

Research Article**Fluid Dynamic Learning Assisted By Student Worksheet Based Rvm with Setting PBL***I Ketut Mahardika¹, Alex Harijanto², Moh Surya Winata³*

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Abstract: This research will be explain about the learning material fluid dynamic based RVM (Representation of Verbal and Mathematic) assisted by student worksheet with setting PBL (Problem Based Learning) in senior high school. In this article, a study that used method of descriptive research with qualitative research with obtained data from various sources such as journals, books, proceedings, internet and observation. The first step is a collect data from journals, books, proceedings, internet and observation. Data from step data collection will be analyzed as research data collection. The result showed that learning fluid dynamic based RVM (Representation of Verbal and Mathematic) assisted by worksheet with setting PBL (Problem Based Learning) can improve student activities and learning outcomes of student.

Keywords: Fluid Dynamic; Worksheet; RVM; PBL

INTRODUCTION

Fluid dynamic is a flow of fluid that moves. Fluid dynamic has some concept of inter-related material. The concept is the continuity equation and Bernoulli's principle. the concept of the fluid dynamic is one of the concepts are easy to find in everyday life. It turned out to not be able to put to good use because in reality there are many students who have difficulty learning in a fluid dynamic. Explanation of the concept of equality and continuity in the classroom are still using lead students to memorize a formula of the continuity equation and Bernoulli's principle. This is why the students have difficulties in learning about the concept of fluid dynamic. The learning process which only lead students to memorize only make the students become less active in the learning process. this causes the level of student understanding to be reduced because of the lack of student engagement in the learning process. activity of students in the learning process is needed. Activity of students in the classroom is necessary because when students are active in the learning process, students will better understand the concept. This is because students can participate directly in the learning process (Felder, 2003).

In a process of learning, when students are more likely to memorize formulas cause less students understand well the instructional material given in class. An effective learning process is a process of learning by using a model that can provide knowledge to students by combining these concepts with problems of students in everyday life. One of the learning model that combines the concept of the existing problems in the neighborhoods is a model of Problem Based Learning (PBL). The learning process by using the model of Problem Based Learning (PBL) can lead students to learn the concept of fluid dynamic by hooking on everyday life. Model Problem Based Learning (PBL) has its drawbacks, namely in the learning process takes a lot of time to engage students in learning about the problems in life. This problem can occur when the learning process of students in the class do not use

tools such as worksheets students. In essence, the student worksheets can increase the level of understanding of students in the learning process (Ningtiyas, 2012). By increasing the understanding of students with the help of student worksheets, then the time in the learning process will be put to good use. student worksheet contains a guidance and steps to complete tasks to better understand the concepts of physics. Student worksheet used by students should aim to improve students' skills in understanding concepts and analyzes the concept of the fluid dynamic material. Student worksheets that can lead students to understand the concept and analyze the student worksheet concept is based Representation of Verbal and Math (RVM). When students have understood and be able to analyze the concept of fluid dynamic, the student will understand the concept of fluid dynamic without memorizing that would cause the level of students' understanding of the learning fluid dynamic will increase.

Based on the above, in the learning process fluid dynamic material, required a knowledge-based student worksheets definition of the concept on verbal and mathematical knowledge by setting a problem-based learning (PBL). The problem that arises is how the learning activity and student learning outcomes in a fluid dynamic learning assisted by Student Worksheet based on RVM with setting PBL. The aims of this study is to describe how the learning activity and student learning outcomes in a fluid dynamic learning assisted by student worksheet based on RVM with setting PBL.

MAJOR HEADING

Fluid Dynamic a fluid that moves. Fluid moves will have an average rate. when a fluid moves through a small cross-section, the flow rate of the fluid is large, and when the fluid flows with extensive cross-sectional area, the fluid velocity will decrease or small. This is the definition of the concept of the continuity equation. One of the equation that is often used

in the fluid dynamic is the Bernoulli equation. Bernoulli states that "If the rate of a fluid element flows increased during such elements along the horizontal direction of flow, the fluid pressure is certainly decreased, and vice versa" (Halliday, 2010). This shows that when a fluid flows at great speed, the fluid pressure will be small and when the fluid flow has a small speed, the fluid pressure will be great. The principle of the Bernoulli equation describes an effort when fluid flows that takes effort. Basically, fluid dynamic consists of learning about the concepts and principles bernoulli continuity equation.

