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Contextual Learning Module Based on Multiple Representations: The Influence on Students' Concept Understanding

Ummul Uslima*, Chandra Ertikanto, Undang Rosidin
Faculty of Education and Teacher Training, Universitas Lampung, Lampung

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*Correspondence Address:
ummuluslima@gmail.com

Abstract: This study aims to describe the effect of using contextual learning module based on multiple representations of static fluid material toward students' conceptual understanding. The sample of this research was the students of class XI IPA 2 and XI IPA 3 in SMA N 1 Trimurjo, Central Lampung. This research was conducted using Pretest-Posttest Control Group Design. Data were tested with N-gain analysis, normality test, homogeneity test and Independent Sample T-test. Results from the Independent Sample T-test value of the Sig value. (2-Tailed) was less than 0.05 which is 0.036, then it can be stated that there is a significant influence of contextual learning module based on multiple representations toward the students' conceptual understanding. Based on the N-gain value, the average N-gain concept comprehension in the experimental class was 0.56 (medium category), while the control class was 0.46 (medium category). Contextual learning modules based on multiple representations can improve students' conceptual understanding.

INTRODUCTION

Learning model will be more accomplished in delivering material when accompanied by learning resources (Kızkapan & Bektaş, 2017). Learning resources include human, learning media, concept maps, and so forth. One of the learning resources is learning media (Setiyawan & Indrowati, 2016). The development of learning media is currently growing rapidly. Variety of learning media includes audio, visual, audiovisual, and other media (Irwandani, Latifah, Asyhari, Muzannur, & Widayanti, 2017; Saraç & Şekerci, 2017). Using learning media in learning is very beneficial for students and teachers (Bidarra, Figueiredo, & Natálio, 2015). Some advantages of using the media in learning; generating ideas that are conceptual, so as to reduce students' misconceptions in learning, increasing student interest for subject matter, providing real experiences that stimulate self-activity to learn, can develop sustainable thinking, and provide unusual experiences and make the learning process profound and diverse (Prayitno, 1989).

One of the visual media is the learning module (Irwandani et al., 2017; Jaya, 2011; Sujanem, Suswandi, & Ganesha, 2012). The learning module is one of the still visual media that can be called printed media. A module is one of the learning media that has been arranged systematically that can be used as teaching material for students in the learning process (Rohman & Lusiyana, 2017).

Teachers sometimes cannot teach all students completely, therefore students have to learn individually to gain a better understanding of the lesson. Among the various teaching methods, the individual teaching modules is a part of individual teaching methods that combine the advantages of various other individualized learning such as special instructional goals, learning by individual speed, and feedback (Nasution, 2011). Based on these statements, the module has many advantages for the individual student learning.

Physics is one of the fundamental science that is used to study phenomena directly related to daily life (Saregar, Diani, & Kholid, 2017). Physics is a branch of science that studies something concrete and can be proven mathematically by using equation formulas (Gok & Silay, 2008). Physics is one of the subjects considered difficult by students because it takes a high level of understanding to understand the concepts. Most of the physics lesson is just a matter of delivering without involving learners in learning (Setyandaru, Wahyuni, & Pramudya, 2017). Physics learning will be more meaningful when learners are engaged primarily in thinking. Learning will also be meaningful when it is associated with the real world presented in a contextual state so that learners are able to understand and apply the concept in everyday life. Therefore, it is needed for contextual learning to connect learning with everyday life.

Based on the results of interviews with physics subject teachers in one of the State Senior Highschool (called SMA) in Central Lampung, there were no teachers in the school that employed Multiple Representation Model in delivering materials, especially physics. The material was only delivered verbally and mathematically, especially for static fluid material. The book used in the learning in the Senior Highschool is a printed book for students that tend to display an explanation with two representations only. To reason a concept, it is required important points from multiple representations, i.e. external help such as things that can help someone in problem-solving (graphics, diagrams or drawings, verbal, mathematical).

Based on these problems, it is required a contextual learning module based on multiple representations developed by Radha Indah Pertiwi which has been tested by some experts and has been produced since 2017 in order to improve students' understanding of the concept in physics learning, and to change students' belief that physics lessons are difficult to understand. Learning to use the module makes it easier for students to study with the teachers as well as individually.

Based on the above statements, this study was conducted to determine the effect of contextual learning module based on multiple representations toward the students' conceptual understanding.

