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Application of Relation between Ability to Study Concepts and Problem-Solving Kinematics with Student Achievement in Physics Learning at Public Junior High Schools in Pidie Regency

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ABSTRACT

This study aims to improve the application of the relation between the ability to examine concepts and problem solving that can shape students to be more skilled in the learning process to improve student achievement. This study examines the relation between the ability to study concepts and problem solving physics to improve student achievement, so this study used a quantitative approach, correlation technique. Based on the results of the analysis, it can be concluded that there is an increase in physics learning outcomes in kinematics material with a problem solving. Suggestions that can be given by teachers of physics subjects as an alternative learning method that is able to solve problems in physics learning which tend to always be associated with formulas, because it is proven to be able to produce better learning outcomes so that learning with problem solving can be applied in physics learning to improve teaching and learning process to be more effective.

Keywords: kinematics, problem solving, application of the concept

INTRODUCTION

The learning process that occurs throughout the ages, the end is the achievement of increased learning achievement. The quality of education in Indonesia today is generally still low, with such conditions (low physical facilities, teacher quality, and teacher welfare) student achievement becomes unsatisfactory. According to Trends in Mathematics and Science Study [1], Indonesian students are only ranked 35th out of 44 countries in terms of mathematics achievement and ranked 37th out of 44 countries in Indonesia. This is partly due to the undeveloped learning process. Education is said to be of high quality if the learning process is effective. Therefore, in the learning process, teachers as educators are expected to have skills in carrying out the learning process, including skills in delivering material and choosing the right learning model so that learning activities are effective and efficient.

The selection of the learning model is based on the fact that each student has different abilities and levels of thinking so that the selection of the right learning model will help students master the subject matter in accordance with the targets pursued in the curriculum, that physics is the most important subject for all in Indonesia.

Physics is related to how to find out about nature systematically so that learning physics is not only for mastering a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery, so that students are required to be able to think critically and creatively. Physics lessons are not memorization lessons, but rather understanding concepts and even application of these concepts. Mastery of physics concepts is needed to be able to solve all physics problems, both problems in everyday life and in the form of questions.

Physics subjects are generally considered difficult by most students in junior high school

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and high school. This assumption has a major influence on the learning outcomes of physics at the school level. Only students who are really interested in studying physics show satisfactory learning achievements. Based on the empirical experience of students in one of the junior high schools in Pidie District practicing physics, there are several conditions that support the erroneous assumption of physics subjects: 1) Physics material has a lot of formulas and a series of abstract events. Whatever the concept of physics material in every basic competency, it almost has a formula. Yet the formula actually comes from an ordinary statement. For example, the formula for Distance (s = vxt). This formula is derived from the statement; The motion of an object is the product of the velocity (v) of the object with time (t). 2) Less conducive learning model , it is known that the lack of student interest in learning physics is caused by learning factors. Learning is carried out by teachers with strategies and methods that do not attract students' attention. 3) The attitude of the physics teacher is less enthusiastic and friendly. Physics does require seriousness to pursue it but it requires a relaxed, humorous and friendly attitude. Too strict in carrying out learning is not the right way to get students to enjoy the subject. The most important thing is to get students interested in the teacher first. If it is so, interest in the subject will grow naturally. 4) Limitations of learning tools and media. This problem is not new in the world of education. However, efforts to complete these learning facilities are still half-hearted by the government. This is especially true for schools in suburbs and rural areas. Physics needs tools for practicum, it needs media to concretize abstract material.

Problem solving and the principles of physics in the early grades of junior high school are prerequisites for the success of learning physics and increasing students' interest in physics in later grades. In other words, if the problem-solving process and the principles of physics in the early grades are very low along with a negative attitude towards physics lessons, it is difficult to expect students to do well in learning in the classrooms. Furthermore, physics lessons in junior high school have motion material. The material is often taught only theoretically. This causes students to become bored, lazy to think, and just accept the material. Therefore, appropriate learning strategies are needed so that the learning process becomes fun. Class discussion activities that involve all students in small groups with problem solving are suitable for use in learning the subject of Kinematics. Students are expected not to experience boredom in the learning process, so that the quality of learning will increase.

Based on the narrative of the physics subject teacher at the Pidie District Junior High School, it is known that the learning outcomes of students in the learning process tend to be low, this is because the learning that takes place is still conventional with the lecture method, where students tend to only record what is taught by the teacher. Students do not have problem solving skills on physics material in particular. The low learning outcomes are thought to be due to several factors, namely: 1)teacher-centered learning; 2) learning approaches and learning resources that are less varied; 3) learning oriented to the pursuit of material without problem solving; 4) students' lack of interest in learning physics subjects. Therefore, the researcher took the initiative to do research at the school.

