Model of Problem Based Learning Assisted with Multimedia Flash in Improving the Concept Understanding of Elementary School Students

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Article Info	Abstract
	This study has purpose to determine the difference of the improvement of concept understanding in the problem based learning model assisted with flash multimedia with direct instruction model. The research method used in this study was quantitative of research using pretest-posttest design. This study was conducted at an Elementary School in Brebes Regency in science learning of single and mixed substances in grade V. The sample in this study were 38 students taken for experimental class and 32 students for control class. The data collection techniques used were observation and test. The data analysis techniques used to gain the significant difference was t-test. The results of this study indicated that the ability of concepts understanding of students in the problem based learning model assisted with flash multimedia is better than that of the direct instruction learning model. The independent sample t-test with a significance of $0.015 < 0.05$. The average value obtained by the experimental class with a score of 79.95 and the average value of the control class with a score of 75. Therefore, it can be concluded that the use of problem based learning model assisted with flash multimedia can improve the ability of concepts understanding of students.

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INTRODUCTION

Understanding 2018 National Education Day, Muhadjir as Minister of Education in Indonesia invites teachers or cultural practitioners to adapt to the development of the times, especially entering the cyber world system and digital technology. Human resources according to OECD (Organization for Economic CO-Operation and Development) data for 2015 Indonesia has a potential in human resources (HR) of about 43% for ages under 25 years. The development of human resources can not be fully utilized. The development of abundant resources must also be balanced with strong education since the development of the times will increasingly open up the nation in the facing of other nations. PISSA 2015 produced data that the ability of science, reading, and mathematics has a score of 62, 61 and 63 from 69 countries in the world. The result of PISA showed that the cognitive level of elementary school in Indonesia.

Fitrianawati et al. (2016) states that one of the biggest problems of the education system in all countries, especially developing countries is the problem of low student achievement. Farida (2015) states that the factor that influences the low student learning outcomes most importantly is the low interest of students to take lessons well and seriously. Nashrullah et al. (2015) argues that one of the efforts to improve the quality of the process and learning outcomes for students at every level of education was providing qualified teachers. Qualified teachers are those who can teach well and able to assess their student proportionally in all subject including in science learning.

Science learning in elementary schools can be assessed by using integrative thematic assessment. Wati (2015) states that the problem of science learning is occur when the learning process more directed to students to memorize information without being required to understand the concept. Ula et al. (2018) states that the results of grade IV interviews showed that in learning science in terms of understanding student concepts are not in accordance with the learning objectives. Halim et al. (2017) reveals that the

problems that arise in learning are like students who do not understand the lesson because students are inactive to enggage the learning. Recognizing these problems, the problem based learning model can help students who have weak thinking abilities and low learning outcomes to be able to have an concepts understanding of learning. Nurdiyah et al. (2018) argues that the results of observations of a weak concepts understanding of students lack control over the ability to apply calculations related to their skills in the learning process.

One of the learning process which can achieve the learning outcomes in term of concept understanding is the problem based learning model. Sari (2017) states that there is an influence of the use of the Problem Based Learning (PBL) combined with Numbered Heads Together (NHT) on the metacognitive skills and thinking abilities of students in understanding the environmental materials around the students. Fauzi et al. (2018) reveals that in the problem based learning models students work in small groups and help each other to learn the concept. Nugraha et al. (2017) argues that problem based learning is one of the innovative learning models that is applied to develop the thinking skill of students in solving problems and improving concepts understanding of students.

Concepts understanding is very important in the teaching and learning process, because concepts understanding will facilitate students, especially elementary school students, to learn concepts that have never been taught before. Hidayati et al. (2015) states that difficulties in learning can be indicated from the lack ability of students to understanding the concepts and to solve the problems. Wijanayu et al. (2018) Reveals that the result of initial students value observation is still low than the average daily score of all students by using one of the blended learning models can improve the concepts understanding of students. Abdillah et al. (2017) argues that concepts understanding can be effective instilled to students by implementing a learning model that fits with the students need. The learning model must inspire, attract, be fun, challenge, motivate students to participate

actively in the learning and it can be implemented by using media.

