

THE IMPACT OF PROBLEM-BASED LEARNING ASSISTED BY VIDEO ON PROBLEM SOLVING SKILL**WRS Nurwidodo, Siti Masitoh, Yatim Riyanto and *Fajar Arianto**

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Abstract

In teaching and learning process, learning is usually an act that is done intentionally, which then causes changes that are different from the changes caused by others. If in learning it is felt that the desired learning achievement has not been achieved, then in practice, educators usually choose learning methods that can increase students' attention in learning. The purpose of this study is to explain the impact of Problem Based Learning assisted by video media on students' problem-solving abilities. The research subjects were 120 Vocational High School students with 60 students in the control class and 60 students in the experimental class. This research is a quasi-experimental research. The results of this study indicate a positive influence on students' problem solving abilities. It is expected that Problem Based Learning can be used and developed again in learning.

Keywords: *Problem Based Learning, Problem Solving Skill, Assisted Model, Interactive Video.*

INTRODUCTION

In learning process, it is normal for changes to occur with the learning outcomes, these changes include changes in attitudes, knowledge and experience. Learning objectives are said to be achieved if learning provides improved learning outcomes than before. If in learning there is less improvement in learning outcomes, then educators look for solutions to these learning problems. At first, educators analyze what causes the learning objectives are not achieved. To make educators focus on learning. The capacity to solve problems is basically the nature of learning goals to meet the needs of students in real life. In everyday life students face problems throughout home, school or community district. Lack of confidence in student's environment to deal with current problems is one of the factors that lead to students being not treated in solving problems. In addition, the lack of experience that students have to treat everyday life problems is also a factor that makes problem solving difficult. Other factors have led to the implementation of the possibility of solving problems that lack of preparation, teachers and students carrying out activities to solve problems in learning. This is due to the lack of appropriate approaches to support learning problems.

The objectives of problem solving include: (1) Students become skilled in selecting relevant information then analyzing it and finally re-examining the results; (2) the intellectual potential of students increases; (3) Students learn how to make discoveries by going through the discovery process. Given the importance of practicing problem-solving skills in students, teachers need to pay attention to training these problem-solving skills in learning process. The students have good problem solving skills, as well as good skills and abilities in developing strategies and tactics to succeed in future global competition. Problem solving skills cannot be taught through the lecture method because problem solving is an active process.

One of the appropriate learning models to develop students' problem-solving skills is problem-based learning. Problem solving is part of problem-based learning. According to Arends [1] problem-based learning is a learning approach in which students work on authentic problems with a view to constructing their own knowledge. In problem-based learning, students are required to solve the problems presented by digging up as much information as possible, then analyzing and finding solutions to existing problems. The solution to the problem does not absolutely have one correct answer, meaning that students are also required to study critically. Students are expected to be individuals who have broad insight and are able to see the relationship between learning and aspects in their environment.

Problem Based Learning model is a learning model developed to help teachers develop thinking skills and problem solving skills in students as long as they study learning materials[2]. This model facilitates students to play an active role in the classroom through activities to think about problems related to their daily lives, find the procedures needed to find the information needed, think about contextual situations, solve problems, and present solutions to these problems. Problem Based Learning method is a learning approach in which students are guided to solve authentic problems to develop knowledge, inquiry and higher-order thinking skills, independence and self-confidence of students [3]. Based on this opinion, it can be concluded that the Problem Based Learning model is a learning model that uses real life problems in learning activities as a stimulus to develop students' problem solving abilities. Problems can be obtained from teachers or students. In their learning activities, students are trained to be critical and creative in solving problems and focus on building students' cognitive structures. The Problem Based Learning model is a learning model that invites students to solve problems using the scientific method step so that students are able to learn about these problems and have skills in problem solving. The experience that makes the behavior change process is learning activities used as the basic assumptions of cognitive psychology as a standard for Problem Based Learning. The process of interaction between individuals and

