



# Implementation of Experimental Methods to Improve the Learning Outcomes of Science Class I School Students

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## Abstract

This study aims to describe the application of the experimental method to improve science learning outcomes for second grade elementary school students. This type of research is action research. This study uses a qualitative descriptive analysis technique. The results of the research show that increasing activeness and learning outcomes through the application of experimental methods to science subjects has been successful. This can be proven by the results of cycle tests showing a significant increase as evidenced by an increase in activity and student learning outcomes. The percentage of completeness of student learning outcomes based on preliminary data is in the good category with a percentage of 63.92%. First cycle of research it increased to a good category with a percentage of 73.54% and in the second cycle it became a very good category with a percentage of 80.13% which had achieved the KKM value that had been set.

**Keywords:** *activeness; experimental method; learning outcomes*

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## Introduction

The function of national education is to develop and shape the character of a dignified national civilization in order to educate the nation 's life, this is in accordance with Law no. 20 of 2003 concerning the 2003 National Education System Chapter II Article 3 as follows. "National education aims to develop the potential of students to become human beings who have faith and are devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizen" (Hapsari & Hanif, 2019). Education is a central point in building the sustainability of the Indonesian nation from generation to generation (Hamilton et al., 2021). In realizing this function of national education, there is a forum that prints generations of the nation from time to time to be able to continue the civilization of the Indonesian nation, that container is a school (Huang et al., 2020). A good educational process and from quality schools can create quality Human Resources (HR) (Septantiningtyas et al., 2021).

One of the factors that influence the quality of education is the learning process. In the standard educational process, learning is designed to teach students, meaning that the learning system places students as learning resources or learning is emphasized on student activities (Nurhidayat et al., 2018). In general, education is carried out for positive purposes and the format structure and implementation are directed to guidance, fostering humans in life and educating life (Wuryandani, 2021).

Natural Science (IPA) is a subject that studies events that occur in nature. Students are expected to be able to recognize and know these natural knowledge in their daily lives. According to Sрни M. Iskandar in (Maknun, 2020) science subjects are useful for the life or work of children in the future, part of the nation's culture, train children to think critically, and have educational values, namely having the potential to shape the child's personality as a whole (Firman et al., 2018). But in reality, there are still schools that have low science learning outcomes because they have not reached the predetermined standard of completeness (Agustian et al., 2022).

Based on the results of the initial observation (pre-cycle) which was carried out on May 24 2022 at SD Negeri 101788 Marindal in class II students, totaling 24 people, only 5 students (20.83%) achieved the Minimum Completeness Criteria (KKM) and the remaining 19 students (79.16%) are under KKM. So, it can be concluded that the science learning outcomes obtained are still relatively low (Pratiwi et al., 2019). The specified KKM IPA score limit is 75. From the results of these observations it is known that the low science learning outcomes are caused by several factors that influence during the learning process (Radianti et al., 2020). The factors that influence the science learning process include the less varied learning methods used by teachers, low enthusiasm of students in learning science, and lack of use of learning media (Louis et al., 2019).

The learning method used by the teacher is not varied and teacher-centered learning. The teacher teaches in front of the class and the students listen (lectures) so that students become indifferent and seem less concerned, this is exacerbated by learning that does not use media/props, the learning resources used are only science textbooks, this makes students not interested in science lessons that are close to his life (Subhash & Cudney, 2018). The use of unattractive and less varied methods results in students feeling lazy to learn which in the end learning outcomes are not achieved (Bai et al., 2020). This is in accordance with the opinion of Slameto (in Bardestani et al., 2019) who says that "the low quality of education is an obstacle in the context of development in Indonesia. the low quality of education is caused by factors from within and outside students (Finegan et al., 2021). Factors originating from students include readiness, attitude, interest, and intelligence, while those originating from outside students include teachers, infrastructure and student learning environment (Cheng et al., 2019).

In this regard, it is necessary to strive for a form of learning that is not only materially capable but also prioritizes the creativity of each student, so that it is expected to be able to improve student learning outcomes as much as possible. Experimental or experimental learning methods as one of the learning methods that are suitable to be applied to deal with problems that have been found by researchers in learning. This is in accordance with the opinion of Mulyani Sumantri (in Chang & Hwang, 2018), who says the experimental method is a way of teaching that involves students by experiencing and proving for themselves the process and results of the experiment itself.

