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Increasing Interest and Learning Outcomes in Physics on Static Electricity Through the Teaching at The Right Level Approach in High School Student

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Abstract
This study aims to determine the improvement of problem-solving abilities of class XII-2 on the main topic of Static Electricity at SMA Negeri 5 Semarang through the Teaching at the Right Level (TaRL) approach. This study is a classroom action research conducted in two cycles. The subject of the classroom action research used 1 class XII-2 with 36 students at SMA Negeri 5 Semarang. Learning with the Teaching at the Right Level (TaRL) approach that does not refer to class levels and facilitates various characteristics of students. This classroom action research was conducted in two cycles. TaRL emphasizes teachers to provide different treatments to students. Data on learning interests were collected through questionnaires and data on learning outcomes through written tests with both being analyzed quantitatively. Through this study, it was obtained that the increase in students' learning interests increased from 2.99 in the good category to 3.61 in the very good category. Student learning outcomes increased from 58% below the KKM in cycle I, to 84% above the KKM in cycle II. The implementation of the Teaching at The Right Level (TaRL) approach can increase students' interest and learning outcomes in static electricity material in class XII-2 of SMA Negeri 5 Semarang.

Keywords: teaching at the right level, physics, learning interest, learning outcomes

INTRODUCTION

Learning is the process by which students interact with teachers and learning resources within an environment. In the learning process, teachers are tasked with guiding students toward an understanding of the material being taught and the contextual concepts within everyday life (Handayani, 2016). Beyond material comprehension, teachers also need to build students' character. Therefore, teachers need to select creative and innovative learning models and methods to construct students' knowledge and character according to 21st-century demands (Rahayu et al., 2022).

The new paradigm of learning within the independent curriculum implements student-centered learning practices. In this new paradigm, the Pancasila Student Profile serves as a guiding principle that guides all policies and reforms in the Indonesian education system, including learning and assessment. The Pancasila student profile comprises six competencies and characteristics: faith, devotion to God Almighty, noble character, global diversity, mutual cooperation, independence, and critical reasoning (Kemendikbudristek, 2021). Collaboration and mutual cooperation skills are among the character traits that students need to develop. These abilities align with the dimensions of the Pancasila student profile and 21st-century skills.

The new paradigm of learning ensures student-centered learning practices. With this new paradigm, learning is a cycle that begins with mapping competency standards, planning the learning process, and implementing assessments to improve learning so that students can achieve the expected competencies.

The new paradigm of learning provides educators with the flexibility to formulate learning and assessment plans according to student characteristics and needs (Teaching at the Right Level).

Teaching at the Right Level (TaRL) is defined as teaching that is tailored to the abilities of students. In the learning process, students are required to achieve predetermined competencies without considering their individual abilities. Every person's abilities are inherently different, both in terms of cognitive abilities and skills. This cannot be generalized by a standard. Therefore, education needs to provide an understanding of this, and this is already reflected in the currently implemented independent curriculum. Therefore, student development in learning is no longer measured by existing standards, but rather by how the student progresses. There is no coercion in terms of cognitive and skill achievement, and the teacher's guidance remains consistent to avoid deviating too much from expectations and the desired goals.

Physics is a subject that studies facts from everyday life, principles, concepts, laws, underlying theories, and scientific methods for proof. Physics learning is expected to be applicable to solving problems in society (Afriyanti & Sumardi, 2017). Each student's developmental level requires a different approach (Mubarokah, 2022). To ensure this aligns with the implementation of the independent curriculum, educators are expected to choose a relevant approach, aligned with the applicable curriculum and tailored to the child's developmental stage, regardless of age. After conducting observations at SMA N 5 Semarang, a problem was identified: unequal student abilities. Some students quickly absorbed the material explained, while others were slower to grasp it, resulting in unequal student abilities. The appropriate approach to address this situation is the Teaching at the Right Level (TaRL) approach. The TaRL approach is a learning approach that focuses on the level or stage of student development and is not grade-based.

Based on the problem description above, to improve learning and increase student interest and learning outcomes, a classroom action research study entitled "Improving Physics Interest and Learning Outcomes in Static Electricity through the Teaching at the Right Level Approach for Grade XII Science 2 Students of SMA N 5 Semarang" is needed.

