

A DESIGNING OF DISCOVERY LEARNING APPLICATION TO ENHANCE THE ELEMENTARY STUDENTS' UNDERSTANDING OF SCIENCE LEARNING BASICS AT KLATEN REGENCY INDONESIA

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Abstract

The purpose of this study was to measure the results of designing of the Discovery Learning model application in enhancing the students' understanding of the basic concepts of science learning. This research was conducted at SD Negeri 1 Jabung, Klaten Regency, Indonesia in the 2021-2022 academic year. The subjects of this study were the fifth grade students of SD Negeri 1 Jabung, Klaten Indonesia, as many as 22 students. To achieve the research goals, the class action research was adopted. The research instrument used was multiple choice through written test. Research data were collected through student learning outcomes tests in each first cycle and the second cycle. The data analysis technique was carried out by using descriptive methods to determine the mean, median, mode, presenting class intervals and presenting them in tables. The results of this study indicated that: 1) The application of the Discovery Learning learning model in the first cycle achieved an average value of students' science learning outcomes of 72.54 with a passing rate of 68%. 2) The application of the Discovery Learning model in the second cycle has increased with an average value of 78.54 with the passing rate of 82%. 3) Implementation of the Discovery Learning model can increase students' science learning outcomes from the first cycle to the second cycle by 6% with the passing rate of 82%. Thus, it can be concluded that the application of the Discovery Learning model can improve science learning outcomes for the fifth grade students of SD Negeri 1 Jabung, Klaten Regency, Indonesia.

Keywords: *Implementation, Discovery Learning, Enhance, Science Learning Basic*

INTRODUCTION

In particular, the purpose of learning science at the elementary school level is to increase students' knowledge about the universe and all living things and their function as living things to their environment. According to [Awang \(2015\)](#) the purpose of learning science in elementary schools is to increase students' curiosity about things related to science to develop the ability to ask and answer natural phenomena. Given the importance of science lessons being mastered by students, science lessons are claimed to be lessons that should not be studied ([Ukoh, 2012](#)), as the basis of science for students to be able to master science and technology ([Checkley, 2010](#) and [Haqiqi, 2018](#)). Science learning in elementary schools is also related to how students understand the natural state in a systematic way, so that science learning is not just knowledge consisting of facts presented to students, concepts, or mere principles. Science learning is closer as a vehicle for elementary school students as a process of discovery ([Devi, 2010](#)). Through this vehicle, it is hoped that elementary school students can understand themselves as living beings who have functions and depend on the existence of other creatures, understand the surrounding natural conditions such as the diversity of plants, animals and other natural phenomena as a complementary system in the universe ([Manalu et al., \(2015\)](#)).

The students' target of learning science at the elementary school level is expected to be able to understand the development of aspects of science process skills in a simple universe. According to [Sudana&Astawan \(2013\)](#) aspects of skills in the science process are observation, classification, measurement, identification and control of variables, formulation of hypotheses, experimental design, inferring experimental results, and communicating experimental results. Furthermore, [Samatowa \(2006\)](#) emphasizes that the competencies which should be mastered by students are being able to observe what is

happening around them, try what is observed, apply the knowledge taught in school, and predict a condition based on natural conditions. [Manalu et al., \(2015\)](#) explain that one of the competency standards that students must have is being able to be scientific with a high attitude and curiosity, ask questions, collaborate, and care about living things in their environment. Meanwhile, instructionally, elementary school students who are declared successful in participating in science learning are students who experience a change in attitude and are able to follow the learning process with a responsible and independent attitude and are able to achieve learning outcomes in accordance with the minimum standard criteria set by the school.

However, empirical facts shown that the above learning objectives have not been achieved at the elementary school level in Klaten Regency, especially in SD Negeri 1 Jabung, Klaten Regency due to certain factors. In general, there are two factors that influence students' problems in understanding the concept of science learning at the elementary school level, namely internal factors and external factors ([Haqiqi, 2018](#) and [Subekti et al., 2021](#)). Internal factors are factors that come from within the students themselves while external factors are factors that come from outside the students themselves. Internal factors that cause student learning difficulties consist of student interests, motivation, talents and things that come from within students which become obstacles for students to be able to follow learning effectively. The problem of external factors consists of the learning environment, low family and parental support, learning methods and learning media that are not innovative. External factors that most influence the difficulty of students, students' success, improving students' learning outcomes is the role of the teacher in the classroom. [Andri et al., \(2020\)](#) revealed that the factor causing students' difficulties in learning science is the lack of use of media that can support or clarify the material so that students easily understand the material presented. Learning media plays an important role in students' understanding of learning, especially students who have visualistic characters.

