	Pre-test	Post-test
Experiment Class	52,66	88,33
Control Class	45.00	77.86

Based on Table 7, it can be observed that the average post-test scores of the experimental class are higher than those of the control class. This is because the control class uses a conventional or lecture-based teaching

model, which hinders students' ability to critically evaluate problems and express what they have learned. On the other hand, the experimental class, which is based on discovery learning, has the advantage of helping students change and train their thinking processes to enhance their knowledge and skills. As a result, it becomes easier for students in the experimental class to evaluate the problems presented. According to Taufiq et al. (2018), such changes occur in individuals as a result of acquiring knowledge and skills through genuine effort over a specific period of time. Therefore, it can be concluded that the experimental class taught with the discovery learning model performs better than the control class taught with the conventional model.

The normality test for the learning outcomes post-test indicates that the data is normally distributed if the significance value is greater than 0.05. In this case, the significance values for the experimental class and the control class are 0.64 and 0.52, respectively, indicating normal distribution. Furthermore, the homogeneity test for the learning outcomes data yields a value of 0.413. Since the obtained significance level is greater than 0.05, the data can be considered homogeneous.

After conducting the normality and homogeneity tests for the learning outcomes, the analysis of the difference in post-test scores between the experimental class taught with the discovery learning model and the control class taught with the conventional model is conducted using an independent sample t-test with the assistance of SPSS 26. The results of the hypothesis test can be presented in Table 8.

Table 8. The test for the difference in learning outcomes between the experimental class and the control class of students.

Independent Samples Test								
		t-test for Equality of Means						
		t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
							Lower	**Upper**
Learning Outcomes	Equal variances assumed	5.922	56	.000	10.476	1.769	6.932	14.020
	Equal variances not assumed	5.874	51.342	.000	10.476	1.784	6.896	14.056

Based on Table 8, it can be seen that the independent sample t-test with equal variances assumed, conducted using SPSS 26 at a significance level of 5%, shows that the post-test scores of the learning outcomes for the discovery learning class and the conventional class have a sig. (2-tailed) value of 0.000 < 0.05. Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. This indicates that there is a significant difference in the average learning outcomes between the experimental class and the control class.

The use of the discovery learning model by teachers provides students with freedom and opportunities to discover knowledge on their own. By discovering knowledge independently, students can develop a deeper understanding of the material being taught. This self-discovery process can have a positive impact on students' learning outcomes (Karaeng et al., 2022).

The difference in learning outcomes between the discovery learning class and the conventional class is due to the different activities that take place during the learning process. In the experimental class, where students are taught using the discovery learning model, the emphasis is placed on the discovery process, allowing students to delve deeper into the material and discover the concepts on their own. On the other hand, in the control class, the learning activities are more monotonous, with students receiving information primarily from the teacher, which can result in a lack of meaningful engagement with the material being taught. According to Sari et al. (2016), the curiosity of students can be stimulated by the discovery learning model, which also helps

them develop social skills when working in groups, express their opinions, speak in public, and try to find and investigate information to understand the material.

The use of the discovery learning model in teaching can have a positive impact on learning outcomes. This is supported by the research findings of Arieshandy et al. (2022), which showed that the discovery learning model can enhance students' learning outcomes. The pre-cycle learning outcomes score was 38%, which increased to 79% after implementing the discovery learning model. Further research conducted by Arpin et al. (2021) found a difference in the average learning outcomes between the experimental class taught with the discovery learning model and the conventional class. The experimental class obtained an average score of 77.46, while the control class obtained an average score of 69.68.

The N-gain test results showed that the average motivation for learning was 0.736, while the creative thinking ability was 0.705. The students' learning outcomes obtained an average N-gain score of 0.752, which is categorized as high. This finding is supported by relevant research conducted by Asrul et al. (2020), which indicated that discovery learning had a significant positive impact on the learning outcomes of elementary school students.

CONCLUSION

Based on the discussed results, it can be concluded that (1) the discovery learning model has a significant and better improvement in students' learning motivation compared to the conventional model in Science education at SD Negeri 1 Lawela; (2) the discovery learning model has a significant and better improvement in students' creative thinking ability compared to the conventional model in Science education at SD Negeri 1 Lawela; (3) the discovery learning model has a significant and better improvement in students' learning outcomes compared to the conventional model in Science education at SD Negeri 1 Lawela.

Declaration by Authors

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