RESULT AND DISCUSSION

The research was conducted in class XII-2 of SMA Negeri 5 Semarang in the 2023/2024 academic year. The school and class descriptions are as follows:

School Description

SMA Negeri 5 Semarang is located at Jl. Pemuda No. 143, Sekayu, Semarang Tengah District, Semarang City, Central Java 50132. SMA Negeri 5 Semarang has various facilities such as an administration room, a vice-rector's office, a principal's office, a teachers' room, a hall, a library, a laboratory, extracurricular activities, a guidance and counseling room, a health and safety unit (UKS), a prayer room, a cooperative, a cafeteria, restrooms, and classrooms.

Class Description

Class XII-2 of SMA Negeri 5 Semarang in the 2023/2024 academic year consists of 36 students. Most of the student seating remains the same, with only a few changes. There are 19 student desks and 38 chairs, as well as a teacher's desk and chair. The classrooms are located on the first floor.

The inventory for Class XII-2 includes a projector, HDMI, two whiteboards complete with a boardmaker and eraser, and a class library. Administrative equipment consists of: an inventory list, an organizational structure board, class administration data, a rules board, and a school vision and mission board.

Research Problem

Before implementing the learning activities, the teacher conducted observations to determine the learning conditions in the field by observing the teaching and learning process in Class XII-2. In addition, a review of documents was conducted, including the Final Semester Assessment (PAS) scores for the Physics subject for Class XII-2 for the 2022/2023 academic year and interviews with the class teacher.

Based on the results of the observations during the learning process, several problems were

identified, including: (1) Diverse student abilities; (2) Gaps in student interest in learning physics; and (3) Gaps in student activity.

Based on the results of observations during the learning process and interviews with the teacher, some students tended to be passive during group activities. The physics knowledge of Class XII-2 students at SMA Negeri 5 Semarang is classified as varied. The minimum passing grade (KKM) set by SMA Negeri 5 Semarang is 75.

Students' Initial Physics Knowledge Based on the results of the cognitive diagnostic assessment analysis. Cognitive diagnostic assessments require efforts to group students according to their abilities. This will enable the implementation of TaRL in grade XII-2. This research is expected to improve student learning interest and learning outcomes.

Cycle I Actions

Cycle I actions were conducted over two weeks, consisting of four meetings. Each meeting lasted two lesson hours (2 x 45 minutes). The stages of Cycle I were:

Cycle I Action Planning

An action plan was created to find solutions to problems related to student interest and learning outcomes using the TaRL approach. It was then agreed that the actions in Cycle I would be implemented in four meetings. The description of the Cycle I planning is as follows:

Developing Teaching Modules

Teaching modules were developed in accordance with the Merdeka Curriculum using the Problem-Based Learning model with the TaRL approach. The first meeting used a discussion learning method, using a virtual lab as the medium. The second meeting used a discussion learning method. The third meeting used a peer tutoring method to work on practice questions. The time allocation for the first and second meetings was 2 x 45 minutes. The teaching module prepared included module identity, learning outcomes, learning objectives, Pancasila student profiles, facilities and infrastructure, target students, learning models, meaningful understanding, trigger questions, learning activities, and assessment instruments.

Preparing Facilities and Supporting Resources

Classroom

The classroom was designed to accommodate the learning activities to be carried out. Tables and chairs were arranged to facilitate student discussions in groups and facilitate teacher supervision.

Media and Learning Resources

All media and learning resources that could support learning activities were prepared in advance of the learning activities. Learning media included videos, images, and PPTs related to the topic of static electricity. In addition to learning media, learning resources were also prepared for students. The learning resources used were Student Worksheets (LKPD) and student textbooks.

Determining Learning Groups

Learning groups were determined based on the results of the student ability diagnostic test, which consisted of three categories: high, low, and medium.

Implementation of Cycle I

The implementation stages of Cycle I actions were carried out four times. The following is a description of the implementation of Cycle I actions.

First Meeting

Preliminary Activities

The teacher opens the lesson with a greeting, which is answered in unison by the students. The class representative leads a prayer before the lesson begins. The teacher then takes attendance. The teacher motivates students, reminds them of prerequisite material, and conveys the learning objectives.

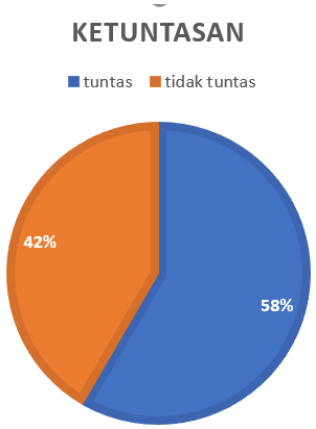

Figure 1. Diagram of Physics Knowledge Mastery Test Results

Based on the results of the knowledge mastery test in Cycle I, 21 students completed the course and 15 students did not. This percentage represents 58% of students completing the course and 42% of students failing to complete it. Therefore, improvements are needed in Cycle I, as the research target of achieving a passing grade of 75% of students in the class was not achieved.