One of the expected goals of this research activity is to see the relation between students' abilities in applying concepts and solving physics problems. According to [2], problem solving is carried out with the following steps: 1) with conceptual analysis of the problem, 2) planning for problem solutions, 3) implementing and evaluating problem solution plans, and 4) reflection on the problem solving. The principles of physics in the early grades are a requirement for the success of learning physics and increasing student interest in physics in subsequent classes. In other words, if the problem solving process is based on the results of the research, according to [3] there are five important steps in problem solving. 1)

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What are the types of questions? It aims to relate the question to a known approach, 2) What is the purpose of the question? or what is the question looking for?, 3) What do I already know?, 4) what is my plan to solve the problem?, and 5) how do I know that I have solved the problem.

There are several studies that have been conducted by several researchers about problem solving is a mental and intellectual process in finding problems and solving based on accurate data and information, so that appropriate and accurate conclusions can be drawn [4]. The results of other studies as proposed by Hamalik [5] To be able to manipulate information, new information must be integrated with the cognitive structure that is already owned. So the problem solving process consists of: (1) awareness of the existence of a problem, (2) problem formulation, (3) hypothesis formulation, (4) data or information collection, (5) hypothesis testing, (6) conclusion drawing and (7) application of problem solving results in new situations. [6] also reported the results of research on problem solving has been recognized as a complex cognitive paradigm that is part of our everyday experience. [7] in his research stated that in learning physics, teachers usually only emphasize the calculations in the students' final answers which are only in the form of numbers regardless of the understanding of students who tend not to be able to solve physics problems outside the classroom, because actually physics is understood well by students. students will be able to solve physics problems in everyday life. [8] also reported the results of research on problem-solving-based learning to be very important. Because in learning, students quickly forget if it is only explained orally, they remember if given an example. And understand if given the opportunity to try [9].

RESEARCH METHODS

This study examines the relation between the ability to examine concepts and problem solving physics to improve student achievement, so this research used a quantitative approach, correlation technique. This is in accordance with what was stated [10] Correlational research is sometimes needed as descriptive research, mainly because correlational research describes a condition that already exists. Correlational studies describe in quantitative terms the degree to which the variables are related. The research instrument used in this study was in the form of questions.

Prior to the implementation of the study, an early stage analysis was carried out which aims to determine the initial state of the population. The initial stage analysis is carried out on the motion material by attaching an indicator to see whether or not the motion question is appropriate for the test instrument test which will be validated by the supervisor in accordance with the directions of supervisor one and supervisor two. From the questions that the researcher made, after the instrument was validated by a powerful lecturer, the valid questions according to the indicators were 34 questions of understanding the concept, 33 questions of problem solving and 30 questions of achievement. Then the questions were tested in class VIII. This is because class VIII has already received motion material that will be researched in class VII at junior high school in Pidie Regency. The trial was carried out with the aim of finding questions that were considered appropriate and appropriate for research questions. From the results of the validity test, the researcher took 20 valid questions from concepts of understanding, problem solving and achievement. This study aims to improve the application of the relation between the ability to examine concepts and problem solving that can shape students to be more skilled in the learning process to improve student achievement.

RESULTS AND DISCUSSION

Prior to conducting the research, an early stage analysis was conducted to determine the initial state of the population. The initial stage analysis is carried out on the motion material by

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attaching an indicator to see whether or not the motion question is appropriate for the test instrument test which will be validated by the supervisor in accordance with the directions of supervisor one and supervisor two. Of the 74 questions that the researchers made, after being validated by the instrument by a powerful lecturer, the valid questions according to the indicators were 40 questions, then a trial test of 40 research questions was carried out in class VIII of forty questions that were worthy of being tested on students to make how many question. This is because class VIII has already received motion material that will be researched in class VII. The trial was carried out with the aim of finding questions that were considered appropriate and appropriate for research questions and obtained 25 valid questions from 40 questions that had been given to class VIII who had received motion material. Of the 40 questions that have been answered by class VIII students, the researcher validates the questions to get valid questions.

