

Improving Science Learning Outcomes on Vibration and Wave Materials Through Discovery Learning for SMP Negeri 1 Tegalrejo

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ABSTRACT

Science learning outcomes, especially vibration and wave material, are not optimal. The enthusiasm of students in participating in learning is less than optimal, which is indicated by the number of students who are less focused, less disciplined, and less active. To improve the science learning outcomes of vibration and wave material, research was conducted using the Discovery Learning model in class VIII D SMP Negeri 1 Tegalrejo, totaling 30 students. This research is a type of classroom action research conducted with two cycles. The method of data analysis of the research results used is descriptive quantitative and descriptive qualitative. From the initial test results of the cycle, 9 students completed learning individually with a percentage of learning completeness of 30%. In the first cycle test results, 20 students were declared individually complete with a percentage of learning completeness of 73.33%, while in cycle II the number of students who were individually complete was 26 students with a percentage of learning completeness of 86.67%. Based on the results of the study, it can be concluded that learning using the Discovery Learning model can improve the learning outcomes of IPA vibration and wave material in students of class VIII D SMP Negeri 1 Tegalrejo.

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INTRODUCTION

Natural Science is a compulsory subject at the Junior High School education level. Science lessons are very important to be taught to students to be able to study themselves and the surrounding nature and can be applied in everyday life. Science material studies many natural phenomena and tends to be abstract so it requires deeper reasoning from students. Vibration and wave material is one of the materials in science lessons that students must master. This material is a prerequisite for learning sound material. Therefore, the basic competencies of vibration and waves become essential material because students who master vibration and wave material may be able to master sound material and of course, will have a positive impact on overall science learning outcomes.

It was found that the results of science learning, especially vibration and wave material, were not optimal. Students consider vibration and wave material to be difficult and uninteresting material. Data on the assessment of student learning outcomes in the 2021/2022 academic year shows that student success in learning

vibration and wave material is still far from the Minimum Completeness Criteria (KKM) standard. Of the 32 students in one class who have reached the KKM, only 13 students while 19 students have not reached the KKM. In addition to the achievement of KKM, students' enthusiasm in participating in the lesson is also not optimal. Students are less focused when attending lessons, lack discipline, are late in completing assignments, are less active in participating in lessons, and lack of willingness to try causes not optimal student learning outcomes. If these conditions are not addressed immediately, the science learning outcomes at SMP Negeri 1 Tegalrejo will be affected as a whole. To solve the problem, a learning model is needed that can condition the improvement of science learning outcomes, especially on vibration and wave material, not only in terms of values but also in terms of student attitudes or characters. This is by Hamalik (cited in Haryanto, 2021) argues that in learning outcomes there is an increase in one's competence (cognitive, affective, psychomotor) that can be measured and observed. Student learning outcomes in vibration and wave material are expected to improve by using the Discovery Learning learning model.

Research by Masayu, et al (2020) concluded that there was an increase in learning outcomes when the Discovery Learning model was applied to learning. Meanwhile, the results of Mahrus's research (2023) showed that the activities and learning outcomes of grade IX students in science subjects increased after the Discovery Learning learning model was applied. Meanwhile, Nurma and Alik (2023) based on the results of their research concluded that the Discovery Learning model with Powerpoint media was able to influence the critical thinking skills of grade VIII students in learning science. The results of Fine and Cintia's research (2023) also concluded that the Discovery Learning learning model was able to improve the understanding of science concepts in junior high school students. Likewise, the results of Eko Purwanti's research (2022) concluded that the Discovery Learning model was able to increase student participation, learning activities, and learning outcomes. Some of these research results show that the Discovery Learning model can improve students' understanding of concepts and critical thinking skills, stimulate active students, and improve student learning outcomes.