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the environment consciously is a learning activity that is not only a process of memorizing facts. Based on the above understanding, Problem Based Learning model is a learning model that provides authentic experiences that encourage students to learn actively, construct knowledge, and integrate the context of learning in school and learning in real life naturally. This model places problem situations as the center of learning, attracts and maintains student interest, both of which are used so that students are able to express their opinions about things in multiple perspectives. In practice students are directly involved in solving problems, identifying root causes and conditions needed to produce good solutions, teaching meaning and understanding, and becoming independent learners. Learning with Problem Based Learning model is assisted by the use of interactive video. Through interactive video learning, students display concrete shows in the form of short videos about the material being taught so that students become more interested in learning. Related to this, video has become an increasingly popular educational medium, which is used in traditional and reverse learning activities[4]. When the instructional video clarifies the lesson content, students respond favorably and report learning from the instructional video [5][6]. Even students at the college level often watch instructional/learning videos several times in preparation for exams [7]. In addition, the use of videos in class assignments can increase motivation which is indicated by increasing class attendance [8]. Other learning advantages have been associated with using video, including better conceptual understanding, mastery of complex problem solving, and increased readiness of the laboratory or learning environment [9][10][11]. In general, students who used problem-based video instruction found the use of video helpful in improving their understanding and memory because the video made them pay attention, allowed them to have a representative emotional experience, and gave them motivation to learn further. Videos were more effective in enhancing their learning because they believed that audiovisual materials could help them to better understand and remember situations [12]. Thus the spirit of learning will emerge from within the students and then supported by the enthusiasm and effort of the teacher so that it is hoped that learning which has not received optimal attention from students will motivate students to learn so that learning is expected to motivate students to learn. Learning objectives will be achieved optimally.

THEORY REVIEW

Problem Based Learning

Problem-based learning is a learner-centered educational strategy using contextual realistic problems and peer support to enhance practical application[13]. McMaster University, a Canadian medical school, first adopted problem-based learning as a pedagogical approach in 1968. At that time, McMaster University adopted problem-based learning as a means of solving problems that students could not apply their scientific knowledge to clinically situation [14]. In other words, problem-based learning is adopted to improve the transfer of learning, the extent to which learners effectively apply skills, knowledge, behaviors, and attitudes acquired in the classroom in either similar or new situations in their real life [15].

The Purpose of Problem Based Learning

The main objective of problem based learning is to motivate students; to promote collaboration, self-regulation, long-term

retention, and problem-solving skills; and ultimately provide opportunities to prepare a more competitive workforce[16]. In problem-based learning, students are encouraged to explore and find solutions to complex, contextual, authentic, and unstructured problems that reflect higher order thinking through small group activities [17].

Problem Based Learning Model

The most typical problem-based learning model is probably the Barrows model (1985) [18], which contains the following three main features: (1) using problem situations, (2) encouraging student-centered learning, and (3) utilizing group learning, small discussion. While proposing a well-defined problem-based learning model, it may be difficult to provide an inclusive definition of problem-based learning that fits its various applications. The application of problem-based learning has expanded from medical education to business education, engineering education, and K-12 math classes. However, the main components and formats of problem-based learning differ from one learning setting to another based on the objectives of the program or the nature of the subject matter [19].

Principles of Problem Based Learning

The following are the principles of problem-based learning by Graaff [20] as follows (1) Problem based learning is an educational approach where the problem is the starting point of learning process. The type of problem depends on the particular organization. Typically, problems are based on real-life problems that have been selected and edited to meet educational goals and criteria; (2) Who formulates the problem statement and who is responsible for the main decisions depends on the next principle, participant-led learning process, or 'self-learning', which has a much more individual-oriented focus; (3) Learning experiences: also an implicit part of the participant-directed learning process, in which students build on their own experiences and interests;(4) Activity-based learning: is a central part of the Problem Based Learning process, which requires activities that involve research, decision making, and writing. This can motivate and provide opportunities for students to gain deeper learning; (5) Interdisciplinary learning: relates to problem orientation and participant-directed processes, where problem solutions can go beyond traditional subject-related boundaries and methods; (6) The practice of exemplary relates to ensuring that the benefits obtained by students are exemplary in terms of its objectives; (7) Group-based learning is the last principle, where most of learning process takes place in groups or teams.

Problem Based Learning on Problem Solving Skills

Problem Solving is a cognitive process in which knowledge, skills, and personal experience are mobilized to identify problems, find solutions, and resolve conflicts effectively [21] [22]. State that exploring curiosity about how to solve a problem is a cognitive aspect that plays an important role in problem solving process [23]. Important problem-solving skills in the workplace to help employees meet challenges and innovation. This challenge requires them to become professional content masters and skilled problem solvers [24]. Fitriani's research [25] shows that problem-based learning model has a significant impact on students' problem-solving skills. Presentation of problems encourages students to

improve their problem solving skills [26] because it is one indicator of problem solving skills in identifying problems [27]. Effective learning model must be able to help students analyze a problem, find a solution to the problem, and reflect on the process [28].

