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Peer tutoring method to improve the Physics learning outcomes of grade XII students of Senior High School 1 Bambanglipuro

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Abstract

This study addresses the urgent need to enhance the effectiveness of physics education, particularly in light of the challenges faced by students in mastering complex scientific concepts. This study employed Classroom Action Research (CAR) to examine the effectiveness of the peer tutoring method in enhancing physics learning outcomes at Senior High School 1 Bambanglipuro. Conducted over two cycles, each consisting of two face-to-face meetings, the research followed the iterative process of planning, action, observation, and reflection. The research subjects were 32 students from class XII MIPA 3 during the 2020-2021 academic year. Data collection methods encompassed direct observation, field notes, tests, and documentation. The results of this study demonstrate a significant improvement in student learning outcomes. In Cycle I, the average physics score was 57.35, which increased to 83.21 in Cycle II, reflecting a marked enhancement in student performance. Moreover, the proportion of students meeting the learning completion criteria increased dramatically from 32.35% in Cycle I to 88.24% in Cycle II. These findings suggest that the peer tutoring method is an effective strategy for improving academic achievement in physics. The study concludes that peer tutoring not only fosters greater academic engagement but also contributes to more substantial learning outcomes, thus supporting its potential integration into broader educational practices for enhancing student performance in science subjects.

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual, religious strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves and society, the nation, and the state (Law of the Republic of Indonesia Number 20 of 2003, 2nd). Education is also an effort to realize the inheritance of culture from one generation to another (Bp et al., 2022). Law-Law of the Republic of Indonesia Number 20 of 2003 Article 3 states that national education aims to develop students' potential to become human beings who believe in and fear God Almighty, have noble morals, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens.

The learning process must be organized and planned according to the students' needs to achieve learning objectives (Sanjani, 2021). One of the important subjects in high school education is physics. This subject plays a crucial role in preparing students to understand the basic concepts of physics that can be applied in everyday life. Furthermore, the goal of physics learning is to master the concepts and principles of physics, develop skills, develop knowledge, and develop self-confidence as a foundation for continuing education, and provide a foundation for developing knowledge and technology (Jayadi et al., 2020). However, conditions in the field indicate that Physics lessons receive less attention because students assume that the material is heavily focused on concepts, formulas, and calculations. Many

students find it difficult to learn Physics, which results in passivity in participating in Physics learning activities, so that Physics learning outcomes tend to be less than satisfactory (Gustiawan, 2021). There are still many students who are not interested in studying physics because they think physics is difficult (Nurmadanti, 2021). This condition was also found in Senior High School 1 Bambanglipuro, especially class XII MIPA 3, which is still considered low. Based on data obtained from observations of the learning process, some students still have difficulty understanding physics material that is considered complex, such as the concept of physical laws, force, and energy. Based on data from the results of daily tests on physics subjects in class XII MIPA 3 on Static Electricity, the average score was 57.1%; only 10 out of 34 students (29%) achieved the Minimum Completion Criteria (KKM) score. These data indicate that the learning process has not been optimal, impacting the level of mastery of the material, so that student learning outcomes are still very low.

These low learning outcomes are influenced by several factors, including immature lesson plans, learning methods that lack student interaction, inadequate physics learning media, learning strategies that are inappropriate for the topic, and low student motivation. The one-way learning process, with the teacher dominating as the center of information, makes students less active during the learning process (Mega Kurniawati & Rizal, 2023). The suboptimal learning process results in students' learning outcomes not reaching the Minimum Competency (KKM). Therefore, learning methods are needed that involve student interaction and participation during the learning process, tailored to students' needs and environmental conditions (Korompot et al., 2020). One method that can be a solution is the peer tutoring method.

The peer tutoring method is an example of a method applied by teachers during teaching and learning activities (Puspitasari et al., 2019). The heterogeneous nature of the students means that there are some students who have greater abilities, so they can be used as peer tutors who are considered capable of helping their friends in learning in these groups (Sanjata et al., 2022). A method that can help friends, students who have mastered the material, can help other friends who are having difficulties. Students tend to be afraid or reluctant to ask questions or express their opinions to teachers, but they prefer and are more willing to ask questions or express their opinions about the subject matter to their friends or other students. Therefore, the implementation of this peer tutoring learning method is expected to help students understand the subject matter. The peer tutoring system is implemented on the basis that there are groups of students who find it easier to ask questions and are more open with their friends than with their teachers. In line with the opinion (Fatin et al., 2023), the peer tutoring method can facilitate learning by increasing student engagement and strengthening students' understanding of the material taught. Furthermore, this method can help increase students' motivation to learn and develop their social skills.