IPA is needed in everyday life to meet human needs, so IPA can be used as a solution to solve a problem. Therefore, the application of IPA must be done wisely so as not to have a negative impact on the environment. At the elementary school level, science learning should be directed at experiential learning. Science learning should be done by finding problems, this is to foster the ability to think, work and behave scientifically. Therefore, according to Sulistyorini (in Khalida & Astawan, 2021), learning science in elementary schools emphasizes providing direct learning experiences through the use and development of process skills and

scientific attitudes. The scope of science learning that will be studied in elementary schools is living things and their life processes, objects or materials along with their properties and uses, energy and changes, as well as the earth and the universe.

Learning outcomes are essentially changes in behavior that are desired in students. Learning outcomes are the level of mastery achieved by students in following a predetermined learning program. According to Nana Sudjana (in Megawati et al., 2019), learning outcomes are the abilities possessed by students after they receive their learning experience. Learning is an ability possessed by students after receiving learning experiences (Somantri et al., 2018). Factors that can affect learning outcomes, namely: a) intelligence, b) child readiness, c) child talent, d) willingness to learn, e) child interest, f) material presentation model, g) teacher personality and attitude, h) learning atmosphere, i) teacher competency, j) community conditions. So it is increasingly clear that student learning outcomes are the result of a process that involves a number of factors that influence each other (Juita, 2019; Ichsan et al., 2020).

Based on the description above, the writer feels interested in conducting research with the title: "Application of the Experimental Method to Improve Science Learning Outcomes of Class second grade Students of SDN 101788 Marindal, Patumbak District, Deli Serdang Regency". Experiment or trial is a development of science and technology in order to produce a product that can be enjoyed by the public safely (Rokhmad, 2021). The experimental or experimental method is defined as a way of teaching and learning that involves students by experiencing and proving the process and learning outcomes themselves (Waruhu, 2018). From these various opinions it is stated that the experimental method is a way of learning that involves students to conduct experiments by observing the process and results of the experiment, which then students present the results of their experiments and are evaluated by the teacher (Loilatu et al., 2021).

## Methodology

This action research which aims to improve the learning process in increasing student learning activities and outcomes with experimental methods in science learning. This research is one of the efforts of teachers or practitioners in the form of various activities carried out to improve and or improve the quality of learning in the classroom. The subjects in this study were all 24 grade II students in the 2022/2023 school year. When the research was carried out on June 21 and June 28 2022, this classroom action research was carried out in two cycles, but if in the first cycle you have obtained a score according to the set KKM standard, namely 75 then research in the second cycle and third cycle does not need to be done again. To collect data on the process of implementing the action and to find out the learning outcomes after the implementation of the action, several research instruments were used, such as; Written test and research observation sheet. The following is the research design conducted (Yulidar, 2020).

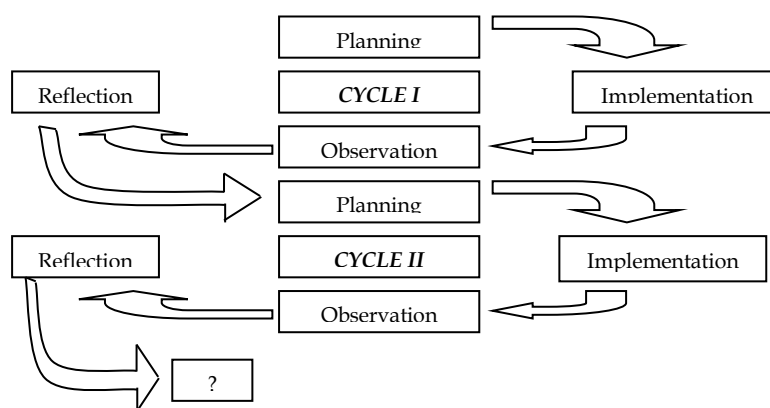


Figure 1. Research Design

The calculation of each student's activeness achievement uses the following formula (Nugrahini Dwi Wijayanti, 2012: 67). Achievements:

$$\frac{\text{Jlh skor yang diperoleh}}{\text{skor max}} \times 100\%.$$

Guidelines for student activity criteria in learning according to Suharsimi Arikunto (2009 : 18) are as table 1.