THEORETICAL SUPPORT

The module is one of the learning media which has been arranged systematically so that it can be used as learning material for students in the learning process. The module can be formulated as a self-sufficient unit and consists of a series of learning activities that are structured to help students achieve a number of clearly defined and specific objectives (Nasution, 2011). A module has several functions, one of which is as an independent teaching material to improve the ability of learners to learn by themselves without relying on the presence of teachers (Nisrokhah, 2016).

Contextual Teaching Learning (CTL) aims to motivate students to understand the content of the lesson through more valuable learning and equip students with more meaningful

knowledge (Bidarra et al., 2015). CTL learning outcomes are expected to be more meaningful for students in problem-solving, critical thinking, and observation, as well as drawing conclusions in their long-term life (D. A. Lestari, 2017).

CTL has the advantage of making students able to control themselves and be active in learning and help students work efficiently (positively) in their study groups. Contextual learning has characteristics that strongly support teachers and students to be actively involved in learning. Learn together and support each other so that students get meaningful learning as well as fun (Wangi, Winarti, & Kharis, 2016). People instinctively convey, receive, and interpret intent through various delivery and communication, both in reading and writing. Therefore, the role of representation is very important in the processing of information about something (Abdurrahman, Liliasari, Rusli, & Waldrip, 2011).

Multiple representations are a way of explaining a concept (Irwandani, 2014). Multiple representations have three main functions (Finnajah, Kurniawan, & Fatmaryanti, 2016) as a compliment, interpretation barrier, and understanding builder. In science learning, many types of representations can be raised. These types include verbal descriptions, drawings or diagrams, graphics, and mathematics.

Physics understanding as the ability to build an understanding of processes in learning, which include oral, written, and graphical communication. Students can understand when while they are connecting new knowledge to be added to the prior knowledge (Becerra-Labra, Gras-Martí, & Martínez Torregrosa, 2012). The new knowledge is integrated with existing mental models and cognitive frameworks. A basis for understanding is conceptual knowledge.

The concept is the result of one's thinking expressed in a definition to create a product of knowledge that includes: laws, principles, and theories. Concepts are derived from facts, events, experiences through generalizations and abstract thinking (P. A. S. Lestari & Rahayu, 2015). Understanding the concept is the ability to grasp meanings such as being able to express a material that is presented into a more comprehensible form, capable of interpretation, and able to apply it (Kelley & Knowles, 2016; Waluya, 2008). Concept Understanding is divided into three, namely the understand the concept, misconception, do not know the concept. Identifying the occurrence of conception, misconception, and ignorance of concepts, the CRI (Certain Response Index) is usually used as a basis on a scale and is given together with each answer to a question (Gumilar, 2016; Hakim, Liliasari, Kodarohman, S, & M, 2012).

METHOD

The population of the study was the students of the Eleventh grade of SMA Negeri 1 Trimurjo, Central Lampung in the second semester of the academic year of 2017/2018 which consisted of two classes. This research used experiment class and control class as the sample. This study involved one independent variable (X) and one dependent variable (Y). The independent variable of this research is the use of contextual learning module based on multiple representations, while the dependent variable is students' conceptual understanding. The researcher used the purposive sampling technique to select the control and experiment class. This research used Pretest-Posttest Control Group Design, where one group is subject given a certain treatment (experiment), while the other group serves as a control class.

In general, the research design to be used can be seen in Table 1.

Table 1. Experimental Design Pretest-posttest Control Group Design

Classes	Pretest	Treatment	Posttest
Experimental	O_1	X_1	O_2
Control	O_3	X_2	O_4

In this study, the instrument used was the syllabus, lesson plan (RPP), test questions in the form of description which were used to measure students' conceptual understanding. The tests were given in the pretest and posttest. Before the instruments were used in the sample groups, they must first be tested for its validity and reliability.

The data obtained in this study is the data of students' conceptual understanding during the learning process. The data obtained were then analyzed through N-gain test, normality test, homogeneity test, and Independent Sample T-Test. To analyze the students' conceptual understanding categories normalized gain scores were used. N-gain was derived from a reduction of the posttest score with the score gained in pretest divided by the maximum score minus the score of the pretest. To see improvements in students' conceptual understanding, the results of pretest and posttest on the control class and experiment class should be normally distributed as the basis of normality test. The data can be said as normal if Kolmogorov Smirnov value of sig > 0.05 and data is not normally distributed if the sig value < 0.05.