Instructional Videos

The use of instructional videos is increasingly common in higher education. Instructional videos are designed to teach specific content, skills, or concepts, and differ from other educational videos such as narrative films, or those designed primarily to facilitate communication or collaboration [29]. A growing body of literature confirms that instructional videos are not only popular among students [30], but can also enhance student learning. For example, videos can facilitate learning by giving students control over the pace of teaching [31].

Benefits of Instructional Videos

There are several benefits of instructional videos obtained in their use in learning activities, including, (1) Increasing social interaction: social interaction increases with discussion after the video is watched in the classroom environment for online education platforms; (2) Unlimited access: easy-to-use learning videos. Learners can access with all types of mobile devices such as smartphones, tablets, laptops, and desktops; (3) Provide an individual learning environment: with instructional videos, learners get information about courses whenever they want. So, it offers students the opportunity to learn on their own; (4) Increase motivation and concentration levels: Recently, a scientist presented that there is strong evidence that instructional videos can engage and inspire learners when integrated into learner-centred classroom activities. As a consequence: student motivation and learning experience will increase, learner autonomy as a staff opportunity will be developed properly, student communication and ability to work together will increase; (5) Training period: instructional videos can have a fairly large impact in a short time; (6) Replay and pause videos: The most significant benefit of instructional videos is that learners can stop, rewind, pause, and then manipulate the learning timeline [32].

Characteristics of Instructional Videos

There are several characteristics of instructional videos according to Riyana [33], among others: (1) Clarity of messages: With video media students can understand learning messages more meaningfully and information can be received as a whole so that information will automatically be stored in long-term memory and is retention; (2) Stand-alone: The videos developed do not depend on other teaching materials or must not be used together with other teaching materials; (3) The information display that appears is helpful and friendly to the user, including the ease with which the user can respond and access as desired; (4) Content Representation: The material must be truly representative, for example simulation or demonstration material. Basically, every subject matter can be made into video media; (5) Visualization with media: The material is packaged in a multimedia which includes text, animation, sound, and video according to the demands of the material. The materials used are applicable, processed, difficult to reach, dangerous if directly put into practice, have a high level of accuracy; (6) High resolution: Display in the form of video media graphics made with digital engineering

technology with high resolution but support for every speech computer system; (7) Can be used classically or individually: Learning videos can be used by students individually, not only at school, but also at home.

Problem Based Learning Assisted by Instructional Video

This study is to investigate the effect of instructional videos applied to the use of problem-based learning. In the application of problem based learning students will be asked to display instructional videos if there is a suitability or even in accordance with the learning material being studied. The shows selected and displayed by students can be a separate focus to find out how high the level of students' abilities in finding conformity and understanding what they know and get. This will make learning more interesting, and students will be more interested in learning. The use of video in problem-based instruction can positively affect the learning and transfer of students' knowledge [34].

METHODS

The research design used was the Control Group Pre-test Post-test Design. The data collection technique used an observation questionnaire, then the researchers also gave a pre-test and post-test to measure the changes that occurred after the Problem Based Learning method was applied to the experimental class and control class, in which the control class was given the Problem Based Learning method without video, while the experimental class was given the Problem Based Learning method with a video. This research was conducted in a Vocational High School with the research subjects being class X students. The research subjects were 120 students, with the provision that 60 students were in the control class and 60 students were in the experimental class. This research is a quasi-experimental research. Methods of data collection using observation questionnaires and literature review.

RESULTS AND DISCUSSION

The main focus of this research is the process that occurs during learning. The first thing to do is to give a problem test to students at the beginning of learning, the point is to know the problem solving ability of students before being given the Problem Based Learning method in learning. The relationship between instructional videos in the application of problem-based learning is the Problem Based Learning model with the use of video. Through video learning media, students display concrete impressions in the form of short videos about the material being taught. In this case, video has become an increasingly popular educational medium, which is used in traditional and reverse learning activities [35]. In other words, the role of the video in this case is as a form or form of students having done problem solving conveyed through videos that they get for each student. Here it can be seen how concretely students can display videos that are in accordance with the subject matter. This was done to two classes, namely the control group who were treated with blended learning without video assistance and the experimenter who was treated with blended learning and video assisted. The experimental results were then analyzed using the T-test. The following is the result of the T-test analysis of the effect of video-assisted blended learning to solve the problem.