In addition, other research findings indicated that the problems faced by students in learning science were the many foreign language terms used (Latin and English) so that students find it difficult to remember terms and understand them ([Khoir, 2008](#)). Actually, the problem in learning science in elementary schools is the teacher's role in carrying out scientific and creative learning in the classroom which was not yet optimal ([Bunterm et al., 2014](#), [Khalaf&Zin, 2018](#), [LianZhai, 2019](#), [Gumilar, 2020](#), and [Sopian et al., 2021](#)). In science learning, teachers are required to be able to compile relevant teaching materials according to the student's character and learning instruments to evaluate the results.

Based on the observations of researchers at SD Negeri 1 Jabung, Klaten Regency, the problems described above were also found in the classroom. The main problem found by the author in class V SD Negeri 1 Jabung was students' understanding and activeness were still low because students' participation in the learning process has not been optimally involved. Documentation studies in the field shown that the average of the fifth grade students' of SD Negeri 1 Jabung was 45. In total, the number of the fifth grade students' consists of 20 students, where the number of students who achieved the passing standard of 75 was 7 students which was equal to 35%. Meanwhile, students who did not reach the passing standard were 13 students and was equal to 65% of students did not reach the minimum completeness criteria. The student learning outcomes above required an efforts to improve the learning process on students' understanding of science concepts for fifth grade students at SD Negeri 1 Jabung. For this reason, teachers need to apply learning models which has the high relevant to the character of students and the character of the learning material being taught. Theoretically the right learning model to be applied in this learning was discovery learning.

The discovery learning is a learning model which encourages students to be actively and independently involved in finding the information they need in accordance with the learning material being studied ([AkhsanaulIn'am, 2017](#)). This discovery learning requires teachers to be more creative in creating situations in the classroom so that students learn actively in discovering their own knowledge so that they can increase science knowledge competence ([Suyani et al., 2020](#) and [Suari&Astawan, 2021](#)). This learning model can create a transformation of activity-based learning methods for students and can encourage students to collaborate and be independent so that the conditions of the learning process become meaningful, and students easily remember the material being studied because students themselves

find facts and concepts in learning (Kusumawati&Sudarisman, 2003 and Ningsih et al., 2019). The results of previous studies showed that the application of discovery learning learning models can improve students' critical thinking skills, students' activity in learning and improve students' learning outcomes (Rahayu et al., 2019; Erlidawati&Habibati, 2020, and Serviñana&Mansuridin, 2020). Azhari&Nurita (2021) revealed that the effect of the application of the discovery learning has an effect on increasing students' understanding of written science learning materials in elementary schools with an average value of 86.76.

In the application of the discovery learning, the teacher acts as a mentor and facilitator who helps direct students to be actively involved in constructing their knowledge through trial practice and discovering the principles of the trials that have been carried out (Hannya& Kristin, 2020). (Widoretno&Dwiastuti, 2019) stated that this learning model can encourage students to be actively involved in finding themselves a concept or principle that they do not know. Discovery learning can also train students' knowledge acquisition skills and cognitive abilities. According to Maya (2019), the application of the discovery learning has several advantages, namely generic code, facilitating transfer, and retention. The transferability that has developed is referred to by Bruner as intellectual (Maya &Kartono, 2020). The development of the discovery learning is expected to improve science learning outcomes (Azura&Kamariyah, 2019 and Rahmayani, 2019). So the purpose of this study was to determine the effectiveness of the discovery learning on students' understanding of the science concept of fifth grade students at SD Negeri 1 Jabung, Klaten Regency.

RESEARCH METHODS

The research design was class action research with the type of individual action research. According to Sugiyono (2018), action research is a scientific way to obtain data with the aim of finding new problems and actions that can be used to solve problems, improve or improve work situations. To obtain effective and efficient action, the action is tested through several cycles, until a consistent action is found that can improve the situation. Meanwhile, individual action research is research conducted individually on social situations on a small scale such as in organization, production, and class. Meanwhile, individual action research is research conducted individually on social situations on a small scale such as in organization, production, and class. The type of data in this study is quantitative data in ordinal form. Ordinal data is quantitative data in the form of rankings taken from measurement results (Sugiyono, 2019).