A similar study was conducted at Senior High School 3 Bengkalis, which used the peer tutoring method to improve Physics learning outcomes in 11th-grade students. The results showed a significant increase from 29.17% in the pre-cycle to 70.83% in the second cycle. These findings indicate that the peer tutoring method is effective in improving student learning outcomes, making it relevant to be implemented in 12th-grade students at Senior High School 1 Bambanglipuro as an alternative solution to the low achievement of Physics learning outcomes (Suryani, 2022). The results of research conducted by(Nasihah et al., 2020) suggest that the use of peer tutors in physics learning plays a role in the physics learning process, especially in the process of improving student learning and achievement.

In practice, students feel more comfortable and open to discussions or questions from their peers than from their teachers. Peer tutors are students who are appointed or tasked with helping their peers who are experiencing learning difficulties, as peer-to-peer

relationships are generally closer than teacher-student relationships. This can improve student learning outcomes (Nuriyani & Winarso, 2021). Peer tutors can provide a sense of comfort and do not create psychological stress, as with a teacher. Application of learning methods with peer tutors in Physics learning for class XII students is expected to improve student learning achievement. This method is still rarely used in Physics learning, even though it has good potential to improve students' understanding of the learning material. This study aims to describe the improvement in student learning outcomes in Physics through the application of the peer tutoring method to class XII MIPA high school students.

METHOD

This research is classified as Classroom Action Research (CAR) with two cycles consisting of planning, action, observation, and reflection stages. The subjects of this research were students of class XII MIPA 3 of Senior High School 1 Bambanglipuro. The object of this research is the improvement of learning achievement through the peer tutoring method. The location of the research was carried out at Senior High School 1 Bambanglipuro, Bantul. The research instrument used to measure the learning process using the peer tutoring method was an observation sheet. The instrument used to measure student learning outcomes was a written test sheet. The collection technique used an observation format consisting of teacher and student activities during the learning process. Quantitative data analysis to calculate the improvement in physics learning achievement was conducted by calculating the average score of the final test of cycle 1 and the final test of cycle 2, with the following formula (Sugiyono, 2009).

$$Me = \frac{\sum xi}{N}$$

Information:
Me = Average (mean)
$\sum xi$ = Sum of all Values
N = Number of individuals

The next step is to calculate the percentage of student learning outcomes completion using the following formula:

$$KB = \frac{T}{Tt} x\ 100\%$$

Information:
KB = Learning Completion
T= Total scores obtained by students
Tt = Total score
(Trianto, 2012:63-64)

FINDINGS AND DISCUSSION

The initial stage of the action implementation is the planning stage, which includes a series of preparations to support the success of the learning process. These activities include creating a teaching program for one topic designed in the form of sub-topics (making lesson plans), creating teaching materials, creating student worksheets (LKPD), compiling observation instruments, compiling evaluation instruments, selecting tutors based on physics subject scores during class XI MIPA 3, forming groups, and activities related to the preparation of learning implementation. In the learning process, the method used is group discussions in

each peer tutor group, while the teacher acts as a facilitator and motivator. At the beginning of each lesson, a question and answer session is always held to determine the extent of student readiness in participating in the learning. At the end of each group discussion, each peer tutor group presents the results of their discussion, represented by one of the students in the group or their tutor. The division of peer tutor groups is based on the results of a joint discussion between the researcher and the class leader, and the results of the recapitulation of physics scores during class XI MIPA 3. For group formation, class XII MIPA 3 consists of 34 students divided into 8 groups, each group consisting of 4 or 5 students. Students who have high physics scores are made tutors for their friends and are tasked with guiding their friends in the peer tutor group.

Activities carried out in cycle I The learning process for the Physics subject on Magnetic Induction is planned for two meeting times. Uto facilitate and make it easier to carry out activities, learning is done using the peer tutoring method as a solution to solving learning problems. The actions are carried out by teachers and peer tutors. The teacher provides an introduction, and the peer tutors teach and accompany their respective group members. This cycle ends with reflection. The results of the data analysis carried out at this stage it is used as a reference for planning the next cycle. If the expected results have not been achieved, then the repairs are carried out in the second cycle.