Results of Learning Interest Analysis

Learning interest achievement was determined by the scores obtained by students using physics teaching aids based on argument mapping. The research obtained data from a questionnaire on student learning interest in a field trial. The average results of student learning interest achievement at the initial and final meetings for each aspect are shown in Table 1.

Table 1. Student Learning Interest Scores in Cycle 1

Aspek	Skor Rata-Rata	
	KBM Awal	Siklus 1
Perasaan senang peserta didik	3,04	3,53
Keterlibatan peserta didik	2,95	3,59
Ketertarikan peserta didik	2,98	3,73
Perhatian peserta didik	3,00	3,60
	2,99	3,61

Reflection on Cycle I Actions

The purpose of this reflection was to review the actions in Cycle I. Student learning interest in Cycle I averaged 3.61, categorized as very good. Meanwhile, student learning outcomes in Cycle I achieved a classical mastery of 58%. This was despite the predetermined target of at least 75% of students achieving mastery. Therefore, the target for achieving students' physics knowledge was not achieved, requiring further action.

Based on Cycle I observations, several obstacles were encountered during Cycle I learning, including:

1) During group work, some students still used their mobile phones to access social media and play games.
2) During discussions, some students remained silent. Some students joked around and played with their group mates. As a result, the discussion was less than optimal, and only a few group members worked on the worksheets.
3) During formative assessments and practice questions, some students did not work diligently. They

were only concerned with completing the lesson quickly.

4) During laboratory practicals, some students still separated from their groups and played with other groups. Consequently, only a few group members collected data.
5) Some students still lack responsibility for their assignments during discussions.

Based on the weaknesses in Cycle I, the improvement plan for Cycle II includes:

1) Monitoring student activities in groups and reprimanding students who use their phones to play games.
2) Motivating students to be active in group discussions and warning inactive members about the possibility of reducing their grades to encourage further development in group activities.
3) Monitoring group activities to ensure students divide and complete their tasks equally.
4) Conducting practice questions using a variety of media to increase student enthusiasm for learning.
5) Motivating students about the importance of listening carefully to the teacher's explanations once the lesson begins.

Data obtained in Cycle I did not meet the target. Physics learning outcomes did not meet the target. Therefore, improvements are needed in the next cycle, with the hope that all targets can be achieved.

Cycle II Actions

Cycle II actions consist of two meetings. Each meeting lasts for two lesson hours.

Cycle II Planning

The purpose of Cycle II is to improve Cycle I. The teacher conducted better preparation based on the results of the Cycle I action reflection.

Cycle II Implementation

First Meeting

Preliminary Activities

The teacher opened the lesson with a greeting, which was answered in unison by the students. The class leader led a prayer before the lesson began. The teacher then took attendance. The teacher motivated the students, reminded them of prerequisite material, and conveyed the learning objectives.

Core Activities

The core activities began with the teacher providing stimulus questions about Ki Ageng Selo's ability to capture lightning. Then, several students asked questions about the questions posed by the teacher. The teacher asked students to form groups based on their abilities, which had been previously assigned. The teacher distributed worksheets to each group. The teacher guided the groups in a discussion using the PhET virtual lab. The teacher demonstrated the use of PhET. Students investigated capacitor capacity. Students created infographics about capacitors and sample problems. Students discussed in groups and created products based on their creativity. The results of the discussions and the products created were presented at the next meeting. Next, students undertake a formative assessment using game-based media to gauge their understanding after the lesson.

Closing Activities

In the closing activities, the teacher explains the learning implementation for the next meeting. The teacher closes the lesson with a prayer and greetings.

Second Meeting

Opening Activities

The teacher opens the lesson with a greeting, which is answered in unison by the students. The class leader leads a prayer before the lesson begins. The teacher then takes attendance. The teacher motivates students, reminds them of prerequisite material, and explains the learning objectives to be achieved.

Core Activities

In the core activities, students present the results of their discussions and the products they have created. The products are student-generated works, including posters or infographics. The purpose of the products is to discuss capacitors and sample problems.

Closing Activities

In the closing activities, the teacher asks students to submit their completed worksheets. Then, students undertake a final summative assessment. The teacher concludes the lesson with a prayer and greetings.

