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Analysis of the Application of the Problem Based Learning Model in Improving High School Students' Concept Understanding Ability in Physics Lessons: Literature Review

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Abstract This literature review is to provide a comprehensive picture of the implementation of the problem based learning learning model to improve students' cognitive abilities. This research method uses qualitative research methods with a literature review approach. The literature review is used through various previous research results and theoretical studies from various sources. The data is taken, collected, and analyzed from books and scientific journals that have similar topics, then made into writings and conclusions. The results of the study show that implementing the problem-based learning model can improve students' understanding of concepts. The application of problem-based learning is more effective for increasing students' conceptual understanding than the usual lecture method which focuses only on the teacher.

Keywords: *Application; problem based learning; concept understanding*

INTRODUCTION

Indonesia has a goal, one of which is to educate the life of the nation, so that education is needed to achieve this goal. Education is a very important need, every human being needs education whenever and wherever. Education will direct a person to become a human being who has noble character and noble character. Education does not only provide knowledge or values, or train skills but education functions to help students develop all their potential, abilities and positive traits (Nana Syaodih Sukmadinata, 2009). In Law no. 20 of 2003 concerning the National Education System (Sisdiknas), it states that: "Education is a planned conscious effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character , as well as the skills needed by himself, society, nation and state (Hasbullah, 2008).

Related to the development of the times, education must be able to facilitate students to be able to compete according to the times, especially in learning in the classroom. Learning is a process of interaction between students and educators and learning resources in a learning environment. Many students in the learning process only memorize concepts or formulas in physics, only take notes without knowing whether students understand or do not understand a theory, this condition causes low student learning outcomes. Understanding concepts is very important with the aim that students can understand and remember the material concepts they studied before, so that the learning process will become more meaningful.

Physics is a part of natural science. Physics is one of the important subjects to study. Therefore mastery of the concept is the most important thing in learning physics. Understanding is the ability of a person to interpret, interpret, translate or state something in his own way about that knowledge. Students' understanding of physical material greatly influences student learning outcomes. This is because the teacher only teaches abstract physics through classroom learning, only monotonous notes, not equipped with an experimental process in the laboratory.

In addition, a learning model is also needed which must be determined by students (Regulation of the Minister of Education and Culture of the Republic of

Indonesia, 2014). Education is basically a conscious effort to develop personality and abilities inside and outside school that last a lifetime. Therefore education must have someone who is in accordance with individual abilities (Asfiati, 2016). Many learning models stimulate students to learn to understand the material. One of them is the problem-based learning model (PBL). Problem Based Learning is a learning model that encourages students to apply critical thinking, problem solving skills, and content knowledge to real world problems (Maulana Arafat Lubis, 2018). Problems that are created or designed can rebuild students' understanding of the knowledge that has been previously obtained.

The problem-based learning (PBL) learning model is a learning process that has the characteristics of learning starting by giving problems that have context with the world of real, active group learning, formulating problems and identifying the basis of their knowledge, learning and finding their own material related to problems and solutions to problems. The PBL learning model in the opinion of Barbara J. Duch, is problem-based learning that can provide a place where skills can be developed. Learn it starting from the problem raised, which will be solved by learning in a problem-based approach, context is used in providing motivation and encouragement to students to solve problems. The learning problem-based learning model (PBL) is studying that focuses on problem-solving activities. (Dasa ismamuza, undated, 2010). With the intention of students can actively seek answers to problems given by educators. In this case more educators act as mediators and facilitators to assist students in building knowledge actively. (Siregar, 2016). The application of the PBL model has been studied by several previous researchers, (Eka yulianti and Indra Gunawan, 2019) reporting the results of their research that the effectiveness of use. The PBL model is more effective in increasing the conceptual understanding and critical thinking of student participants, so it can be concluded that there is an effect of applying the PBL model on the conceptual understanding and critical thinking of high school students.

METHOD

The method used is a literature study or literature review. Literature study is a research design used in collecting data sources related to a topic. The literature study aims to describe the main content based on the information obtained (Herliandry et al., 2020). The method used in this writing is a study of librarianship.

RESULT AND DISCUSSION

1. Problem Based Learning

The learning model is a system consisting of various components that are interconnected with one another. (Rusman, 2010). The learning problem-based learning model (PBL) is studying that focuses on problem-solving activities. (Dasa ismamuza, undated 2010). According to Wina Sanjaya in Mohamad Syarif Sumantri's book, problem-based learning is a learning model associated with contextual learning. (Dr. Syarif Sumantri Mohamad, 2015). From the statements of several experts above, it can be concluded that Problem Based Learning (PBL) is a learning model that involves students solving problems where students are involved in carrying out group work, giving feedback, discussing and encouraging students to be more active. in developing critical thinking skills.