**Table 1 . Criteria guidelines for student activity**

Achievements	Criteria
75% - 100%	High
50% - 74.99%	Immediate
25% - 49.99%	Low
0% - 24.99%	Very low

To calculate the learning completeness achievements of each cycle, according to Daryanto (2011: 192) the formula for calculating learning completeness achievements :

$$P = \frac{\sum \text{students who complete learning}}{\sum \text{student}} \times 100\%$$

The level of assessment of learning outcomes will be grouped into five categories, namely very good, good, sufficient, poor, and failed with the classification as following.

**Table 2 . Value Grouping**

Value Range	Category
80-100	Very Good (A)
66-79	Good (B)
56-65	Sufficient (C)
40-55	Poor (D)
0-39	Failed (E)

Indicators of success to be achieved in this study are: a) Student activeness in science learning is said to be successful if activeness is achieved 75% of the number of students ( high criteria ), b) The completeness of student scores is said to be complete if the student evaluation scores obtained are at least the same as the KKM determined by the school, namely 75 .

## Result and Discussion

### Pre Cycle

Pre cycle was carried out before cycle I , namely on May 24 20 2 2 at SD Negeri 101788 Marindal in class second grade students totaling 24 people, only 5 students ( 20.83 %) achieved the Minimum Completeness Criteria (KKM) and the remaining 19 students (79.16 %) were below the Minimum Completeness Criteria. So it can be concluded that the science learning outcomes obtained are still relatively low. The KKM IPA score limit that has been determined is 7.5 .

### Presentation of Cycle I Results

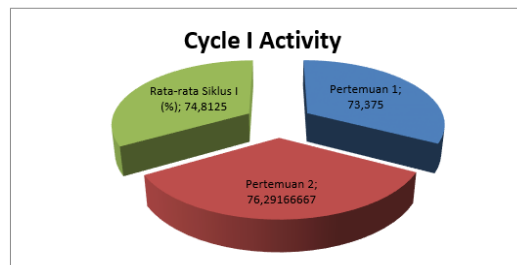
Before carrying out the action, the teacher and researcher first make a Learning Implementation Plan using the experimental method. The Cycle I Learning Plan was held in two meetings, each time 2 x 4 5 minutes . The Learning Implementation Plan for the first cycle, both the first meeting and the second meeting, contains competency standards, basic

competencies, indicators, teaching materials, methods, learning steps, assessments, tools, materials, resources, LKS, and test questions. Data on student activity in cycle I showed that the average student activity in cycle 1 as a whole was 74.81 %, and the following table shows the average student activity achievement overall in cycle I meeting 1 and meeting 2 . Cycle I actions were carried out face to face on Tuesday, 21 June 2022.

**Table 3 . Average Student Activity Achievement Cycle I**

Total students	Achievement of student activity		
	Meeting 1	Meeting 2	Average cycle I
24 people	73,37	76,3	74,81

Based on the data in Table 3 , the average overall student activity in cycle I meeting 1 was 73.37 %, at meeting 2 was 76.33 %, so the average student activity in cycle I was 74.81 % , to make it clearer regarding all aspects of student activity in cycle I can be read in the figure 2 diagram:



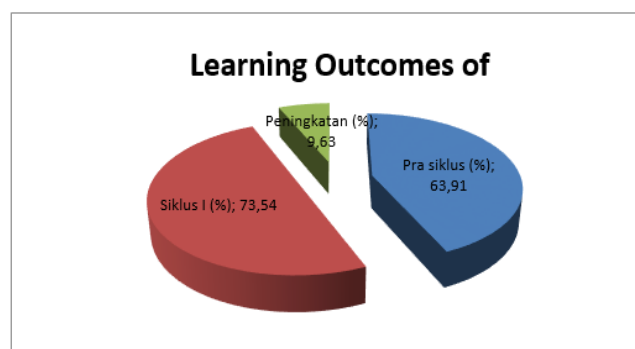
**Figure 2 . Diagram achievement of student activity cycle I**

Figure 2 shows the amount of student activity, the average student activity in cycle 1 is 73.38 % (medium criteria) but has not reached the criteria to be achieved, namely 75% according to the success criteria.