Observation Results for Cycle II

Observation Results for the Evaluation of the Learning Process

Based on observation data, it can be concluded that the following actions were taken in Cycle II:

a) In opening the lesson, the teacher conducted activities in accordance with the teaching module.
b) In orienting students to the problem, the teachers oriented students to the problem in accordance with the teaching module.
c) In organizing students for learning, the teacher organized students to learn in accordance with the teaching module.
d) In guiding individual and group investigations, the teacher guided individual and group investigations in accordance with the teaching module.
e) In developing and presenting work, the teacher aligned with the teaching module. This was demonstrated through student presentations.
f) In analyzing and evaluating the problem-solving process, the teacher engaged students in analyzing and evaluating problem-solving. This demonstrates that the activity aligned with the teaching module.
g) In closing the lesson, the teacher informed students about the learning that would be covered in the next meeting. This demonstrates that the closing activities aligned with the teaching module.

Physics Knowledge Mastery Results

The physics knowledge mastery test was administered at the end of Cycle II after studying the topics of capacitor capacity and the benefits of static electricity. The physics knowledge mastery test consisted of 10 multiple-choice questions. The percentage of students who completed the physics knowledge mastery test is shown in Figure 2.

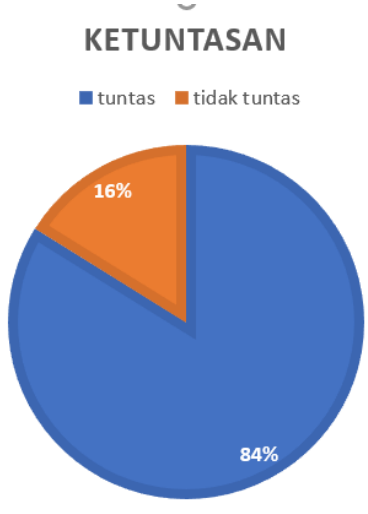

Figure 2. Physics Knowledge Mastery Test Results Diagram

Based on the results of the knowledge mastery test in Cycle II, 36 students completed the test and 5 students did not. This represents a percentage of 84% of students completed the test and 16% of students did not. The physics knowledge mastery test achieved the completion target.

Reflection on Cycle II Actions

Cycle II was implemented to achieve the research targets not achieved during Cycle I. The analysis of students' physics knowledge skills in Cycle II yielded a classical completion rate of 84%. The predetermined target was for at least 75% of students to achieve completion.

Based on observations in Cycle II, it was shown that during Cycle II learning:

1) Students actively participated in product creation within their groups.
2) Students held themselves accountable for completing group assignments.
3) Students completed assignments according to their respective roles.
4) During learning, students did not use their mobile phones and focused on completing group assignments and paid attention to other groups presenting their products.
5) Students were more active and enthusiastic in presenting the capacitor product they had made in their groups.
6) Students were very enthusiastic during the formative assessment using games.

Comparison of Action Results

Based on the description of the research results, we will then describe a comparison of the results of the actions between Cycle I and Cycle II regarding the application of the Teaching at the Right Level approach to improve interest and learning outcomes in physics regarding static electricity.

Analysis of the learning process evaluation data in Cycle I and Cycle II showed improvement. This improvement can be seen from the series of learning activities carried out by the teacher, which were aligned with the teaching module. Based on the actions in Cycle I, there were still aspects or steps that were not yet fulfilled, namely organizing students for learning and guiding individual and group investigations. In Cycle II, it was evident that all aspects or steps of the learning were implemented in accordance with the teaching module. This proves that the learning implementation was in accordance with the teaching module.

Data analysis regarding physics knowledge mastery can be seen in Table 4.6. Based on the results of Cycle I and Cycle II, it was found that there was an increase in students' cognitive abilities. This improvement was demonstrated by the percentage of students who passed the cognitive ability test.

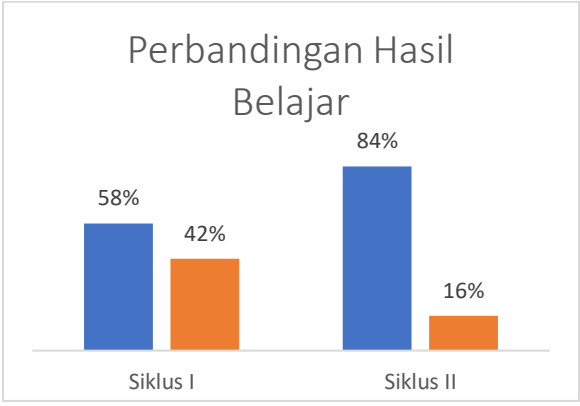

Figure 3. Comparison of Percentage of Students' Achievement of Physics Knowledge Mastery in Cycle I and Cycle II

Figure 3 shows that the comparison of the percentage of physics knowledge mastery in cycles I and II has increased. In cycle I, the percentage of students who completed the task was 58%, but this result did not reach the target of 75%, so corrective actions were continued in cycle II. In cycle II, the percentage of students who completed the task was 84%. This proves that the increase has reached the target of completion. The researcher also analyzed students' learning interest, which increased in cycle I and achieved success indicators in the very good category.