One of the learning resources that can help the learning process is the Student Worksheet. Student Worksheet is a student guide that is used to conduct an inquiry or problem-solving (Ningtiyas, 2012). Student worksheets needed to support the learning process carried out by the students in the classroom. Student worksheet also contains tasks performed by the students. Student worksheet may facilitate teachers in the learning process. student worksheet also facilitate students to understand the material learned in the classroom during the learning process.

Representation is something that represent or describe an object or process. Representation serves to reveal an object from various angles of the object (Prain, V. & Waldrip, B.). Verbal representations is a way to describe something in the form of the definition of the concept being studied. Verbal representations can help learners understand the concepts learned. Mathematical representations is one form of representation used to describe a material in a mathematical form. Mathematical representations can assist students in analyzing the concepts they are studying students (Mahardika, 2013). Verbal and mathematical representations required in the learning process to help teachers in the process of giving the material to the students.

Problem Based Learning is one of the innovative learning model that is capable of providing active learning conditions for students. Problem Based Learning guide students to learn concepts through direct issues so that students can be directly involved in the learning process. The main characteristic of the Problem Based Learning is a learning process starts from a problem as it relates to the lives of learners who lead students will organize learning around problems are discussed. Issues discussed will be presented again by the learners in the form of products or performance (Ali, 2016). Problem Based Learning learning model has several step activity. 1) Oriented learners on the problem, 2) Organize learners to learn, 3) teachers to guide investigations carried learners, 4), the participants presented the results of the work, 5) analyze and evaluate the problem solving process. In the model of Problem Based Learning has the advantages that it can find new knowledge in everyday life of learners that can be developed directly by the learners. Disadvantages owned by the model of Problem Based Learning which takes a lot to introduce students to the problems studied by learners. Problem Based Learning model is effective for the learning process of learners because by using a model of problem-based learning, students

will learn to analyze and solve problems studied (Dochy, F. & Segers, M. & Bossche, PVD & Gijbels, D., 2003).

METHODOLOGY

The method used in this research is descriptive research method. Descriptive research method is a research method that seeks to describe and interpret something like condition or relationship, or a tendency to progress (Sukmadinata, 2006). The descriptive method describes the possibility to solve a problem by using several measures, namely the act of collecting the data, organizing the data, clarify the data, analyze and interpret data already obtained. Descriptive method of analysis carried out by treating the facts and analyzing that data to provide insight fitting the description of the results of the data analysis. Research Implementation Phase consists of the stages of preparation, stages of data collection and data processing stages. At the preparatory stage, performed by studying books and literature in accordance with the problems to be studied. Stages of data collection or library study conducted by collecting data from various sources. Sources collected from books and electronic media such as the internet, articles, and journals. The final stage is the stage of data processing. At the stage of data processing, the PBL is done is compile and process data that have been obtained to be clarified and analyzed in order to take a conclusion of the research.

RESULTS AND DISCUSSION

1. Fluid dynamic learning with Student Worksheet
 Previous research on Student Worksheet obtained from articles, journals and books shows that by using Student Worksheet in the learning process can improve student learning activity and student learning outcomes. Some research on Student Worksheet is shown in Table 1.

Table 1. Results of research studies related to Student Worksheet

Years	Conclusion Research (Researcher)
2007	Student Worksheet may lead students to choose a method to analyze shortly the material learning. to be understood easily understandable and meaningful information in digging. (Mattijs, J.)
2011	Student Worksheet is an instructional tool that consists of a series of questions and information designed to guide students to understand complex ideas. Systematics provided is as a trigger issue to be resolved by the students and in group discussions. (Choo, S. S. Y, & Rotgans, J. I, & Yew, E. H. J.)
2013	Student Worksheet can improve student learning outcomes well, this is because students are able to master the concepts learned. (Yasir, M. & Susantini E. & Isnawati)
2016	Results Learning students can be increased with the help of which support the learning process. one that can help support the learning process is the Student Worksheet. Student worksheets can provide important assistance in the classroom more active in directing students to practice new skills and explore a lesson. (Education.gov.gy)

2. Fluid dynamic learning with Representation of Verbal and Math (RVM)

Previous research on about Verbal and Mathematical Representation obtained from various sources, namely books, articles and journals. Results of previous studies show that when a learning process is equipped with more than one representation of a representation, it can improve the performance and understanding of the students in the learning process. in the process of learning physics, there is some representation. Namely the representation of verbal, mathematical, pictures and graphics. Learning physics in general, students are introduced to the concepts of physics and lead students to analyze the physics concepts in mathematical form (Mahardika, 2013). Some previous research on Verbal and Mathematical Representation are shown in Table 2.