Edi Pranoto (2023) stated that Discovery Learning provides opportunities for students to be maximally involved in a series of learning activities. All students' abilities are used to search and investigate with systematic steps, hone students' critical thinking skills, and can be accepted by logic (logical). The series of learning activities will form changes in the behavior of students so that they can find their own concepts of knowledge, attitudes, and skills. According to Rismayani (cited in Sartunut, 2022), the Discovery Learning model is also called discovery learning. In learning the Discovery Learning model, teachers must be able to develop learning that allows students to discover a concept or principle. The discovery involves the mental process of the students during learning.

The use of the Discovery Learning learning model is carried out with the consideration that this model requires teachers to be able to activate students in learning activities, arouse student curiosity, students discover new things, train science problem-solving skills, and learning activities take place fun so that it can improve student learning outcomes.

The purpose of this research is to improve the learning outcomes of science material on vibration and waves in junior high school students by using the Discovery Learning learning model. Positive changes in student behavior are also expected to accompany the improvement of science learning outcomes in junior high school students. The benefits of using this learning model are expected not only to improve student learning outcomes but also to improve teacher competence in managing learning in the classroom.

METHODS

The research was conducted for one month in May 2023 at SMP Negeri 1 Tegalrejo, Magelang Regency. The subjects of this study were students of class VIII D SMP Negeri 1 Tegalrejo in the 2022/2023 academic year totaling 30 students consisting of 14 female students and 16 male students.

This research is a class action research conducted with two cycles. Taufiqur Rahman (2018) states that classroom action research (PTK) is research conducted by teachers during classroom learning. Learning aims to perfect or improve the previous learning process by practicing learning improvement. According to Wina Sanjaya (2016), PTK is also useful for improving teacher competence in learning practices. By doing PTK, teachers can do self-reflection. Based on the results of this reflection, the teacher can plan an improvement process that will be implemented in the next learning process. After implementing the learning, the teacher again conducts a reflection. If the cycle is continuously carried out, it will be able to improve teacher performance.

This research procedure goes through four stages, namely: planning, action and observation, and reflection. The implementation of the action was carried out by following the steps of the Discovery Learning model, namely: (1) Stimulation. The teacher shows pictures and asks questions to direct students to think creatively and critically. The teacher provides an overview of the material to be learned to prepare students to explore learning, (2) Problem statement (problem identification). The teacher divides students into groups of 5 members. The teacher distributes the Learner Worksheet (LKPD) and provides an opportunity to discuss to identify problems which then become the formulation of the problem to be studied, (3) Data collection (data collection). The teacher guides students to conduct experiments according to the instructions on the worksheet and records the data obtained in the worksheet, (4) Data processing. The teacher guides students to conduct group discussions to answer the questions on the worksheet. The teacher asks students to literate the student book as a source of information. The teacher assists groups that are having difficulty, (5) Verification. The teacher asks students to communicate the results of group discussions by presenting and other students respond and add information (6) Generalization (conclusion). The teacher and students conclude from the verification results. The teacher provides feedback, input, and reinforcement of the material and reflects on the learning activities. The teacher gives a test to determine students' understanding of the material that has been learned. Before the research was conducted, the teacher used a conventional learning model in the form of the lecture method. In conventional learning, the center of learning is the teacher. The role of the teacher is very dominant because learning activities are fully controlled by the teacher.

Students are not active when receiving lessons as a result students become bored and learning objectives are not achieved.

The indicator of the success of this study is if the process of implementing the actions carried out by the teacher is included in the high category and the level of achievement of KKM is 85% of the number of students. The KKM for science subjects on vibration and wave material at SMP Negeri 1 Tegalrejo is 77.

RESULT AND DISCUSSION

The research begins with preparing a plan which includes; preparing lesson plans using the Discovery Learning model, coordinating with observers, namely fellow science subject teachers, preparing observation sheets, question sheets, and answer sheets, preparing LKPD, and preparing learning media and tools.

Implementation of actions in cycle I apply the Discovery Learning learning model with vibration material. Cycle I was carried out in one meeting. To obtain quantitative data, initial cycle/pre-cycle tests and cycle I tests were carried out. Initial tests were carried out before the implementation of research actions, while cycle I tests were carried out after the implementation of cycle I actions. To obtain qualitative data, observations were carried out on teachers and students whose implementation coincided with the actions in class. Observations of teachers were carried out by colleagues who observed and recorded all activities that occurred using teacher observation sheets, while observations of students were carried out by researchers using student observation sheets. Result of observations shown as table 1.