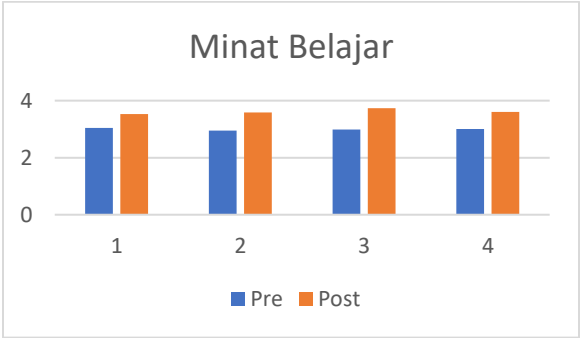

Figure 4. Comparison of Average Learning Interest Indicators

Figure 4 shows that the percentage comparison of student learning interest has increased. The average initial learning interest was 2.99, categorized as good, and after the learning period, it reached 3.61, categorized as very good. This demonstrates an increase in the learning interest of grade XII-2 students at SMA Negeri 5 Semarang.

This research was conducted in two cycles, each consisting of four stages: planning, implementation, observation, and reflection. Initial observations and pre-cycle interviews with teachers were conducted to determine the current situation in grade XII-2 at SMA Negeri 5 Semarang. Based on these observations and interviews, a gap was identified between student interest and learning outcomes in physics learning activities.

In Cycle I, teachers developed a teaching module for static electricity. Cycle I was conducted in three meetings, covering the topics of Coulomb force, electric fields, electric potential, and electric potential energy. Cycle II was conducted in two meetings, covering the topics of capacitor capacity and the benefits of static electricity. In each cycle, students worked on problems solved collaboratively in groups. The learning model used was Problem-Based Learning. Problem-Based Learning (PBL) is a series of learning activities that emphasize authentic (real-life) problems commonly encountered by students. Students must be able to solve these problems through investigation to develop collaborative skills and cognitive learning outcomes using the TaRL approach. The TaRL approach is tailored to student abilities. In cycle I, the percentage of student learning interest was 3.61, categorized as very good. Student learning outcomes, with 52% achieving classical mastery, were still below the success indicator.

The implementation of learning in cycle I was not optimal. During the process of organizing students for learning, the teacher had already organized them into groups according to their abilities. In the first meeting, many students had not yet positioned themselves in groups, resulting in a significant learning time drain. In guiding individual and group investigations, the teacher appeared to be overwhelmed in guiding investigations during practical activities. Some students still struggled to understand the teacher's directions due to the unconducive classroom atmosphere. Only certain students were involved in the PhET virtual lab experiment. Some students still used their mobile phones to play games. Weaknesses in cycle I resulted in learning outcomes not meeting targets, necessitating improvements in cycle II.

In cycle II, 84% of all students in grade XII-2 of SMA Negeri 5 Semarang achieved mastery of physics knowledge. Meanwhile, 16% of students had not yet completed the program. The average student interest in learning was 3.61.

Based on the above analysis, there was an increase in student learning outcomes and interest in cycles I and II after implementing the Teaching at the Right Level approach. Therefore, based on the test results and observations, it can be concluded that the implementation of the Teaching at the Right Level approach can improve the interest and learning outcomes of grade XII-2 students at SMA Negeri 5 Semarang.

CONCLUSION

Based on the results of the implementation of the Teaching at the Right Level (TaRL) approach on global warming in grade XII-2 of SMA Negeri 5 Semarang, the following conclusions can be drawn: 1) the

implementation of the Teaching at the Right Level (TaRL) approach can improve student interest and learning outcomes in static electricity in grade XII-2 of SMA Negeri 5 Semarang. The implementation of the Teaching at the Right Level (TaRL) approach improved student interest and learning outcomes in static electricity in grade XII-2 students at SMA Negeri 5 Semarang, 2) student interest in learning increased, from 2.99 in the good category to 3.61 in the very good category, 3) student learning outcomes improved from 58% below the Minimum Competency (KKM) in Cycle I to 84% above the Minimum Competency (KKM) in Cycle II.

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