Before carrying out the learning process in the form of learning with problem solving, several research instruments were arranged, including the learning implementation plan which contained a research program plan that led to the problem solving process. In later learning, students in learning will use student discussion sheet which contains student discussions where students will be able to solve physics problems using logical thinking and a little using formulas. The learning process with the problem solving referred to in this study is to be able to train students to solve problems in science learning, especially physics. Physics lessons are usually closely related to many formulas that must be memorized and learned so that making students feel bored, lazy and afraid of physics lessons can be helped in this research. This research is more directing students to be able to apply concepts and solve problems, especially with existing questions with no or little use of formulas or the top way (easy, cool and fun) which is usually liked by junior high school students.

Learning the problem solving at Junior Hight School 4 Sakti in class VII was carried out 5 times face-to-face, the details of which were 4 times face-to-face used as learning and 1 time face-to-face was used as a post-test. There are several obstacles that arise in the implementation of the learning. For example, there are some students (5 to 10 people) who make a fuss in class or are not very happy with physics. This is a challenge for researchers, how to make students enjoy physics lessons. In the initial learning process, the students were not happy, the researcher asked the students to come forward by giving questions that already had examples and following the examples. It turned out that the students were happy and motivated to learn. The learning process for the next meeting by creating study groups in the early stages of the obstacle is in the form of a lack of concentration of students in learning, students are not active in asking questions or discussing, in dividing groups, students are not agile to sit with their groups so they waste a lot of time. This is caused because students are not familiar with group learning. The learning atmosphere is a factor that hinders the maximum capture of the material.

In the next lesson the obstacles began to decrease, because with the study group students were happier and could solve a physics problem, especially in motion material. Noise and grouping of students and lack of time efficiency can be handled by easy group placement without having to move randomly from the original place, but in this case pay attention to individual competencies in each group so that group discussions run smoothly. As for the lack of student activity during the discussion, it can be reduced by the active role of the researcher in monitoring and directing students during the discussion so that the discussion takes place. The process of group discussion is better, making each student dare to present the answers to his group discussion without being reluctant with hesitation. With this group study, students who do not understand the material about motion. With problem solving, learning encourages students to cooperate with other students in working on

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a problem. They are more active in asking questions and expressing their opinions in connecting the existing material, so that they are able to complete the student discussion sheets that have been given by the researcher well.

With group learning, it encourages students to cooperate with other students in working on a problem. They are more active in asking questions and expressing their opinions in connecting the existing material, so that they are able to complete the student discussion sheets that have been given by the researcher well. This is what causes better learning outcomes with problem solving. So from the results of the post-test given, it can be seen that the normality test and the correlation between the three variables are; the value of the application of the concept (X) and the value of problem solving (Y) with the student achievement value (Z).

Normality Test on Concept

Understanding From the post test results of the value of understanding the concept that student learning outcomes at Junior Hight School 4 Sakti in class VII can be shown through the results of the normality test on the application of the concept (Tx) = 0.94 at the degree of freedom (df) = 40 with a level of significant 0.70. This means that for understanding the concept of 0.070 > 0.05, normally distributed means that if p is greater than 0.05, it can be concluded that our data is not significantly different from normal data. This means that our data has a normal distribution as well.

Problem Solving Normality Test

From the post-test results of problem solving scores, student learning outcomes at Junior Hight School 4 Sakti in class VII on the normality test indicate that the data is normally distributed (Ty) = 0.958 at the degree of freedom level (df) = 40 with a significant level of 0.146 . This means that for problem solving, it shows a significance value of 0.146 > 0.05, normally distributed, meaning that if p is greater than 0.05, it can be concluded that the data we have is not significantly different from normal data. This means that our data has a normal distribution as well.

Achievement Normality Test

From the post-test the students' achievement scores at Junior Hight School 4 Sakti in class VII were statistically scored (TZ) = 0.97 at the degree of freedom (df) = 40 with a significant level of 0.551. This means that achievement shows a significance value of 0.551> 0.05, normally distributed, meaning that if p is greater than 0.05, it can be concluded that our data is also normally distributed. It can be concluded that the three variables are normally distributed, where the significant value for understanding the concept is 0.07 > 0.05, for problem solving the significant value is 0.146 > 0.05, achievement also shows a significant value of 0.551 > 0.05. The significant value of the three variables is greater than 0.05, this means that if p is greater than 0.05, it can be concluded that our data is also normally distributed.

Correlation Test Results Concept Understanding and Problem Solving The

The value of understanding the concept and the value of problem solving in the correlation test shows the results for the relation between studying concepts and problem solving are obtained by a relation of r = 0.679, this means that there is a fairly strong relation between the two variables. Because the correlation r value > 0, it means that there is a positive correlation. So the higher the understanding of concepts and problem solving, the higher the student's learning achievement. Based on the significant value, it is known that the significant value of 0.000 is smaller than 0.05 (0.00 <0.05), so there is a significant relation between understanding the concept and solving problems. Furthermore, if we look at the interrelated variables between the two variables, it is 46.1%.