According to Ward, as quoted in his book Ngalimun, he said that Problem Based Learning (PBL) is a learning model that involves students solving a problem through the stages of the scientific method so that students can learn knowledge related to the problem and at the same time. as well as having problem solving skills. . Moffit in Rusman suggests that problem-based learning is a learning approach that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills as well as to acquire knowledge and concepts which are the core of the subject matter. From the various definitions above, it can be concluded that the problem-based learning model is a learning model that uses real world problems that involve students in solving problems so that students can improve their cognitive abilities and problem solving skills.

The purpose of problem-based learning (PBM) is mastery of disciplinary heuristic learning content and developing problem-solving skills. Problem-based

learning (PBM) is also related to learning about broader life, skills in interpreting information, collaborative and team learning, and reflective and evaluative thinking skills.

Table 1. Problem Based Learning Model Syntax

Phase	Indicator	Teacher Activities/Activities
1	Orientation of students to problems	The teacher explains the learning objectives, explains the logistics needed, poses problems, motivates students to engage in the problem solving activities they choose.
2	Organizing students to learn	The teacher helps students define and organize learning tasks related to the problem.
3	Me Guiding individual and group investigations	The teacher encourages students to collect appropriate information, carry out experiments to get explanations of problem solving.
4	Analyzing and evaluating the problem-solving process	Teachers help students reflect or evaluate their investigations in the processes they use.
5	Analyzing and evaluating the problem-solving process	Teachers help students reflect or evaluate their investigations in the processes they use.

According to (Agnew, 2001), by implementing problem-based learning students will study in depth to understand concepts and develop skills, students participate and motivate each other in learning.

The steps of the Problem Based Learning learning model above can be done to increase learning activities and develop critical thinking knowledge in solving a problem in everyday life so that students' cognitive mathematics increases, with. Thus the steps of the Problem Based Learning learning model are ways or guidelines for a teacher in carrying out the learning process using the Problem Based Learning model so that it is easy to understand Lessons in a learning model cannot be separated from the purpose of the Problem Based Learning learning model to be achieved through steps Problem Based Learning.

The advantages of the Project Based Learning learning model

There are 8 advantages of the Problem Base Learning Model (Hadi, 2016) as follows:

1. The PBL model is a fairly good technique for better understanding of subject matter.
2. The PBL model can challenge students' abilities and provide satisfaction for discovering new knowledge for students.
3. The PBL model can improve learning activities
4. Through the PBL model being able to show students each subject, it is basically a way of thinking and something students must understand, not just learning from teachers or books.
5. The PBL model is considered more fun and liked by students.
6. The PBL model can develop students' critical thinking skills.
7. The PBL model can provide opportunities for students to apply their knowledge in the real world.
8. The PBL model can develop students' interest in learning continuously, even though learning in formal education has ended.

Lack of Problem Based Learning learning models

The disadvantages of the Problem Based Learning learning model (Maulana Arafat, and Nashran Azizan, 2019) are as follows:

1. If students do not have interest or do not have confidence that the problem being studied is difficult to solve, then they are reluctant to try.
2. Successful PBL takes time to prepare
3. The stage of understanding why they are trying to solve the problem being studied, then they will not learn what they want to learn.

2. Concept Understanding

Understanding is defined from the word Understanding (Sumarmo, 1987). Degrees Understanding is determined by the degree of relevance of an idea, procedure or fact. The degree of understanding is determined by the degree of relevance of an idea, procedure or fact mathematics is understood as a whole if these things form a network with high affinity. And the concept is defined as an abstract idea that can be used to classify a set of objects (Depdiknas, 2003:18). Concepts are

categories that group objects, events, and characteristics based on common characteristics (Zacks & Tversky, 2001). Concepts are elements of cognition that help simplify and summarize information (Hahn & Ramscar, 2001; Medin, 2000). Imagine a world where we have no concepts, we have to see each object as unique and cannot make generalizations. If we don't have a concept, it will be difficult for us to formulate a problem.