Media as a learning aid to assist teachers in carrying out teaching and learning activities in class so that learning can motivate students to be active and have a high interest in learning. One of which is flash multimedia. Sanusi *et al.* (2015) states that the use of multimedia in learning can have a positive impact and extraordinary benefits in facilitating the learning process of students. Khuzaini *et al.* (2016) reveals that multimedia is a combination of text, images, graphic art, animation, sound, and video which are in control of a computer program with assistive devices. Rahimi *et al.* (2019) argues that multimedia is a free and user-friendly software program that allows users to make video presentations with still images combined with text, narration, and music. Flash multimedia is a media in which there are activities in helping to apply the problem based learning learning model.

The results of observations at SDN Pengabean 02 in grade V Semester I of 2018/2019 academic year based on the daily test scores of science subjects on student achievement that did not meet the minimum completeness criteria with the percentage of students on themes 1 through theme 4 had low learning achievement. The data on the observations on theme 1 shows a percentage of 39%, theme 2 shows a percentage of 39%, theme 3 shows a percentage of 45%, and theme 4 shows a percentage of 37% of the total 38 students. Due to theoretical considerations and the results of field observations, it can be concluded that the implementation of the learning process by using a model of problem-based learning assisted with multimedia flash can improve the concepts understanding of students.

METHODS

This study was conducted at an Elementary School in Brebes Regency in the learning process of grade V to determine the ability of concepts understanding of students. The type of research used was a type of quantitative research with a quasi experimental design. Sugiyono (2014) states that the quasi-experimental research design has a control group that does not function fully to control the external variables that affect the experiment. The quasi-experimental design applied in this study was nonequivalent control group design to determine the effect of problem based learning model assisted with flash multimedia.

Subjects and populations was selected using random sampling include the pretest posttest experimental group using the problem-based learning model assisted by flash multimedia and the pretest posttest control group using the direct instruction model. The population used was the fifth grade students of SDN Pangabean 02 and SDN Prapag Kidul 02 in the academic year of 2018/2019. The material used in semester II theme 9 objects around us subtheme 3 humans and objects in their environment focus on the science learning of single substances and mixed substances.

The measured variable was the improvement in the concepts understanding of students. The data collection techniques were carried out by using descriptive tests for pre-test and post-test and experimental observation sheets. The selection of the use of the description test has purpose to measure the high-level thinking process and determine the average abilities of students and the score of student answers can be done correctly since it is calculated by the question item scoring technique. The data collection instruments used include observation sheets that have a function to support problems in the concepts understanding of students and tests to collect the result of student test to determine the ability of concepts understanding as proven by the following trial requirements: (1) the validity test items (2) the reliability of test items (3) the level of difficulty of the understanding concept test, and (4) the differentiation of test items.

Validity test with the number of 7 items with $r_{value} > r_{table}$ obtained: $0.578 > 0.329$; $0.412 > 0.329$; $0.599 > 0.329$; $0.410 > 0.329$; $0.444 > 0.329$; $0.408 > 0.329$; $0.553 > 0.329$, that the problem is said to be valid. The test of reliability shows the value of r_{value} $0.684 > r_{table}$ 0.329, it can be concluded that the test items is reliable. Then,

the difficulty level of all test items was in the medium category. Meanwhile, the testing of different power of problems obtain a range of differentiation power with a score of 0.91 in the excellent category.

Activities to test the research instruments need to be carried out with prerequisite tests in the form of data normality and homogeneity tests of data with the results of the final exam (UAS) science learning values and the purpose of determining the existence of normally distributed populations and homogeneous data variants. The following data on the results of normality and homogeneity tests are presented in Table 1.

Table 1. Test of Normality of Data

	Eksperiment	Control
N	38	32
Mean	73.89	73.38
Sig. (2-tailed)	0.200	0.161

Based on Table 1 Kolmogorov-Smirnov test one-sample output, it was found that the (UAS) science learning data of the experimental class and the control class with a significance of more than 0.05, therefore, the Experimental class and Control class data are normally distributed. Homogeneity test results were obtained using a statistical levene with a significance of 0.452. The test output of homogeneity of variances shows that the significance of the experimental class and control class variables is more than 0.05, therefore, the data has the same variant.

Data analysis techniques using IBM SPSS Statistics Version 25, as follows: (1) average test (2) classical completeness test (3) average difference test, and (4) average increase test.