Results of t-test Pretest Problem-Based Learning on Problem Solving

A pretest problem-based learning t-test was conducted on problem solving with the detailed results obtained as follows:

Table 1. Group Statistics for Pretest

Groups	N	Mean	Std. Deviation	Std. Error Mean
Experiment	60	57.3770	11.85350	1.51769
Control	60	56.7213	11.72196	1.50084

Table 2. Independent Samples Test for Pretest

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Grade	Equal variances assumed	.015	.903	.307	120	.759	.65574	2.13446	-3.57034	4.88181
	Equal variances not assumed			.307	119.985	.759	.65574	2.13446	-3.57034	4.88182

After giving tests to students without using the problem-based learning method, the teacher gave treatment to the problem-based learning method in both classes, the control class and the experimental class. The control class was given learning materials using the problem-based learning method without video, while the experimental class was given learning materials using the problem-based learning method with video.

Result of t-test Posttest Problem-Based Learning on Problem Solving

A pretest problem-based learning t-test was conducted on problem solving with the detailed results obtained as follows:

Table 3. Group Statistic for Posttest

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Grade	Experiment	60	74.0164	8.15576	1.04424
	Control	60	59.2623	10.44175	1.33693

Table 4. Independent Samples Test for Posttest

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Grade	Equal variances assumed	7.214	.008	8.697	120	.000	14.75410	1.69641	11.39532	18.11287
	Equal variances not assumed			8.697	113.352	.000	14.75410	1.69641	11.39331	18.11488

Based on the results of the analysis of problem solving abilities in the experimental class, there was a significant increase. The indicator of understanding the problem has increased from 57 to 74. Even though the control class has also increased, it is not too significant, from 56 to 59. The conclusion that the problem solving ability in the experimental class is better than the problem solving ability in the control class. Based on the results of the average difference test obtained Sig of 0.01 < 0.05, then based on the independent sample t-test decision making, it can be concluded that H_0 is rejected and H_a is accepted, meaning that there is a difference between the average problem-solving ability of the experimental class students and control class. In the mean box, it can be seen that the average problem-solving ability of students in the experimental class is 74.0164, while the average problem-solving ability of students in the control class is 59.2623. This shows that the average problem solving ability of students in the experimental class is higher than the average problem solving ability of students in the control class. As a reference in the discussion of this research, as for previous research on the relationship between Problem Based Learning methods and increasing Problem Solving Skills. Andis Klegeris and Heather Hurren [36] stated that in their research, they determined that using Problem Based Learning in large classes had several positive results on student satisfaction with the learning process.

The data shows that the Problem Based Learning method described has an impact on students' problem-solving skills, this is because students feel comfortable and enjoy during the learning process, the absorption of learning material can be easily absorbed if students feel comfortable and enjoy learning. Husamah's research [37] states that the results of the average score and level of completion on each aspect of skills can be seen in the table. The score for problem solving skills increased, from a score of 79.23% to 86.78%. The ability to think creatively in solving problems enables them to become independent learners. Students need habituation to have the ability to solve the problems they encounter. The habituation is expected to help them improve their skills. The skills acquired can be applied to real-life situations. One of the important skills in solving problems is creative thinking skills. Creativity is one of the markers of humanity. This study also states that thinking skills are needed for problem solving. Moreover, creative thinking is a mental process that individuals use to generate new ideas. Subsequent research mentions in general, the results of this study indicate that Problem Based Learning can be more effective in problem solving skills than conventional teaching methods. However, the results showed that students' motivation to learn physics failed to increase in both cases. Therefore, there is an indication of another demotivating factor for students. These results are in line with the results of research based on Problem Based Learning

[38][39][40][41]. From some of the research above, it can be concluded that the learning method using Problem Based Learning is a method that can make students comfortable and enjoy during the learning process, making students think more creatively so that students' problem solving abilities can increase.

Conclusion

Based on the results of the observation questionnaire and the calculation of the T test, it can be seen that Problem Based Learning assisted by video can improve students' problem-solving abilities. In line with the research of Hee Jun Choi [42] the use of video in problem based learning can positively influence students' perceptions of learning and knowledge. Students can actively participate in learning, and can solve problems/tasks given by educators and encountered during learning. Video-assisted Problem Based Learning helps students hone their problem solving skills better than learning with the Problem Based Learning method without using videos. With videos, students can find out with visualization of the existing problems, so that students' grasping power is faster. The video-assisted Problem Based Learning (PBL) learning model is effective in improving students' problem solving abilities. This increase can be seen from the results of the research above.

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