Schrödinger:Journal of Physics Education
Vol. 5, No. 1, March 2024, pp. 32~38
ISSN: 2716-1587, DOI: 10.37251/sjpe.v5i1.883

Improving Science Learning Outcomes on Light and Optical Instruments Through Visual Methods in Junior High Schools

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Article Info

Article history:

Received Jan 16, 2024
Revised Mar 14, 2024
Accepted Mar 20, 2024
OnlineFirst Mar 20, 2024

Keywords:

Learning Outcomes
Light and Optical Devices
Visual Method
Science

ABSTRACT

Purpose of the study: to improve science learning outcomes about light and optical devices through visual methods (learning by observing and describing) in class VIII junior high school students.

Methodology: This type of research is classroom action research which is carried out in two cycles, namely cycle I and cycle II, each cycle contains planning, implementation, observation and reflection. The data collection method includes tests in the form of questions. Data analysis was carried out by calculating the achievement of learning outcomes for each cycle with an increase in classical completeness criteria, namely 85%.

Main Findings: The research results show an increase in student learning outcomes through visual methods (learning by observing and describing) on the topic of light and optical devices. This research was successful with the average score increasing from 57.85% to 65.18% in the pre-cycle, increasing 21.42% in the first cycle, and reaching a class average of 81.42% with 96.42% completeness in the first cycle. cycle II, exceeding the target of 85% for classical completeness.

Novelty/Originality of this study: The results of this research can contribute to scientific studies, especially on visual methods in learning in junior high schools. This research can be a guide for teachers to create interesting, effective and innovative learning, as well as increase students' enthusiasm for learning in science lessons through visual methods (learning by observing and imagining).

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1. INTRODUCTION

Natural Sciences is one of the subjects that students don't like [1]-[3]. Many students who just hear the word science immediately make negative assumptions [4]-[6]. Most students' way of thinking about science subjects is that science is difficult [7]-[9]. Sometimes they feel that their teacher is unpleasant so the lesson material becomes annoying. Science is a subject that requires a lot of ability to memorize Latin names and formulas, so many students don't like this subject, student learning outcomes are not as expected [10]-[12].

Natural Sciences is a human effort to understand the universe through targeted observations, and using procedures, and explaining with reasoning so as to reach a conclusion [13]-[15]. Science learning is defined as natural science and can be classified into three parts, namely as product, process and attitude [16]-[18]. The products in question are facts, principles, models and natural laws. Natural science or science includes sciences

such as physics, chemistry and biology. The science learning process, especially physics, does not only prioritize principles, but physics learning also requires discovery and proof [19]-[21].

Appropriate science learning methods can improve student learning outcomes [22]-[24]. A fun teaching and learning process can make children feel happy learning science, besides that using fun methods will make students feel more at home in class [25]-[27]. Let's look at the phenomenon that is happening to students today, they think that activities outside class hours are more fun than in class or during lesson hours. When students learn in class, students are more likely to play around, get bored with teachers who only use lecture methods so they are less focused on receiving learning. This is because they feel burdened when they are in class, especially when they have to face boring subjects like the science subjects they assume. Therefore, teachers need learning methods so that students become enthusiastic and have motivation to learn.

Learning using the visual method (learning by observing and picturing) displays more pictures so that students don't get bored, whereas the previous methods delivered by teachers tended to be lectures, making students bored and having difficulty accepting lessons, thus affecting their learning outcomes. The visual method (learning by observing and picturing) by increasing pictures and observations in learning makes it easier for students to remember because they do it and students are more active. Previous research on improving student learning outcomes by Isma et al., [28] using a problem-based learning model can improve student learning outcomes. Furthermore, previous research by Suhada et al., [29] using discovery learning models can improve student learning outcomes. Based on several previous studies, this research discusses improving students' science learning outcomes by applying visual methods. The novelty of this research is that this research makes a new contribution by exploring and applying visual methods more effectively in science learning, especially the topic of light and optical instruments in junior high schools. In this context, novelty lies in the use of visual methods which can significantly improve students' understanding. This research highlights the importance of improving learning outcomes in the field of science, which is an important aspect in developing the quality of education. Through an approach focused on visual methods, this research provides new insights into effective strategies to achieve these goals.