The activities carried out in cycle II are intended to improve upon the previous cycle. The implementation of cycle II is the same as the previous cycle, starting with the planning, acting, observing, and reflecting stages. A new plan is developed to improve the results of the reflection in cycle I. This is intended to determine alternative solutions to address deficiencies in the previous cycle and develop learning tools from the previous cycle that are deemed to be good.

Based on the results of observations on the assessment of the learning process using the peer tutor method between cycles I and II, it shows a significant increase, especially in teacher-student interaction and interaction between students. Students feel motivated and actively involved in discussions in peer tutor groups so that there is freedom to ask questions to their peers. In addition, this peer tutor method is also useful for establishing cooperation between friends, not being selfish. But to achieve learning achievements, healthy competition between friends is maintained. Assessment of the learning process using the peer tutor method, according to collaborator observations from cycles I and II, has shown a significant increase.

A recapitulation of the assessment of the learning process using the peer tutor method by collaborators during two cycles can be seen in Table 1 below:

Table 1. Recapitulation of the Assessment of the Learning Process with Peer Tutors by Collaborators During Two Cycles

Cycle	Face to face	Category (%)			
		Not enough	Enough	Good	Very good
I	1	25	55	20	0
	2	5	45	30	20
II	1	0	10	55	35
	2	0	0	55	45

If we look at the data, it shows that the assessment of the learning process using the peer tutor method has increased from cycle I to cycle II, from the category of less, sufficient, to good, and finally to very good.

The research on learning achievement of the subject of Magnetic Induction in cycle I and cycle II is said to be successful if students can master the learning material provided by the researcher. This success can be measured by the results of student learning achievement through written tests given at the end of cycle I and the end of cycle II. Students are said to have achieved learning mastery if they have met the Minimum Mastery Criteria (KKM) set by the school, namely While the learning process is said to be successful if at least 75% of students in one class have received a score The results of the recapitulation of the average value of students' daily tests for two cycles can be seen in table 4.2 below:≥ 70. ≥ 70.

Table 2. Recap of KKM Achievement

Value Category	Cycle I Values		Cycle II Values	
	Freq	%	Freq	%
N (Complete)≥ 70	11	32.35	30	88.24
N (Not Completed)< 70	23	67.65	4	11.76
Number of students present	34	100	34	100
Number of students absent	0	0	0	0
Average value	57.35		83.21	

The percentage of grades achieved by the class in cycle I was 32,35% and the average value achieved is 57.35. Therefore, it can be said that in cycle I, the main material of magnetic induction has not reached classical completeness, which is 75%. It is necessary to have a follow-up cycle and improvements from the reflection of cycle I. From the observations that have been made, it appears that the learning process is still not running smoothly. Students are not ready to present the results of their discussions in front of the class. For this reason, improvements need to be made in implementing learning actions in class. Learning is continued in cycle II with the main topic of magnetic force. The shortcomings in cycle I are important considerations for teachers when preparing cycle II. In cycle II, many students actively ask questions to the tutor, and the teacher has motivated them more, especially students who have not completed cycle I. Cycle II classical completeness achieved is 88.24% with an average value of 83.21. The number of students who have completed is 30. This means that cycle II has reached the achievement indicator (Table 2).