RESULTS AND DISCUSSION

Results and discussion of study conducted using the problem-based learning model assisted with flash multimedia in the experimental class and direct instruction model in the control class. The results of the analysis of the hypothesis test regarding the effectiveness of the problem based learning model assisted with multimedia flash in improving the concepts understanding of students in a concise manner can be seen in Table 2.

Table 2. Result of Analysis of Hypothesis Test

Test	Sig. 2 tailed/ z_{value}	$\alpha = 0.05$ / z_{table}
Average test	0.000	0.050
Classical completeness test	3.559	0.326
Average different test	0.015	0.050
Improvement test	0.004	0.050

Based on Table 2, it can be described as follows. The average test results in the class that uses the problem based learning model assisted with flash multimedia shows the results of one sample t-test in the column sig. (2-tailed) obtained a score of 0.000 < 0.05 means that the average ability of understanding concept in the class that uses Problem based learning model assisted with flash multimedia is more than the standard of minimum completeness, which is 68.

Classical completeness test results in classes using the Problem Based Learning model assisted with flash multimedia calculation shows $z_{count} = 3.559$. The value of z from the standard normal distribution list is $z (0.45) = 0.3264$, it can be concluded that $3.559 > 0.3264$ means that the ability of concepts understanding of students using a multimedia-based problem-based learning model has reached the classical completeness of 75%.

The results of the average different test in the ability of concepts understanding in the experimental class with problem based learning models assisted with flash multimedia and control classes that use the direct instruction model. The average difference test results in the independent sample table test column sig. (2-tailed) in the Equal variances assumed column of 0.015 < 0.05 means that the average ability of concepts understanding using a multimedia-based problem based-learning model is better than the average ability of concepts understanding using the direct instruction model.

The results of the average improvement test between the ability of concepts understanding through the model of problem-based learning assisted with multimedia flash that is calculated is the difference between the pretest and posttest

values of both the control class and the experimental class. The average improvement test of the ability of concepts understanding produces the following data. (1) the average improvement in the ability of understanding concept in classes using problem based learning models assisted with flash multimedia is 28.97 and the average improvement in the understanding concept of classes using the direct instruction model is 21.93 (2) The results of the independent sample table test column sig. (2-tailed) with a significance of 0.004 < 0.05 means that the average improvement in the ability of concepts understanding using multimedia based of problem based learning model is better than the average improvement of the ability of concepts understanding of the classes using the direct instruction model.

The process of learning of problem based learning assisted with flash multimedia becomes important and utilizes existing technology since students will learn with the problems that they encounter every day, however, in this case students were given direct reinforcement by being projected as well as in daily life to improve the understanding concept.

The first stage of the ability of concepts understanding is to classify certain objects according to the concept. Experimental class using student worksheet which is adapted to the needs of students and can answer the problem of classification of objects around whether including substances or mixed substances. In the exercises at student worksheet students classify substances such as water, coffee, sugar, and milk into elements or compounds. Dian *et al.* (2016) reveals the concepts understanding can be assisted by linking the learning material raised from the problems and classifying the things available around the students.

The second stage of the concepts understanding ability is to provide an example of a concept. These items are classified as single substances or mixed substances in kitchen utensils such as water, copper, sugar, silver, salt, etc. This stage students classify the objects into a single substance or a mixture of substances. The purpose of classifying single substances and mixed substances so that students are able to find out the concept of material by including examples in everyday life. Ulfah *et al.* (2018) reveals that an effective learning process can be carried out by bringing real experiences in everyday life.

The third stage of the concepts understanding ability is to use and utilize and choose certain procedures or operations. Flash multimedia and the use of concrete objects has purpose to make students to be able to conduct experiment with the material concepts of single substances and mixed substances. Budarsini *et al.* (2018) states that more abstract material can be taught using media or learning tools as well as more concrete explanations so that students can learn from the concrete stage to the more abstract stage.

The fourth stage of the understanding concept ability is applying concepts to problem solving. Siregar (2019) argues one of the effort that can be done so that students have the ability to understand the concepts of science is to apply a problem-based learning. Problem Based Learning Model, one of the problem based learning model that emphasizes students to actively construct the concepts of a given problem, is also able to explain the concepts they have acquired and apply these concepts in the problem solving. The following result is a sample of the pretest ability of students concepts understanding in Figure 1.