The implications of this research can include several things that can have a positive impact in the educational context. By identifying and implementing more effective visual methods, this research can help improve the quality of science learning in junior high schools, which in turn can increase students' understanding and interest in the subject matter. This research can also trigger innovation in science teaching and learning methods, especially in the use of increasingly sophisticated technology and visual media. This can open up opportunities for further development in the field of education. Thus, this research has the potential to contribute to improving science learning outcomes at junior high school level through the application of innovative and effective visual methods.

Based on the results of observations and interviews with one of the science teachers at State Junior High School 6 Salatiga, apart from the method, material is also a problem for students in learning science. Science learning is not always easy for students to convey and absorb, especially in physics, one of which is light and optical instruments. Students' difficulties in studying light and optical instruments is a challenge for teachers in preparing lessons and managing classes more effectively and efficiently. Students' interest in science lessons is still low which has a big influence on student learning outcomes with the grades obtained always being low, besides that the available media is rarely used. Especially in class VIII, specifically in class VIII E, it is quite difficult because the children tend to be from less active groups and the condition of the class is a former laboratory so the room is too big, this has an impact on the completeness of student learning outcomes which are less than the minimum science completeness criteria set in school is 7.5. Based on the final grade for class VIII E for the odd semester in science subjects, the overall average grade is only 57.85. This low average score is an important problem for science teachers in learning activities. Based on the problems above, researchers are interested in conducting research which aims to improve science learning outcomes about light and optical devices through visual methods (learning by observing and describing) in class VIII junior high school students.

2. RESEARCH METHOD

The research design determined is classroom action research, at this stage the researcher determines the focus of events that need special attention to be observed. The research location was carried out at State Junior High School 6 Salatiga. This school was chosen because it requires visual methods (Learning By Observing And Picturing) so that an atmosphere that is not too boring for science learning is created and science learning objectives can be achieved optimally. The research was carried out in even semester learning activities when light and optical instruments were taught. The subjects of this research were students in class VIII E of State Junior High School 6 Salatiga in the science subject of light and optical instruments. The number of students is 28 people with 13 women and 15 men.

The research steps consist of planning, implementation, observation, reflection. The planning stage explains what, why, when, where, by whom, and how the action is carried out. The stages in this planning consist of:

1) Researchers create a learning implementation plan using visual methods (learning by observing and picturing)
2) Research prepares learning media as a means of supporting research
3) Researchers prepare teacher and teacher observation sheets to find out how the learning is taking place
4) Research prepares evaluation sheets as a means of measuring student abilities.

The implementation stage begins with doing everything that was planned in stage 1. The research is expected to be able to collaborate with teachers and be able to improve student learning outcomes by using visual methods (learning by observing and describing), apart from that it is also visual. The observation stage was carried out by researchers to see to what extent students were able to absorb learning. The researcher made observations by recording all events during the lesson which were adapted to the teacher and student observation instruments and gave evaluation questions to the students. The reflection stage is an activity to restate what has been done. The researcher will discuss with the class teacher regarding further activities whether additional cycles need to be held or not, and the research will be considered successful.

Researchers used interviews, tests and observations as data collection methods. Interviews were conducted as a start to the research [30]. Researchers conducted interviews to find out the initial conditions of the research subjects, both research materials, minimum completeness criteria, or learning methods that are often used in schools before applying the visual method (learning by observing and picturing). A test is a set of stimuli (stimuli) given to a person (student) with the aim of getting answers that are used to determine a numerical score [31]. The test used by researchers is a written test which will be given every cycle.

Observations are carried out by observing all student activities in the learning process which are observed, recorded and assessed, then these observations include student activity and initiative during learning activities [32]. By recording observation results, evaluating observations, analyzing learning outcomes, improving the weaknesses of cycle I in cycle II. The results of the reflection are reflections on the plans that have been implemented, which will be used to improve teacher performance in the next stage, namely cycle II and beyond.

The instruments used in this research consist of: a) Learning Implementation Plan as a reference for the learning process using visual methods (learning by observing and picturing). b) Science lesson question sheet on light and optical instruments. c) Teacher observation sheet when using visual learning methods (learning by observing and picturing), including: teacher's ability to open a lesson, teacher's attitude in the learning process, mastery of learning materials, teaching and learning activities, use of learning resources/learning media, learning evaluation , ability to close learning activities, and follow-up.

Data analysis that must be carried out after data collection is analyzing the data [33]. Data analysis is carried out every cycle by providing test questions at the end of each learning implementation [34]. The collected data is analyzed to determine improvements in student learning outcomes. Researchers in proving the hypothesis act of analyzing using statistics to calculate classical completeness, if the student's classical learning outcomes reach ≥85% then the cycle is stopped.