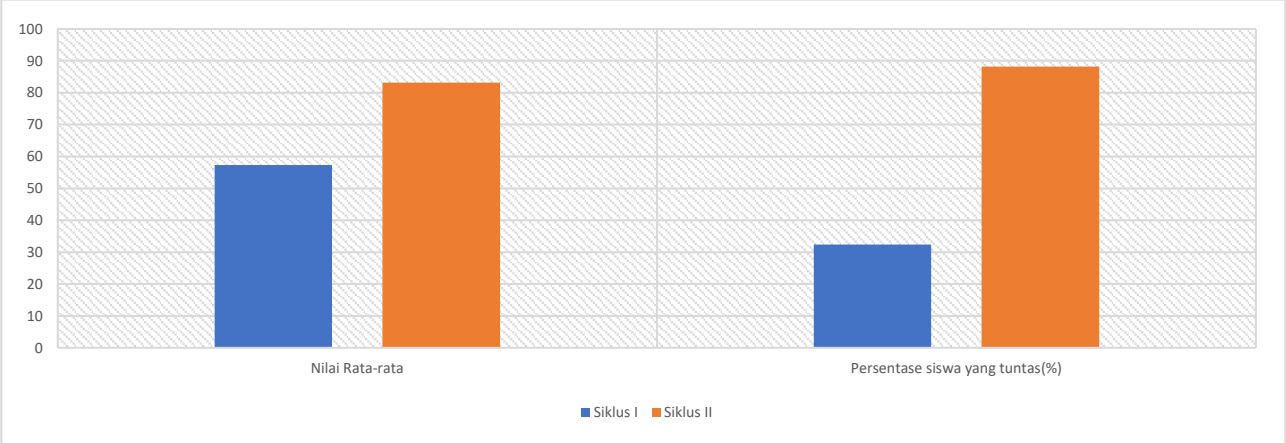

Figure 1. Comparison of Average Daily Test Scores and Student Learning Completion

From Figure 1 it can be seen that there was an increase in students' cognitive learning achievement from cycle I and cycle II. This increase in the percentage of learning achievement is one indicator that there is an increase in students' understanding of the material being studied. This increase in students' understanding of the material being studied is indicated by the fulfillment of the Minimum Completion Criteria (KKM). This increase in students' understanding of the material being studied is influenced by internal and external factors of the students. External factors are factors that exist outside the students, for example, choosing the peer tutor learning method has fostered trust and active participation from students in participating in learning. These external conditions can influence students' internal conditions, among others, due to increased motivation and interest due to feelings of enjoyment in participating in learning. Learning through group discussions with peer tutors can foster enthusiasm and a sense of enjoyment in participating in discussion activities because they are valued as capable and experienced individuals. This situation can facilitate students' understanding of the material being studied, as evidenced by the significant increase in students who have met the Minimum Completion Criteria (KKM). This result is in line with research (Mahsup et al., 2020) concluded that peer tutoring learning models can improve learning outcomes and students are able to achieve learning completion. As well as research has been conducted, which shows that the peer tutoring method can improve student learning outcomes. Based on these research results, implementing the peer tutoring method can improve student learning outcomes and motivation in Physics learning.

The implementation of the peer tutoring method in Physics learning has transformed the learning process for students in the classroom. The learning process, which was previously dominated by the teacher lecturing and students listening to the teacher's explanations, has now shifted to collaborative learning, placing students as active participants in the learning process. Students can interact with other students in small groups, such as through discussions, re-explaining material, and correcting each other's understanding. Students use more conversational language, and this language is used in their daily lives with their peers. It will help students understand material that is considered difficult to digest and understand.

The peer tutoring method also has a positive impact on students' learning attitudes. Tutors feel responsible for understanding the material well enough to explain it to group members and encourage group members to understand by asking questions. Meanwhile, group members are motivated to pursue greater understanding. Students who tend to be passive and reluctant to ask questions of their teachers will feel more comfortable asking their peers. The learning process becomes more than just absorbing information, but also develops critical thinking, communication, and teamwork skills.

In the peer tutoring process, the teacher shifts from a teaching center to an active facilitator. The teacher monitors the discussion, provides guidance when groups encounter difficulties, and evaluates the discussion process and outcomes. The teacher also provides initial training for tutors before the lesson begins so that tutors are materially prepared to learn with their peers. Overall, the Physics learning process using this method demonstrates a more active learning process, and learning becomes more student-centered.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the learning method through peer tutoring can improve student learning outcomes on the topic of magnetic induction in physics subjects in class XII MIPA 3 of Senior High School 1 Bambanglipuro Bantul. This is evidenced by student learning outcomes reviewed from the aspect of observation of the learning process and daily repeated tests, both showing significant improvements from the beginning of the study to cycle I to cycle II.

Student learning outcomes from the aspect of average scores increased from 57.35 in cycle I to 83.21 in cycle II. The increase in student learning completeness can also be seen in cycle I, as many as 11 students (32.35%) whose scores or grades have reached the Minimum Competency Criteria (KKM), and in cycle II, as many as 30 students (88.24%) whose scores or grades have reached the Minimum Competency Criteria (KKM). There is an increase in learning completeness of 55.89%. The use of learning methods through peer tutors has been proven to improve student learning outcomes. Therefore, schools are expected to always motivate teachers to be active and creative in using learning models (methods) so that student learning achievements can improve.≥ 70 ≥ 70

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