Based on Figure 1 shows that students who can answer the pre-test have not been able to answer correctly. The initial ability of students has not comprehended the material about single substances and mixed substances. The results of the pre-test did not meet the maximum criteria of 68.

Figure 1. Pre-test Results of Students Concept Understanding Ability

The ability to concepts understand after giving the treatment of problem based learning models assisted by flash multimedia. The following result is a sample of the post-test students ability in Figure 2.
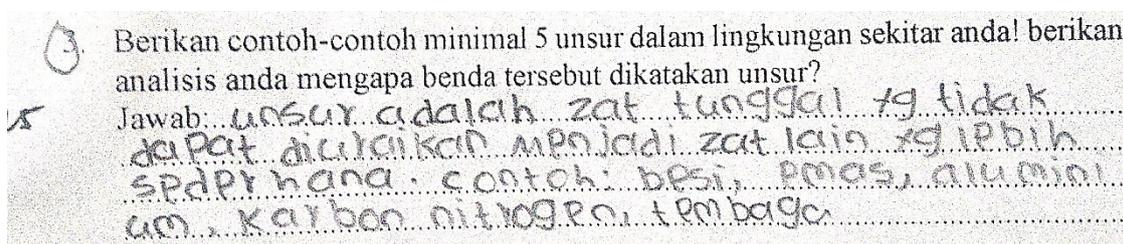

Figure 2. Post-test Results of Students Concepts Understanding Ability

Based on Figure 2 shows that students who answer post-test are able to answer all of them correctly. The ability after giving the treatment, the students understand the material about single substances and mixed substances. The posttest results fulfill the maximum completeness criteria. The model of problem based learning assisted with flash multimedia can improve the concepts understanding of students.

The making of flash multimedia using Adobe Flash CC 2015 software is assisted with CorelDRAW image editing program and other supporting software validated by material experts and media experts. Flash multimedia contains the use of buttons: user guide, profile maker, criteria standards competency, core competence, mapping of basic competence, learning activities, and learning evaluation. The use of the initial appearance is adjusted to the characteristics of elementary school so that the display can attract students to learn in understanding the concept. Multimedia flash is made with the effects of animation, sound, images, interactive buttons, and learning videos that are combined into one in the learning media. The flash multimedia opening menu can be seen in Figure 3.

Figure 3. Menu of Opening The Multimedia Flash

In Figure 3 contains: (1) The guidance that contains how to use the buttons in the multimedia flash with the use of the media as the whole part, how to play the learning video, and how to answer evaluation questions that are able to see the score directly. (2) The profile maker that contains the biography of the researcher as the maker of flash multimedia. (3) The criteria standards competency that contain learning activities carried out on learning one to six and attitude competence, knowledge, and developed skills such as attitudes (high curiosity, confidence,

and cooperation) knowledge (elements and compounds) skills (identifying and communicating). (4) Core competence that contain spiritual attitude, social attitudes, knowledge, and skills. (5) Basic competence that contains 3.9 grouping material in daily life based on its constituent components (single and mixed substances) and 4.9 reporting the results of observing the properties of the mixture and its constituent components in daily life. (6) Learning activities contain about learning material that was taught in line with the Curriculum 2013 and other sources for supporting learning material. (7) Evalution that contains questions about student practice provided with a randomized system score.

Flash Multimedia requires materials and materials as the main support in making media that can be projected in class. Materials and materials in developing multimedia learning in the form of textbooks for grade V elementary school curriculum 2013 and other supporting books. Other supporting things are needed by media photos, audio, video, and animation to complement learning multimedia. Following this display of scientific material on multimedia flash can be seen in Figure 4.

Figure 4. The Concept of Material of Multimedia Flash

Based on Figure 4 about science learning materials in single substances and mixed substances. This material covers about recognizing human obligations and environment objects in their everyday life. The material is presented by visualization using instructional media and students can understand the material directly to their objects in the environment along with the exercise that have been provided.

Research that have been carried out covering science material about single substances and mixed substances in class V will be better if develop widely with different material considering the use of multimedia flash only provided a small of primary schools that have supporting facilities.

CONCLUSION

Based on the results of the study, it can be concluded that the use of the problem based learning model which is assisted with multimedia flash is more effective than the direct instruction learning model to improve the ability of concepts understanding of elementary school students in the subject matter of single subtances and mixed substances.

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