3. RESULTS AND DISCUSSION

This research was carried out in science subjects in class VIII. This classroom action research was carried out in two research cycles. The description of the two cycles is as follows:

3.1. Cycle I

The implementation of cycle I actions is carried out in the even semester. The implementation of this action is in accordance with the semester program for class VIII science subjects. Cycle I was carried out in one meeting for 3 hours of lessons attended by 28 students. The implementation of each cycle in this research was carried out in 4 stages, namely planning, acting, observing and reflecting. Learning outcomes in cycle I were not optimal, both test results and student observations. The test results show that 6 students completed it or 21.42% and 22 students did not complete it or 78.57% with an average score of 65.18. The percentage of student completeness which is only 21.42% shows that it is still below the classical completeness limit, namely 85%. Student completion results can be seen in table 1:

Table 1. Completeness of Student Scores in Cycle I Stage.

No.	Completeness		Number of students	Percentage
	Number	Completeness		
1	<75	Not Completed	22	78,57%
2	≥75	Complete	6	21,42%
Amount			28	100%

3.2. Cycle II

In cycle II, students are happier and pay more attention to lessons so they can follow the teaching and learning process properly and properly. The results also experienced a very good improvement. The average class score increased from 21.42% to 96.42%. The results of cycle II can be seen in table 2 below:

Table 2. Completeness of Student Scores in Cycle I Stage.

No.	Completeness		Number of students	Percentage
	Number	Completeness		
1	<75	Not Completed	1	3,57%
2	≥75	Complete	27	96,42%
Amount			28	100%

Through the learning process carried out by researchers, a recapitulation or distribution of test results and observation results for students was obtained. The distribution of values and recapitulation can be seen in table 3 below:

Table 3. Recapitulation of Improvement in Learning Outcomes Per Cycle

No.	Cycle	Value	Increased Results
1	Cycle I	65,18	7,33
2	Cycle II	81,42	16,24

The average student score has increased very well, it is proven that there is an increase in each cycle. The distribution of student scores from the pre-cycle, cycle I and cycle II stages can be seen in the following table:

Table 4. Distribution of Student Scores

No.	Student Initials	Minimum Completeness Criteria	Pre Cycle	Cycle I	Cycle II
1	S1	75	60	70	75
2	S2	75	55	70	80
3	S3	75	55	70	90
4	S4	75	57,5	50	75
5	S5	75	55	70	80
6	S6	75	47,5	65	85
7	S7	75	57,5	60	90
8	S8	75	72,5	65	85
9	S9	75	40	75	85
10	S10	75	47,5	75	85
11	S11	75	65	65	80
12	S12	75	70	70	85
13	S13	75	40	85	75
14	S14	75	60	75	75
15	S15	75	52,5	75	75
16	S16	75	55	40	80
17	S17	75	65	55	80
18	S18	75	57,5	70	90
19	S19	75	60	65	80
20	S20	75	62,5	80	70
21	S21	75	60	55	85
22	S22	75	65	70	80
23	S23	75	70	65	85
24	S24	75	57,5	70	85
25	S25	75	60	50	80
26	S26	75	45	40	80
27	S27	75	72,5	65	80
28	S28	75	55	65	85
Amount			1620	1830	2280
Average			57,85	65,18	81,42
Completion Percentage			0%	21,42%	96,42%

Based on table 1 and table 2 above, it can be seen that the learning outcomes of class VIII junior high school students have increased in each cycle. In cycle I, learning outcomes increased from none to 6 (21.42%), and in cycle II learning outcomes increased from 6 (21.42%) students who completed to 27 (96.42%). Based on the analysis and discussion of the data obtained in this research, the hypothesis which states that the visual learning method (Learning By Observing and Picturing) can improve science learning outcomes in class VIII junior high school students is proven to be acceptable.

Based on the indicators of success determined by the researcher having been achieved, there is no need to carry out further research. The results of this research are supported by previous research which states that visual methods (Learning By Observing and Picture) can improve science learning outcomes. This research is in line with the theory put forward by Sholeh [35] that visual methods (Learning By Observing and Picture) make learning easier when you see what is being discussed by the lecturer or a book or computer program. The novelty of this research is the effort to improve learning outcomes by using learning methods in the form of visual methods (Learning By Observing and Picture). This research seeks to explore and apply visual methods more effectively in science learning, especially the topic of light and optical devices in junior high schools. Through an approach that focuses on visual methods, this research provides new insights into effective strategies for achieving improved student learning outcomes.