**Table 4 . Student Learning Outcomes after Cycle I**

Total students	Student learning outcomes		
	Pre cycle (%)	Cycle I (%)	Enhancement (%)
24 people	63,91	73,54	9,63

Student learning outcomes were obtained after students took the first cycle learning outcomes test, namely at the end of the second meeting increased compared to the learning outcomes tests conducted during the pre-research. Increased learning outcomes reached 9.63%. Learning outcomes after cycle I are presented in the table 4.



**Figure 3 . Diagram achievement Student learning outcomes cycle I**

Based on the data in Figure 3 above, it can be explained that learning science using the experimental method can improve the learning outcomes of second grade students at SD Negeri 101788 Marindal. Initial conditions before the action average student learning outcomes 63.91 % increased to 73.54% in the first cycle . The diagram above shows the magnitude of the increase in learning outcomes, but the average learning outcomes do not meet the success criteria that the number of students who score more than KKM  $75 \geq 70\%$ . Then proceed to cycle II.

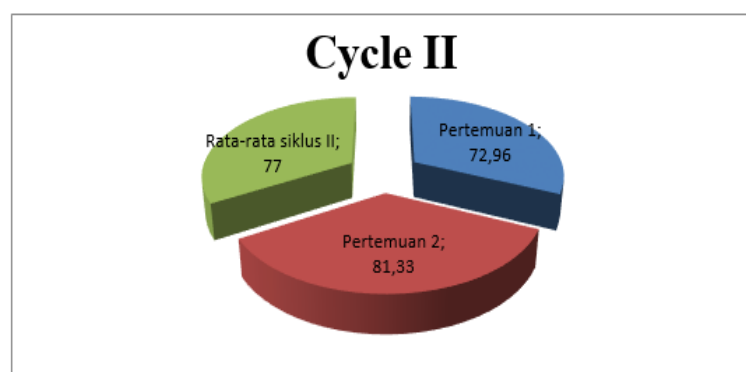
**Presentation of Cycle II Results**

The Cycle II Learning Implementation Plan for both the first meeting and the second meeting contains competency standards, basic competencies, indicators, teaching materials, methods, learning steps, assessments, tools, materials, resources, LKS, and test questions. The lesson plan made by the teacher is adjusted to the learning objectives of each meeting. This is adjusted to the class conditions and indicators that are expected to be achieved. The next thing to prepare is to prepare the media. In this cycle, the media that must be prepared are tools and materials for experiments to prove that light can be reflected, light can be refracted, and light can be broken down. Cycle II was held in 2 meetings. Evaluation is carried out at the end of the cycle to determine the increase in student learning outcomes. Observations carried out by researchers and teachers as executors of action. The things that are observed are student activities during the learning process using the experimental method. Observations in cycle II are the results of observing each action in the cycle.

**Table 5 . Average Achievement of Student Activity Cycle II**

Total students 24 people	Achievement of student activity		
	Meeting 1	Meeting 2	Average cycle II
	72.96	81.33	77

Based on the data in Table 5 , the average overall student activity in cycle I I meeting 1 was 72.96 % , at meeting 2 was 81.33 % , so the average student activity in cycle I was 77 % , so that it is clearer about all aspects of student activity in cycle I I can be read in the figure 4 diagram.



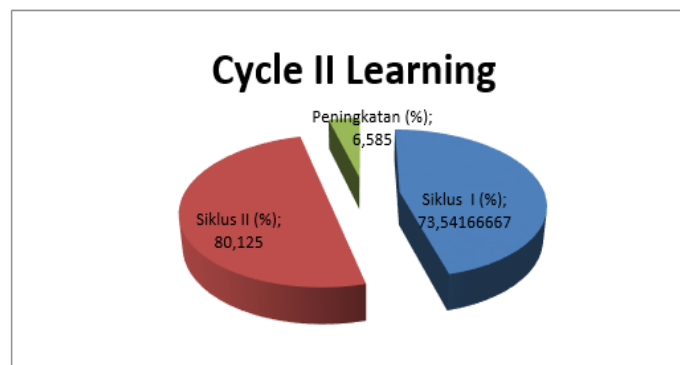
**Figure 4 . Diagram achievement of student activity cycle II**

Figure 4 shows the amount of student activity, the average cycle II student activity is 77% , it has reached the criteria to be achieved, namely 75% according to the success criteria. Student learning outcomes were obtained after students took the second cycle of learning outcomes tests , namely at the end of the second meeting increased compared to the learning outcomes tests conducted during the pre-research. Increased learning outcomes reached 6.585%. Learning outcomes after cycle I I are presented in the table 4.