In line with the above (Ministry of National Education, 2003: 2) reveals that, understanding of concepts is one of the skills or skills in mathematics to be achieved in learning mathematics, namely by demonstrating understanding of the mathematical concepts they learn, explaining the relationship between concepts and applying concepts or algorithms in a flexible, accurate, efficient, and good at solving problems. Understanding the concept is one aspect of the three aspects of the assessment. Assessment on the aspect of understanding this concept aims to determine the extent to which students are able to accept and understand the basic concepts that have been received by students (Dewiatmini, 2010)

Understanding concepts is a very important part of the learning process and solving problems, both in the learning process itself and in the everyday environment. The following indicators of understanding the concept are as follows:

1. Restate a concept
2. Classify objects according to certain properties
3. Give examples of each object that has been classified
4. Presenting the concept in various forms
5. Develop necessary or sufficient requirements of a concept
6. Using, utilizing, and selecting certain procedures or operations
7. Applying the concept or problem solving

3. Physics lesson

Basically physics is a science that explains natural phenomena in the form of facts, principles and laws whose truth is tested through activities in the scientific method. Physics as a branch of science is one of the compulsory subjects in Senior High School (SMA). Learning physics is very important to be programmed in formal

schools because physics is a part of human life that is attached to phenomena in everyday life. Physics is a subject that is still considered difficult by students. Soong et al (2009) stated that the results of their research survey showed that on average students were not interested in studying physics, this is because physics is a difficult subject to learn so that students feel inadequate before studying physics and make students prefer to memorize formula rather than prioritizing its understanding.

Physics learning is a study of natural phenomena and symptoms in everyday life that can be reviewed through activities such as experience, observation and experimentation based on a scientific attitude to improve science process skills. In learning physics, educators use methods, models, media, and others to support the expected physics learning. Physics is a science that studies real events in everyday life, meaning that physics is not only about memorizing equations and theories, but also having to understand the application or meaning of the physics of the material in everyday life.

4. Application of Problem Based Learning in Improving Students' Understanding of Concepts in Physics Lessons

Many students in the learning process only memorize concepts, memorize physics formulas, take notes, listen passively, things like this cause low student learning outcomes. The low results of student learning are caused by the implementation of learning that is not optimal. The implementation of learning cannot be separated from several supporting sources including management, use of learning resources, use of learning media, use of learning strategies and models, developer performance, monitoring the implementation of learning tools, and management of improving the quality of education.

Understanding the concept is very important with the aim that students can remember the material concepts they learn. Improving understanding of concepts can be through various innovations or learning models that suit the characteristics of students. One model that is suitable for students' creative abilities is like using the Problem Based Learning model. In learning using the Problem Based Learning model students are required to be able to solve problems by discussing with their

group mates, students dare to express their ideas and are confident when presenting the results of their group discussions. In the experimental class, student learning mastery increased compared to the control class.

The problem-based learning model is learning that focuses on learning on problem-solving activities. With the aim that students are actively able to solve the problems given by the teacher. In this case the teacher is only a facilitator and mediator to help students actively increase knowledge. Problem-based learning can significantly improve student learning outcomes and especially improve students' understanding of concepts.

The following are some previous studies that have conducted research on Problem Based Learning as follows:

1. Halim, et al with the title "The Impact of Problem Based Learning on Conceptual Understanding in View of Students' Thinking Styles in Physics Subjects'. The results of this study concluded that experiment-based PBL learning can improve students' understanding of concepts. The increase in understanding of the concept of the experimental class was higher than that of the control class seen from the N-Gain of both classes. In addition, the increase in conceptual understanding was dominated by AA thinker students in both the experimental class and the control class. However, in the concrete random thinking style, the increase in understanding on each indicator of conceptual understanding in the experimental class was zero because the experimental class did not have a concrete random thinking style.
2. Moh. Fitrah with the title "Problem-Based Learning to Improve Understanding of Mathematical Concepts in Quadrilateral Material". The results of this study concluded that problem-based learning (PBL) gave very positive results for increasing understanding of mathematical concepts, especially in quadrilateral material. This is evident in the increase in each cycle which was analyzed by the researcher on the results of the concept understanding test. In addition, the teacher's activities greatly support the success of students in exploring the mathematical concepts themselves. Students' responses to problem-based learning on quadrilateral material also

received a positive response because it greatly motivated students to continue to investigate the problems given by the teacher so that students fully understood mathematical concepts.

Ulp Saharsa, et al with the title "Effectiveness of Application of Problem-Based Learning Models Assisted by Video-Based Laboratories to Improved Understanding of Physics Concepts". The results of this study concluded that the Problem Based Learning model assisted by Video Based Laboratory can improve students' understanding of physics concepts in class VIII SMP Negeri 19 Bulukumba. This is evident from the results of hypothesis testing which shows a significant value that is less than 0.05 and an increase in student scores in the experimental class compared to the control class. In addition, an assessment of student activity during the learning process was also carried out and the results were positive. The benefit of this research is to add new knowledge about the application of video-based laboratory-assisted problem-based learning models to students' understanding of physics concepts.

CONCLUSION

Based on the discussion and studies that have been described, it can be concluded that the problem-based learning model can make the physics learning process more active, help students think critically in solving problems, and the concepts of the material being taught are easy to understand, thereby helping students understand and understand the concepts the concept of physics material and encourage students to achieve success in learning.

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