The use of visual methods (learning by observing and visualizing) in science learning related to light and optical instruments has a significant impact on student learning outcomes. The main finding of this research is that there is an increase in student learning outcomes from the first cycle to the second cycle, as shown by the average score increasing significantly. This shows that visual methods are effective in increasing students' understanding of science subject matter, especially light and optical instruments. By using a classroom action research approach, this research can be concluded as successful because it achieved a higher percentage of classical graduation than the target set [36], [37]. This shows that the visual method intervention implemented has provided positive results in increasing student achievement.

Data analysis also showed an increase in the number of students who successfully completed the learning material, indicating the effectiveness of visual methods in helping students achieve better understanding and higher graduation rates. The results of this research provide a strong basis for teachers and educational practitioners to consider using visual methods (learning by observing and visualizing) in designing more effective and interesting learning. This also encourages further research and development in the application of visual methods in science learning at the junior high school level. Thus, the results of this research provide a valuable contribution in strengthening evidence about the effectiveness of visual methods in improving student learning outcomes, especially in the context of science learning about light and optical instruments at the junior high school level.

The implications of the results of this research have several significant impacts in the context of science education and learning at the junior high school level. The results of this research show that the use of visual methods (learning by observing and visualizing) can improve student learning outcomes. The implication is that teachers and educational practitioners need more attention in designing more interactive, creative and effective teaching strategies, especially in complex science topics such as light and optical instruments. Visual methods have the potential to improve students' understanding of abstract or difficult to understand subject matter. The implication is the importance of introducing and implementing visual methods effectively in the science learning curriculum in junior high schools to increase students' understanding and mastery of these concepts.

Learning experiences that involve interesting and interactive visual methods can increase students' learning motivation. The implication is the importance of creating a learning environment that motivates and arouses students' interest in learning science, so that they are more involved and enthusiastic in the learning process. The results of this research also provide encouragement for innovation in science learning approaches in junior high schools. The implication is the need for further experimentation and development of visual methods and other supporting technologies to create more innovative, interesting and effective learning experiences for students. Thus, the implications of this research indicate that the application of visual methods (learning by observing and visualizing) in science learning in junior high schools has great potential to improve learning outcomes, student learning motivation, and innovation in learning approaches. This can make a significant contribution to improving the quality of science education and students' interest in science at junior high school level.

Research limitations are aspects that need to be considered to understand the context and limitations of the research results that have been conducted. The main limitation in this research is the difficulty of generalizing the results to the entire student population at the junior high school level. This is due to the sample size which may be limited, as well as differences in student characteristics and learning contexts between one school and another. Each student's previous learning experience, initial level of understanding, and learning motivation may vary. These limitations can affect research results and students' ability to follow the proposed learning method. The existence of external factors such as curriculum changes, social conditions, or extraordinary situations can influence learning outcomes and can be a limitation in interpreting research results. However, being aware of these limitations can help educational researchers and practitioners to be more careful in interpreting and applying the

results of this research in a broader context. Further research and the development of more comprehensive methods are needed to expand understanding of the effectiveness of visual methods in improving science learning outcomes at the junior high school level.

4. CONCLUSION

Based on the results of Classroom Action Research, this researcher can be said to have been successful, this can be seen from the recapitulation of the average value of pre-cycle students which has increased, from the average value of the class starting pre-cycle, namely 57.85%. Furthermore, in the first cycle stage the class average score was 65.18, the percentage who completed the minimum completeness criteria was 21.42% with the number of students who completed it being 6 students and 22 students who had not completed it with a percentage of 78.57%, then the second cycle averaged -The class average reached 81.42% with a completion percentage of 96.42%. The number of students who completed was 27 and 1 person did not pass with a percentage of 3.57%. In cycle II, classical completion had exceeded the target, namely 85%. Based on the results of the research described above, it can be concluded that the visual method (learning by observing and picturing) can improve the learning outcomes of class VIII students in science subjects regarding light and optical instruments in junior high school. Based on the results of this research, the researcher recommends that teachers should be more creative in packaging the lessons to be delivered, so that students do not get bored easily during learning, and apply learning models that refer to active student learning.

ACKNOWLEDGEMENTS

Thank you to all parties involved in this research. I would like to express sincere appreciation to everyone who contributed to the completion of this article. A heartfelt thank you to the respondents for their valuable insights and support throughout the research process.

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