Table 1. Student KKM profile pre-cycle, cycle I, and cycle II

No.	Indicator	Pre-Cycle	Cycle I	Cycle II
1.	Average Score	55.3	71.3	86.0
2.	Complete KKM	9	20	26
3.	KKM Percentage	30%	66.7%	86.7%

The minimum completion criteria set for vibration and wave material is 77. Based on Table 1, it can be concluded that during the pre-cycle of the 30 class VIII D students who were research subjects, only 7 students completed the KKM. The percentage of classical completeness is 30% with an average score of 55.33. Thus, there were 21 students, or around 70% who did not complete the KKM. This is because during the pre-cycle students are not active in learning activities. This problem becomes a challenge for teachers to change the learning situation to be more enjoyable. With fun learning, students become active in learning activities, and will improve student learning outcomes.

The results of data analysis after the actions in cycle I are shown in Table 1. At the end of cycle I there were 20 students who completed the KKM with an average score of 71.33. The percentage of classical learning completeness was 66.67% or there was an increase in the percentage of classical learning completeness by 36.67% and an increase in student learning outcomes of 16.00. However, the increase in learning outcomes has not yet reached the ideal completeness that should be achieved, namely

85%. The increase in the value of learning outcomes is the impact of implementing actions in cycle I which were carefully prepared and learning activities were by the syntax of the Discovery Learning model.

Qualitatively analyzing data from teacher observations in cycle I, a score of 46 was obtained. The process of implementing this action was in the high category. Although overall the learning implementation process in cycle I went well and was in accordance with the syntax of the Discovery Learning learning model, there were still several things that needed to be improved, namely; (1) The distribution of groups is not evenly distributed in terms of ability and gender so that learning activities that require active participation of students do not run smoothly. For example, during a presentation the group of students assigned to do the presentation cannot convey the material well or there is no response from other groups and students still have difficulty solving problems in group discussions, (2) The teacher has not given awards or rewards to groups of students whose performance Good. Awards need to be given to provide learning motivation to students.

The results of student observations show that most students' behavior in terms of discipline, independence, activeness, cooperation, communication skills and empathy is still less than optimal. During learning, some students did not take part in experiments or discussions. Students do not focus on carrying out experiments, there are even children playing with experimental equipment. During the presentation, some students were still embarrassed to convey the results of their discussion, while students in other groups also did not provide responses or input, so the presentation seemed stiff and uninteresting. This happens because the group division is unequal both academically and gender-wise. Students with good academics are gathered in one group. The proportion of male and female students is also unequal. Some groups consist of only men or only women.

Implementation of the action uses the Discovery Learning learning model with several things improved by the teacher from the results of reflection in cycle I. Improvements made include a) the teacher re-dividing the student groups to be more evenly distributed in terms of ability and gender, and b) the teacher giving awards or rewards in the form of stars and bonus points for groups that perform well. Cycle II was carried out in one meeting. After the actions in cycle II, a test was carried out with the data obtained in Table 1.

The results of data analysis after the actions in cycle II are shown in Table 1. Data was obtained from 26 students who completed the KKM with an average score of 86.00. The percentage of classical learning completeness is 86.67%. When compared with cycle I, in cycle II there was an increase in the percentage of classical learning completion by 20% and an increase in student learning outcomes by 4.67. This increase is the result of improvements from cycle I action, where teachers have prepared more mature learning improvement plans and implemented actions according to the enhanced Discovery learning model syntax. The percentage of classical learning completeness of 86.67% has exceeded the level of achievement of the minimum completeness criteria (KKM) set by researchers, namely 85%. There are still 4 students who have not succeeded in reaching the KKM, so they must be guided again by providing remedial learning.