Correlation of Concept Understanding with Achievement The

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The value of concept understanding and achievement value on the correlation test shows the results for the relation of r = 0.939, this means that there is a fairly strong relation. Because the correlation value is > 0, it means that there is a very positive correlation. So if the level of understanding of students' concepts is high, student learning achievement also reaches a high level, based on a significant value of 0.000 less than 0.05 (0.00 <0.05), then there is a significant relation between understanding concepts and student achievement. The variables that are mutually binding between the two variables are 88.2%.

Correlation of Problem Solving with Achievement The

The value of problem solving with achievement scores on the correlation test shows the results for the relation of r = 0.887, this means that there is a fairly strong relation. Because the correlation value is > 0, it means that there is a very positive correlation. So if the level of problem solving with learning achievement increases, student learning achievement also reaches a high level, based on a significant value of 0.000 which is smaller than 0.05 (0.00 < 0.05), then there is a significant relation between problem solving and learning achievement. . The variables that are mutually binding between the two variables are 78.7%.

From the correlation level of the three variables, it is in accordance with research [11] that the problem solving process will bring a person to better understand the problems at hand, because there is a reciprocal process that occurs. Based on the results of the study, it can be seen that the learning outcomes test of students who obtained the problem solving on motion material were better. This can be seen from the tests that have been described previously, such as giving student discussion sheets. This is one of the factors that have supported the achievement of learning outcomes because students are personally seen to be active in learning and motivated because learning is interesting and fun.

In this study there is a difference with the theory stated [12] that problem solving can be considered as a systematic manipulation of information, step by step by processing information obtained through observation to achieve a thought in response to the problems encountered. Because this study emphasizes students' understanding of science learning, especially in physics, which in learning uses a problem solving that is oriented towards developing students' abilities to minimize the use of formulas by way of understanding that has been trained by researchers, thus making students interested and motivated. in learning so that it affects learning outcomes which tend to rise [13].

Based on the results of the study, it can also be seen that students who have obtained problem solving by learning to use student discussion sheets to improve understanding and skills on the subject matter of motion have a significant influence on learning outcomes [14]. The above statement is in line with the theory that has been put forward by [15] which states that the problem solving process provides opportunities for students to play an active role in learning activities. Problem solving requires the ability to process information to make certain decisions. In addition, efforts to find answers to the problems faced require creative thinking skills and the ability to explore new fields [16]. Because the learning uses student discussion sheets which require students' creativity in each group to solve problems in innovative new ways [17].

CONCLUSION

Student discussion sheets are used as a tool in learning with a problem solving ability to improve student understanding and make students more creative and innovative because in discussions they are required to provide new solutions with existing formulas, so that student learning outcomes also increase. The value of

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understanding the concept and the value of problem solving in the correlation test shows that for the relation between analyzing concepts and solving problems, the relation is obtained by r = 0.679, this means that there is a fairly strong relation between the two variables. Because the correlation value is > 0, it means that there is a positive correlation. So the higher the understanding of concepts and problem solving, the higher the student's learning achievement. Based on the significant value, it is known that the significant value of 0.000 is smaller than 0.05 (0.00 <0.05), so there is a significant relation between understanding the concept and solving problems. Furthermore, if we look at the interrelated variables between the two variables, it is 46.1%. The value of understanding the concept with the achievement value on the correlation test shows the results for the relation of r = 0.939, this means that there is a fairly strong relation. Because the correlation value is > 0, it means that there is a very positive correlation. So if the level of understanding of students' concepts is high, student learning achievement also reaches a high level, based on a significant value of 0.000 less than 0.05 (0.00 <0.05), then there is a significant relation between understanding concepts and student achievement. The variables that are mutually binding between the two variables are 88.2%. The value of problem solving with the achievement value in the correlation test shows the results for the relation of r = 0.887, this means that there is a fairly strong relation. Because the correlation value is > 0, it means that there is a very positive correlation. So if the level of problem solving with learning achievement increases, student learning achievement also reaches a high level, based on a significant value of 0.000 which is smaller than 0.05 (0.00 < 0.05), then there is a significant relation between problem solving and learning achievement. . The variables that are mutually binding between the two variables are 78.7%.

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