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Efforts to Improve Learning Outcomes and Motivation Through Experimental Learning on Dynamic Electricity

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Abstract: Motivation and learning outcomes are two interrelated aspects. A high level of learning motivation will result in commitment and resilience in learning, thereby leading students to improve their learning outcomes. This research aimed to describe the improvement of learning outcomes and student motivation after application experimental methods in science learning on the topic of dynamic electricity. This research is a type of Classroom Action Research design consisting of two cycles with instruments in the form of formative test sheets and questionnaires where there are 30 students as research subjects. Based on the results of the formative test in cycle I, an average score of 85.4 was obtained and increased to 88.7 in cycle II. The classical learning completion in cycle I was 53.3% and increased to 86.7% in cycle II. According to the questionnaire's results, it is known that 100% of respondents thought that using experimental methods to teach science was very interesting and enjoyable. In addition, 83.3% of respondents stated that experimental methods can increase their motivation to learn on dynamic electrical materials. Consequently, it might be concluded that the application of experimental methods is significantly able to improve student learning outcomes and motivation.

Keywords: Experimental Method; Learning Outcomes; Student Motivation

INTRODUCTION

Education is the cornerstone for the development and enhancement of human resources since it enables personal growth. Education and learning are intimately connected. The process of learning involves students and teachers interacting in a way that is engaging, inspirational, enjoyable, and encourages students to engage fully in class (Tyera et al., 2022). The success of educational goals depends on how the learning process and learning outcomes have been achieved (Sasingan & Wote, 2022). Learning outcomes are a cognitive process that result in the mastering knowledge, abilities, and attitudes with process skills (Wahyudi, 2021). Learning outcomes include student self-assessment in the form of changes that are observed, measured, and validated in relation to the skills that students acquire as a result of the learning process (Rahma, 2023).

Students' motivation for their studies has an impact on learning outcomes as well. One of the most important factors in successful learning is learning motivation (Huang et al., 2023). Motivation is a procedure or activity that encourages and motivates someone to do action (Urhahne & Wijnia, 2023). Students that are highly motivated to learn will be more committed to their studies and will persevere through challenges, which will lead to improved learning outcomes (Harefa, 2023). However, expectations are not met by the reality on the ground. According to the results of school observations indicate that low motivation, low student learning outcomes, and a barely of student involvement in the learning process are the main issues in schools (Ananda et al., 2022). One of these takes place in the scientific subject on dynamic electricity, which is considered a challenging subject because it calls for a more profound understanding of active thinking. It is necessary to be able to think abstractly and make connections between different, related ideas in order to understand this stuff. Scientific education should place a high priority on giving students hands-on experience in order to build their competencies. This way, students will learn more than just facts, concepts, or principles; they will also be involved in the process of discovery (Sholekah, 2020).

Based on the problem above, learning method is needed that can be implemented so that learning material becomes enjoyable, engage students and motivate them to learn, improve student engagement, and give them hands-on experience. This will improve student learning outcomes and enable them to figure out the concepts they are struggling with on their own. Experimental methods is one possible learning strategy (Fathurohman et al., 2022). Students are given the chance to experiment and do things for individually during the learning process through experimental methods (Sari, 2019). In order to improve student learning outcomes and inspire students to learn science on dynamic electricity, the researcher intends to undertake a study utilizing experimental approaches in the learning process. The title of this research is "Improving Learning Outcomes and Student Motivation through Experimental Methods on Dynamic Electricity Material". The research's goal is to determine whether learning outcomes have improved and student motivation after using the experimental method in teaching science on the topic of dynamic electricity. This research will be expected to provide additional give educator more resources, especially science teachers, about teaching methods that can be used to enhance learning outcomes and student motivation, while also serving as a study and improvement for the researchers in their future writings.