Table 2. Results of Research Study on the Verbal and Mathematics Representation

Year	Conclusion Research (Researcher)
1999	The learning process comes to representation to facilitate students in understanding the concept of learning. (Cheng, P. C. H.)
2006	Research shows that match the type of representation in accordance with the demands of learning about the situation, can improve performance and students' understanding of concepts learned. (Ainsworth, S.)
2008	Using more than one representation is required in the learning process because basically, each individual student is different, so learning how to understand each individual is different. By using more than one representation, learning to be more easily adapted to the resources and strategies used in the learning process. (Rose, D. H.)
2010	each individual learner's ability is limited by the particular strengths and weaknesses. By combining several different representations with different properties, learners will cover the weaknesses of understanding of the concept of learners with the power of understanding the concept of learners. (Ozmantar, M. F. & Akkoc, H. & Bingobali, E. & Demir, S. & Ergene, B.)
2013	Representations were designed according to the needs of the students can get the information properly. (Tsui, C. Y. & Treagust, D. F.)
2014	Using the representation in the learning process can help students in developing new things are learned by the students. (Schnell, S. & Prediger, S.)

3. Fluid dynamic learning with Problem Based Learning (PBL)

Previous research on the model of Problem Based Learning (PBL) were collected from a variety of sources, including books, articles and journals. From the results of previous studies, it can be concluded that the model of Problem Based Learning (PBL) is one model that is effectively used in the

learning process for associating a real life in the learning process so that students become more active and the level of students understanding of the learning material increases. Some previous research results will be outlined in Table 3.

Table 3. Results of Study of Research on Problem Based Learning Model

Year	Conclusion Research (Researcher)
2004	Problem Based Learning (PBL) is one way of learning that involves students actively. Learning and working with real problems that require learners studying issues relevant to the lives of learners. (Gulseyen, S.)
2009	Problem Based Learning (PBL) is a learning process that is effective in the long term skill training of learners. (Strobel, J. & Barneveld, A.V)
2009	Problem Based Learning (PBL) is highly effective in the in improving students' skills in applying domain knowledge in the real world, efficiency in solving problems independently and the ability to learn independently or in groups. (Hung, W.)
2016	Problem Based Learning (PBL) can increase the critical thinking of students. Because learners are taught to analyze and solve real problems that exist in the life around. (Alrahlah, A.)
2017	Problem Based Learning (PBL) directs students to learn scientific ideas in a real-world context. PBL models also allow students to learn independently and as a member of a group with other students. The average value obtained from the learning process by using the model of PBL is higher than the traditional learning process. (Phungsuk, R. & Viriyavejakul, C. & Ratanaolarn)
2017	Problem Based Learning (PBL) is applied at the Aalto University proven to improve student learning outcomes. The core of improving student learning outcomes because students learn in connection with real life. (Jacob, W. J. & Gokbel V.)

CONCLUSION

Fluid dynamic learning is one of physics learning was easily found in everyday life. Fluid dynamic learning would be more appropriate if the learning process is using the model of Problem Based Learning. The ability of understanding the concept of learners will increase when studied something related to the problems in the lives of participants vote learners. Learning to use the Problem Based Learning Model still has obstacles, namely at the time of the introduction of students to the issues to be discussed in the learning process. student worksheets can be a solution to resolve the deficiencies in the model Problem Based Learning. Assistance from the student worksheet to facilitate students in identifying problems in real life to be learned. Student worksheets are also able to improve student learning activities in the classroom. Effective student worksheet is a student worksheet that lead students to develop the ability of more than one

representation. Student worksheets based on verbal and mathematical representation needed to complete the fluid dynamic learning process. It can be concluded that the learning process is fluid dynamic with the help of student worksheets on PBL setting can increase the activity and student learning outcomes.

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