This research was conducted at SD Negeri 1 Krajan, Klaten Indonesia. The subjects of this research come from the fifth grade students at SD Negeri 1 Jabung with the total 22 students. This class was elected as the subject of this research due the students' learning achievement in this class was very low before the researcher gave the treatment. The instrument used to collect data was students' learning outcome test in the form of multiple choice which consisting of 4 choices. Data was collected through a written test at SD Negeri 1 Krajan, Klaten Indonesia. The data were analyzed descriptively to describe and explain the improvement of student learning outcomes based on the cycle. The method used to analyze the data from this research was descriptive method. For quantitative data, it was analyzed by finding the mean, median, mode, and presenting it in tabular form. The data were analyzed to explain the results of the actions given in each research cycle and to compare the results of the actions given between one cycle and another. The research procedure can be seen below:

Planning

At this stage the researcher developed lesson plan in accordance with the provisions of the national curriculum policy at the elementary school level, namely a scientific and thematic-based learning plan. In developing the lesson plan based on discovery learning concepts and thematic learning plans, the writer consulted with other teachers to create instruments and develop teaching materials. At the preparation stage, an agreement was made between the subject teachers. The design was carried out jointly between researchers who will take action with other teachers.

Actuating

The implementation phase of the action was carried out by learning of the fifth grade students at SD Negeri 1 Jabung, Klaten Regency, Indonesia. At this stage the researcher taken an action in the research process by implementing the discovery learning. This learning designed has previously been carefully studied to be applied in the classroom according to the learning steps based on the syntax of the discovery learning theoretically. Learning scenarios were implemented effectively by following the planning created in the lesson plan in order to achieve the goals stated.

Observing

This stage actually ran concurrently with the implementation of learning process in the class each of the research cycles. Observations were made when the action or learning activities was running in the class room, so both took place at the same time. At this stage the teacher who acts as a researcher made deep observations and records all things that occurred during the implementation of the ongoing learning. This data collection was carried out using students' achievement tests, including the results of observations in the classroom from time to time and their impact on students' learning processes and outcomes.

Reflecting

This stage was intended to thoroughly review the actions that have been taken, based on the data that has been collected, then an evaluation was carried out in order to make more perfect the next action the before actions. Reflection in research included analysis, synthesis, and assessment of the results of observations of the actions taken. If there were problems from the reflection process, a review process was carried out through the next cycle which included activities: re-planning, re-action, and re-observation so that the students' problem can be resolved.

RESEARCH RESULTS AND DISCUSSION

1. The Result of Students' Understanding of Science Basic

Before applying the discovery learning, the researcher conducted a pre-cycle assessment to determine the previous student's level of mastery about the science basics. In order to apply this learning model in the first cycle, 4 meetings were held and the second cycle was 4 meetings. Researchers made observations in each cycle after the learning process was completed in 4 meetings. The next step was for researcher to measure the level of understanding of students' science concepts. The measurement results can be seen in the following table below.

Table 1. The Result of Students' Understanding of Science Basic

Indicator of Science Understanding	Result of Observations		
	Pre-Cycles	First Cycle	Second Cycle
Ability to answer questions	28.90	30.10	28.15
Ability to ask questions clearly and logically	26.59	25.73	25.63
Ability to express opinions clearly	22.54	22.33	23.95
Ability to find new ideas	21.97	21.84	22.27

2. Science Learning Outcomes

Before applying the discovery learning, the researcher conducted a pre-cycle assessment to determine the level of students' mastery before being given treatment. In order to apply this learning model in the first cycle, 4 meetings were held and the second cycle was 4 meetings. Researchers made observations in each cycle after the learning process was completed in 4 meetings. The next step was researchers gave the exams to students to measure students' learning outcomes. The measurement results can be seen in the following table below.

Table 2. Students' Learning Outcomes on Each Cycles

Criteria	Learning Outcomes Percentage		
	Pre-Cycles	1 st Cycle	2 nd Cycle
Score Totally	60.00	72.54	78.54
Evarage	41%	68%	82%
Highset Score	80	88	96

Lowest Score	40	45	40
Median	60	76	80
Modus	50	76	88
Number of Students Passing	9	15	18
Number of Students Not Passing	13	7	4

3. Discussions

The results of observations and reflections in the first cycle showed that students who were able to answer the given questions achieved an overall score of 62 with a percentage of 30.10%, students were able to ask questions clearly and logically reached a score of 53 with a percentage of 25.73%, could express their opinions clearly reached a score of 46 with a percentage of 22.33%, can find new ideas achieving an overall score of 45 with a percentage of 21.84%. From the observations above showed that the learning process has given the impact on the students' critical thinking skills. Means that the students' critical thinking skills have increased from the previous results (pre-cycle). The activeness of students in the learning process has been seen to be active and students' participation in the learning process has looked better, but has not yet reached the standard of completeness which set out in this study. Question and answer activities between researchers and students have been seen effectively. During the discussion process, the activeness of students in solving existing problems was seen. In the experimental process outside the classroom, students' participation was good. It's just that when presenting the results of the discussion some students were still reluctant to be embarrassed. In one group there were still students who were embarrassed to present the results of their discussion.