**Table 4 . Student Learning Outcomes after Cycle II**

Total students	Student learning outcomes		
	Cycle I (%)	Cycle II (%)	Enhancement (%)
24 people	73,54166667	80,125	6,585

Based on the data in Figure 5 above, it can be explained that learning science using the experimental method can improve the learning outcomes of second grade students at SD Negeri 101788 Marindal.

**Figure 5 . Diagram achievement Student learning outcomes cycle II**

The initial condition of cycle I averaged 73.54% student learning outcomes increased to 80.125% in cycle I I. The level of student learning outcomes in cycle II was in the very good category with that percentage . In the diagram above, it has shown the magnitude of the increase in learning outcomes, the average learning outcomes have fulfilled the success criteria that the number of students who scored more than KKM  $75 \geq 70\%$  (23 students), in this case teachers and researchers do not need to continue do cycle III . In the cycle II action which was carried out face to face on Tuesday, 28 June 202 2 , success has reached the desired target because in learning activities, teachers and students are able to carry out all the indicators of applying the experimental method properly .

## Discussion

The research which was conducted in class second grade SD Negeri 1 01788 Marindal aims to increase the activity and learning outcomes in the cognitive domain (understanding of the material) of students in natural sciences subject the subject of the properties of light through the experimental method (Oma, 2021). The research was conducted for 2 cycles, of course it had several obstacles including students' lack of confidence in conveying their work and lack of confidence in responding to differences in the answers of their work in front of the class so that the teacher created learning conditions that could activate students and make students more confident (Suryani, 2018).

In line with the results of research conducted by Septantiningtyas et al., (2021) The second grade SDN 001 Merdeka kids' performance in natural science classes was remained mediocre. Additionally, it is claimed that the current learning process is monotonous and can easily leave students bored, making the current classroom environment unsuitable for learning. Researchers conducted classroom action study by utilizing experimental techniques to the classroom learning process after realizing this fact. With the experimental approach, it is anticipated that children will be curious about learning new things, including the qualities of the light they see every day. Given that students can directly obtain experience and information via the experimental method, it is also anticipated that learning results will

increase. The findings of this research can also be utilized as a source of information for teachers who want to conduct comparable or further study.

From the discussion above, it can be concluded that the application of science learning using the experimental method can increase the activity and learning outcomes of students at SD Negeri 1 01788 Marindal, Deli Serdang Regency. The improvements made by the teacher during the action can be seen by the increased activity and student learning outcomes in each cycle. Classroom action research conducted at SD Negeri 1 01788 Marindal in class second grade has limitations that need to be disclosed, including that there is 1 student who still has learning outcomes under the KKM after completing cycle II. Students who are still incomplete will be handled specifically by the class teacher (Marlis, 2020).

## Conclusion

The research conducted in class second grade SD Negeri 101788 Marindal aims to increase activity and learning outcomes in the cognitive domain (understanding of the material) of students in natural science subjects on the subject of the properties of light through experimental methods. This research is a classroom action research that begins with initial observations, making plans, and implementing actions. The action was carried out in 2 cycles, and each cycle consisted of 2 meetings. The implementation of actions in each cycle is adjusted to the learning objectives in each cycle. The instruments used in this study were worksheets, lesson plans, test questions at the end of each cycle, observation sheets of teacher and student activities. Student learning outcomes from the pre-cycle test reached an average of 63.92 (good category), then by using the experimental method which involved students conducting experiments with teacher guidance increased to reach an average of 73.54 (good category) in cycle I, then the teacher makes improvements so that learning outcomes increase with an average of 80.13 (very good category) in cycle II.

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