To see the variant of the population, then homogeneity test was conducted. The homogeneity test was performed to determine whether or not variants of the population were used using the Homogeneity of Variances on One Way ANOVA. If the significance value is < 0.05, then it can be said that the variants of the two population groups are not the same. After a homogeneity test is completed, Independent Sample T-Test was conducted to determine whether or not there was an average difference between the two unrelated sample groups.

This study examined the Independent Sample T-Test. Based on the value of significance or probability value: (1) If the value of significance or probability value > 0,05, then H_0 is accepted; (2) If the value of significance or probability value <0.05, then H_0 is rejected.

RESULT AND DISCUSSION

The research on contextual learning module based on multiple representations on the static fluid material was started on February 12, 2018, at SMA Negeri 1 Trimurjo, Central Lampung. The learning process lasted for 5 sessions of face-to-face learning with time allocation of 10 hours consisting of 45 minutes for each lesson. This research employed an experiment class which was class XI IPA 3 which consisted of 32 students. The control class was class XI IPA 2 which consisted of 32 students. This study was carried out according to the physics course schedule in the school within five meetings including pretest and posttest.

The instruments used were pretest and posttest. Before an instrument in the form of a pretest and posttest used in the study, the instruments were first tested to determine whether or not they were appropriate. The test was performed outside of the research samples. The instrument was tested for its validity and reliability. The instrument test was conducted on the twelveth grade students IPA 1 in SMA Negeri 1 Trimurjo, Central Lampung who had studied about static fluid, taken from 31 respondents with the number of questions as many as 15 items of multiple choices and 7 essay items. The result determined that 10 multiple choice items and 5 essay items were valid and reliable.

Table 2. Normality Test Results Score *N-gain*

No.	Parameter	Class Experiment		Class Control	
		Pretest	*Posttest*	*Pretest*	*Posttest*
1	Number of Students	32	32	32	32
2	Average	2.27	6.55	1.77	5.48
3	Top Rating	5,00	9, 50	4.50	9.17
4	lowest value	0.17	4.50	0.00	2.00
5	*N-gain*	0.56		0.46	
6	*Asymp. Sig (2-tailed)*	0,549		0,550	

Table 3. Independent Sample T-Test Test Results

		Gain	
		Equal Variances Assumed	*Equal Variances Not Assumed*
t-test for equality of Means	t	2.146	2.146
	Df	62	60.048
	Sig (2-tailed)	0,036	0,036

Table 2 shows the average value of students' concept which was normally distributed with Asymp value. Sig. (2-tailed) above 0.05 ie 0.549 for the experimental class and 0,550 for the control class. The test results concluded that the concept value data of the experimental class and control class was normally distributed.

The homogeneity test results were obtained through the significance value of the variant equation with the sig value of 0.923. When the value of significance is greater than 0.05 then based on the hypothesis testing, it can be concluded that both the experimental class and the control class had the same variant because the significance value was greater than 0.05.

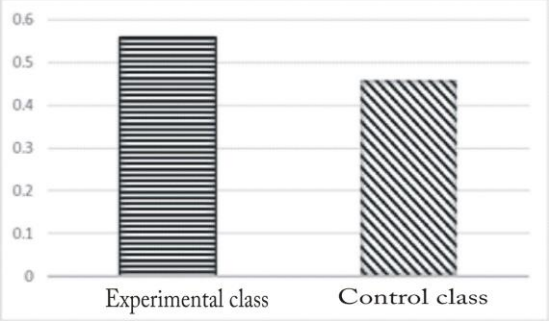

Figure 1. Average N-gain of Concept Understandings

Figure 1 shows that the average increase in the comprehension ability of the experimental class was higher than that of the control class. Hypothesis testing was done by using Independent Sample T-test.

Based on Table 3, the value of $t_{critical}$ Equal Variances Assumed in the table is 2.146 while t_{table} of 1.671. the Value of $t_{critical} > t_{table}$ (2.146 > 1.671) and the significance was (0.036 < 0.05) then H_0 was rejected. Based on the test results, it can be concluded that the average concept of understanding between the experimental class and control classes was significantly different. This means that contextual learning module based on multiple representations gave a significant influence on conceptual understanding.