METHODS

The type of research used in this study is Classroom Action Research. The model of classroom action research used is the spiral model by Kemmis and Taggart, conducted in the form of cycles carried out in two cycles. Each cycle consists of the stages of planning, implementation, observation, and reflection (Kemmis et al., 2014). The research subjects are 30 students of class IX-D at Junior High School 16 Surabaya. The research was conducted from February 11 to 18, 2025. The classroom action research method was conducted in two cycles, each consisting of three stages: preparation, implementation, and data processing. The preparation stage involved preliminary observations, compiling learning modules, and creating research instruments. In the implementation stage, the teacher observed student learning activities and collected data from test results. In the data processing stage, both qualitative and quantitative descriptions were made to obtain the research results. Student motivation questionnaires and formative assessment forms for cycles I and II are the instruments used in this study.

The data collection methods used in this study are testing and questionnaires. The analysis techniques employed in this research are qualitative and quantitative descriptive analysis, which is a research method that aims to describe the reality or facts in accordance with the data obtained, in order to determine the goals of learning that students accomplished and to gather feedback from students about their motivation to study while using experimental methods of teaching on static electricity materials. The assessment of the formative test is carried out by summing the scores adding up all of the students' scores and dividing that total by the number of students in the class. In learning completeness, there are two types of learning completeness, which are individually and classically. A student is considered to have finished learning individually at State Junior High School 16 Surabaya if they receive a score of 80, and they are considered to have finished classically if 80% of the students in a class have attained individual completeness (Permendikbudristek, 2022). The assessment of student motivation questionnaires can be analyzed through the percentage scale.

Table 1. The Score Interpretation Criteria

Percentage	Criteria
0-20%	Very bad
21-40%	Bad
41-60%	Sufficient
61-80%	Good
81-100%	Very good

FINDINGS AND DISCUSSION

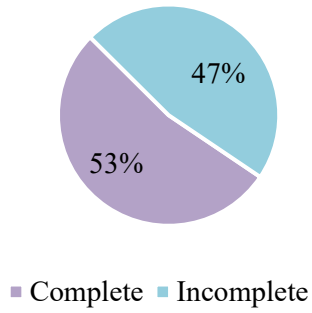
Cycle I

In cycle I which was held on February 11-12, the researcher served as a teacher. The learning process referred to the prepared teaching module related to static electricity material. The teacher used both traditional teaching techniques and straightforward demonstration techniques to deliver instruction in cycle I. Students took Formative Test I to determine their level of learning success of the learning process. Here are the results from cycle I of the study.

Table 2. Student Learning Outcomes in Cycle I

No.	Score	Number of Students	Total Score	Classical completeness percentage	Description
1.	> 80	16	1367	53%	Complete
2.	< 80	14	1016	47%	Incomplete
Total			2383	100%	
Maximum Total Score			3000		
Average Formative Score			79,43%		High

Based on Table 2, it can be explained that by applying conventional methods and simple demonstrations, the average score of students' formative tests in cycle I was 79.43% and the classical learning completeness reached 53% or there were 16 out of 30 students who had completed their learning. Because the proportion of students who received scores greater than 80 is lower than the targeted completeness percentage of 80%, this result indicates that students did not complete their learning in the first cycle in the conventional way. This is because students still feel unfamiliar with the teacher's methods and ideas and are not yet used to them.



Picture 2. Diagram of cycle I

Although there are still some areas that need improvement, the teacher did an excellent job in each of the learning activities in cycle I. Since this is their first time using electrical kits, students still have a tendency to be awkward, but they are all very interested and ready to learn about the methods. The learning in cycle I does not require numerous revisions, but how students are approached should be taken into consideration so they don't feel uncomfortable and can enjoy the learning activities. This will help them accept and comprehend the dynamic electricity material, which is a more complex subject than static electricity. Thus, the learning objectives will be optimally achieved and can reach classical completeness.

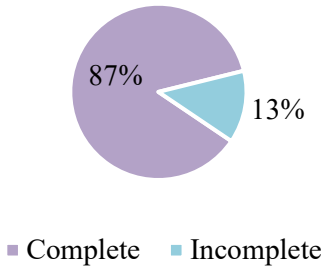
Cycle II

The learning process for Cycle II were implemented in class IX-D at State Junior High School 16 Surabaya, which had 30 students, on February 18–19, 2025. The researcher acted as the teacher. The learning process was conducted in compliance with the developed teaching module, making reference to the cycle I modifications, in order to prevent the errors or deficiencies from being replicated in cycle II. Students were given Formative Test II at the end of the learning process in order to measure their level of accomplishment. The research data from Cycle II is presented in Table 2 as follows.