From the results of teacher observations in cycle II, a score of 48 was obtained, which means it is in the high category. The teacher has carried out all stages of learning activities using the Discovery Learning model according to the syntax very well. There was an increase of 2 scores from cycle I, which means the teacher has made improvements to his performance during the implementation of learning. The score increase was significant due to improvements made by teachers who had divided groups heterogeneously and provided rewards.

The results of student observations in Table 1 show an increase in student behavior in discipline, independence, activeness, cooperation, communication skills and empathy. Students are always active in experiments, discussions, and presentations. During the experiment, all students were able to carry out experiments using the assessment guide. No children played with the experimental equipment. The data obtained is immediately recorded and data processing is carried out. Group collaboration has been established well. Students are brave and skilled in communicating the results of their discussions in front of the class. During the presentation, there were no students who were awkward in conveying the results of the discussion or responding or providing input. The increase in student learning outcomes is shown by the percentage of classical learning completeness of 86.67%, which shows that the Discovery Learning learning model used in the learning process affects student learning outcomes. The results of this research have similarities with previous research conducted by Masayu, et al (2020), Nurma and Alik (2023), Fine and Cintia (2023), Eka Purwanti (2023), and Mahrus (2023), namely that learning uses a model Discovery Learning can improve student learning outcomes.

CONCLUSION

Based on the results of the two research actions carried out, it can be concluded that learning using the Discovery Learning model can improve science learning outcomes regarding vibrations and waves in class VIII students. Based on the discussion and conclusions above, it can be concluded that (1) teachers who experience science learning problems in their classes can apply the Discovery Learning learning model, (2) further research needs to be carried out on the Discovery Learning learning model with a variety of learning methods for different material characteristics. because the Discovery Learning model is not always appropriate for all subject matter, it requires mastery of the material to determine it.

REFERENCE

- Haryanto. (2021). *Meningkatkan Motivasi dan Hasil Belajar dengan Two Stay Two Stray*. Lombok Tengah. Pusat Pengembangan Pendidikan dan Penelitian Indonesia.
- Mahrus. (2023). Upaya Meningkatkan Aktivitas dan Hasil Belajar Peserta Didik dengan Model Pembelajaran Discovery Learning pada Mata Pelajaran IPA SMP Kelas IX. *KONSTRUKTIVIME*, 15(1). 148-158

- Novitasari, A. N. & Laili, M. N. (2023). Pengaruh Model Discovery Learning Berbantuan Media Powerpoint terhadap Kemampuan Berpikir Kritis IPA Siswa Kelas VIII. *Jurnal Pendidikan IPA*, 13(1), 30-38.
- Purwanti, E. (2022). Peningkatan Aktivitas dan Hasil Belajar IPA pada Siswa SMP melalui Model Discovery Learning. *Jurnal Didaktika Pendidikan Dasar*, 6(1), 1-22.
- Pranoto, E. (2023). *Model Discovery Learning dan Problematika Hasil Belajar*. Lombok Tengah. Pusat Pengembangan Pendidikan dan Penelitian Indonesia.
- Prilliza, D. M., Lestari, N., Merta, W. I., & Artayasa, P. I. (2020). Efektivitas Penerapan Model Discovery Learning Terhadap Hasil Belajar IPA. *Jurnal Pijar MIPA*, 15(2), 130-134.
- Rahman, T. (2018). *Aplikasi Model-model Pembelajaran dalam Penelitian Tindakan Kelas*. Semarang. Pilar Nusantara.
- Sanjaya, W. (2016). *Penelitian Tindakan Kelas*. Jakarta. Prenada Media.
- Sartunut. (2022). *Discovery Learning Solusi Jitu Ketuntasan Belajar*. Pusat Pengembangan Pendidikan dan Penelitian Indonesia.
- Siahaan, E. F. & Sihotang, C. (2023). Pengaruh Model Pembelajaran *Discovery Learning* untuk Meningkatkan Pemahaman Konsep IPA Siswa SMP Satrya Budi Perdagangan. *Jurnal Simki Pedagogia*, 6(1), 161-168.