Based on the results of the evaluation of the first cycle value above, it can be concluded that the student's score increased from the previous test score (pre-cycle). From the number of students 20 students, 15 students were claimed completed and 5 students were still below the minimum completeness criteria with the completeness percentage of 68%. The average score of students in first cycle was 72.54 and it has reached below the minimum completeness criteria specified at SDN 1 Jabung and the success target set by the researcher. In the implementation of the first cycle the researcher still found various obstacles during the learning process, namely there were still students who were less active in the learning process, and in the process of delivering the results of the discussion they were still not enthusiastic and felt embarrassed so that the expected results were not optimal. Based on the facts revealed in first cycle, the researchers continued and improved discovery learning-based learning activities in the second cycle. By providing more effective treatment to students, it is expected to be able to improve the obstacles experienced by students in first cycle, namely the low ability to understand science concepts and student activity in learning. The problem of not achieving the indicators of classroom action research in first cycle often occurs in several studies that have been carried out previously such as (Azhari&Nurita, 2021; Suari&Astawan, 2021).

The results of measuring learning outcomes about students' understanding of science subjects increased in the second cycle. This increase in learning outcomes can be seen from first table and second table above that students who were able to answer the questions given by the researcher reach an overall score of 67 with a percentage of 28.15%, students were able to ask questions clearly and logically achieve an overall score of 61 with a percentage of 25.63%, students can express his opinion clearly achieves an overall score of 57 with a score of 23.95%, can find new ideas reaches an overall score of 53 with a percentage of 22.27%. From the observations made by researchers in the learning process that students' critical thinking skills have increased from the previous results cycle in first cycle. The activeness of students in the learning process looks active. Student participation in the learning process looks enthusiastic. The question and answer activity between the researcher and the students was very enthusiastic. When the discussion process takes place, the activeness of students in solving problems can be seen from the way they express their opinions. The process of delivering the results of discussions or presentations in front of the class for each group has made progress. The

obstacles found in the learning process in first cycle were successfully overcome by providing more effective actions.

Based on the results of the evaluation of the value of the second cycle above, it can be concluded that the student's score increased from the previous test score. From the number of students, 22 students were 18 students who completed and 4 students were still below the minimum completeness criteria with the completeness percentage of 82%. The highest score in the second cycle was 96 and the lowest score in the second cycle was 36. The average value of students in the second cycle was 78.54 which was below the minimum completeness criteria specified at SDN 1 Jabung and the success target set by the researcher. The test results obtained by students were more improved than the results of the previous test. In the implementation of the second cycle the researcher managed the learning activities to be better to overcome the obstacles that existed during the learning process in the first cycle, namely there were still students who were less active in the learning process, and in the process of delivering the results of discussions or presentations they were still less enthusiastic and reluctant to be embarrassed so that the expected results were not optimal. By using the discovery learning and the technique of giving more effective actions so that students can increase their enthusiasm for learning, student discussion activities have an impact on student learning outcomes. The obstacles encountered by researchers in first cycle can be overcome properly so that students' learning outcomes have increased.

CONCLUSION

Based on the results of the discussion above, the conclusions of this study can be formulated as follows:

1. The application of the discovery learning can improve the understanding of science concepts for fifth grade students of SD Negeri 1 Jabung, Klaten Regency, Indonesia.
2. The average of learning outcomes on understanding science concepts for fifth grade students of SD Negeri 1 Jabung, Klaten Indonesia, in the first cycle was 72.54 with a passing rate of 68%.
3. The average of learning outcomes on understanding science concepts for fifth grade students of SD Negeri 1 Jabung, Klaten Indonesia, in the second cycle was 78.54 with a passing rate of 82%.
4. The increase in learning outcomes on understanding science concepts for fifth grade students of SD Negeri 1 Jabung, Klaten Indonesia from first cycle to the second cycle was 6%.
5. The explanation of these results proven that the discovery learning was very effectively applied in the learning process to activate students, deepen understanding of concepts, provide meaningful understanding of the material and improve student achievement.

SUGGESTIONS

Based on the results of the research and the conclusions above, the writer's suggestions are as follows:

1. For science teachers at the elementary school level, considering that this model has been proven to be effective in improving student achievement, it is recommended try to apply the discovery learning in the science learning process in the class room.
2. For other researchers, although this research has been able to prove the implementation of discovery learning in improving learning achievement, it is certain that in this study there are still things that have not been perfectly done, therefore it is recommended to other researchers who are interested in researching the topic. The same goes for researching parts that have not been studied.
3. For education developers, to improve teacher creativity and professionalism, further research is needed to verify the data from this research so that the conclusions obtained are able to provide the validity of the overall use of the model.

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