Table 3. Student Learning Outcomes in Cycle II

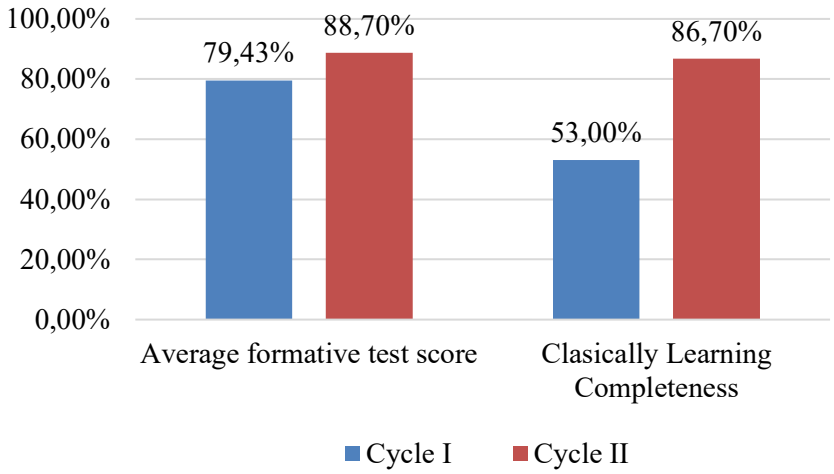
No.	Score	Number of Students	Total Score	Classical completeness percentage	Description
1.	> 80	26	2370	86,7%	Complete
2.	< 80	4	292	13,3%	Incomplete
Total			2662	100%	
Maximum Total Score			3000		
Average formative score			88,7%		Very high

Based on Table 3, it is evident that this second cycle's learning has increased and improved. This can be observed from the average score of the formative test in the second cycle which rose to 88.7%, while the classical learning completeness increased by 86.7% or there are 26 students out of 30 students who have been complete in their learning.



Picture 3. Diagram of cycle II

According to the data above, students completed their classical learning during cycle II, therefore no additional cycles are required. To reach classical completeness and maximize the learning process's goal in following implementations, it is crucial to maintain and improve on what has already been accomplished. The following is a comparison graph of the improvement from cycle I to cycle II.



Picture 4. Graph of the average increase in formative test scores and classical learning completeness

In order to gather feedback on the learning that was done, the researcher gave out a student response questionnaire at the conclusion of the learning session. The data from the student response questionnaire will be presented in the following Table 4.

Table 4. Student Response Questionnaire Results

No.	Statement	Percentage (%)		Criteria
		Yes	No	
1.	P1	100	0	Very good
2.	P2	93,3	6,70	Very good
3.	P3	90,0	10,0	Very good
4.	P4	96,7	3,30	Very good
5.	P5	93,3	6,70	Very good
6.	P6	90,0	10,0	Very good
7.	P7	90,0	10,0	Very good
8.	P8	80,0	20,0	Good
9.	P9	83,3	16,7	Very good
10.	P10	96,7	3,30	Very good

Based on Table 4, it can be seen that the data from the student response questionnaire is rated as very good. This indicates that the learning conducted received a positive response from the students of class IX-D at State Junior High School 16 Surabaya, as evidenced by the high results of responses that answered 'YES' to each question.

CONCLUSION

Student learning outcomes in dynamic electrical material improved and increased following the experimental method's implementation. The results of the formative test showed progress in cycle I, with an average score of 85.4 and an increase in cycle II to 88.7. Students have attained classical completeness, as

evidenced in cycle I, which initially was only 53.3%, increased in cycle II to 86.7%. The students' response to the learning of science on the topic of dynamic electricity using the experimental method is very good. This is proven by the students' responses to each question falling into the very good category. As many as 100% of respondents stated that the use of the experimental method in science learning is very interesting and enjoyable. The experimental method can also increase their motivation to learn about dynamic electricity, according to 83.3% of respondents. In relation to such positive responses from the students, it is highly likely that 86.7% of students have completed the material with scores exceeding the established competence standards.

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