Based on the result of the hypothetical test by using Independent Sample T-test, it is known that the average of students' conceptual understanding on learning using contextual teaching module based on multiple representations is different compared to conventional learning, meaning there is a significant influence of contextual learning module based on multiple representations toward student

concept understanding. Based on the results of the tests, it can be concluded that there is a significant difference in concept understanding between experimental class and control class, where the average N-gain of the experiment class is higher than the average N-gain of the control class. This can be seen based on the average calculation of N-gain of the experimental class which is 0.56 in the medium category and the average N-gain of the control class which is 0.46 in the medium category.

N-gain of the student's conceptual understanding was obtained from the data of pretest and posttest. The average score of concept understanding was taken before and after the implementation of learning using contextual learning module based on multiple representations and learning without using contextual learning module based learning module multiple representations. It is used to determine the improvement of students' conceptual understanding after two different lessons.

Based on the research, the data of students' conceptual understanding after learning using interactive learning media of static fluid material was obtained. The results of concept understanding are presented in Figure 2.

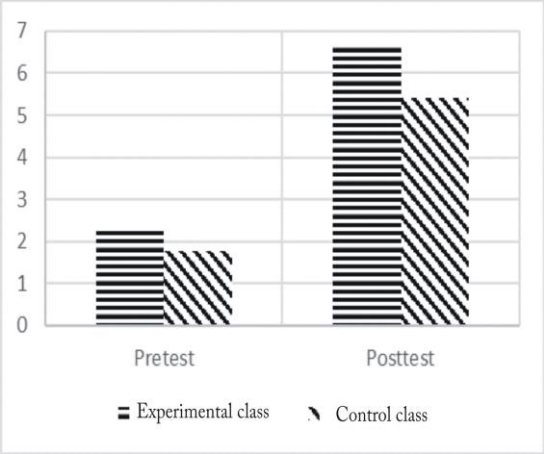

Figure 2. Graph of the Average Score of Concept Understanding of Pretest and Posttest

In the experimental class, the average test score (pretest) of conceptual understanding before the application of learning by using contextual learning module based on multiple representations was 2.27, after giving the treatment, the score increased to 6.65. The increase in the student concepts' understanding was 4.38. The same thing also happened to the control class. In the control class, the average students' conceptual understanding before applying the lesson was only 1.77, after applying the lessons the average score increased to 5.42. The increase in the student concepts' understanding was 3.63.

The experimental class showed a higher N-gain concept understanding. Based on the results of the calculation, it is known that in the experimental class 10 students (31.25%) was in the high category, 22 Students (68.75%) was in the medium category and 0 students (0.00%) was in a low category. While in the control class, 6 students (18.75%) was in the high category, 22 students (68.75%) was in the medium category, and 4 students (12.50%) was in a low category.

The differences in the average score of conceptual understanding in each class were caused by the process of delivering learning materials. In the experimental class, the teacher used a contextual learning module based on multiple representations. This module has several advantages in the presentation of the material, thus helping students more quickly to understand the concept. So when doing the posttest, especially in the multiple choices, the students seemed to understand the concept of the reasons.

Learning through the use the module itself has advantages for students because it can be studied independently regardless of the time and place. Giving the module is also more effective in student learning. This is in accordance with (Peniati & Parmin, 2012) in his research after the module was distributed

to students, the results will be more effective because students can read freely at home. The real impact has been felt that the students' active role when learning is very visible. When the teacher asks questions, the students responded by giving ideas to solve the problem.

One of the advantages of contextual learning module based on multiple representations is the presentation of learning in the form of mathematical, pictures of phenomena concerning material, graphics, and verbal. In addition, because the module is presented with many color variations as well as many representations, thereby increasing the understanding of concepts that affect the cognitive outcomes or grades of posttest. This is supported by the results of research (Suhandi, 2012) that claims that the multiple representations learning approach have a high effectiveness in embedding the concepts covered in the material of physics. The same theory is also expressed by Tsani in (Artha, Bharata, & Caswita, 2014; Ertikanto, Rosidin, Distrik, Yuberti, & Rahayu, 2018) in his research, the use of representations to communicate ideas or mathematical ideas can enhance conceptual understanding. Representation is a substitute for the expression shown in the search for solutions to problems encountered, as a result of the interpretation of the mind. Solving problems with representations can be displayed through images (visual), words (verbally), tables, graphics, or mathematical symbols, so it can help the student in understanding the concept (Sabirin, 2014).

The result of the N-gain value of the students' conceptual understanding is also influenced by contextual learning module based on multiple representations, where the module is arranged following contextual learning syntax. The results research Asfiah and Purwantoyo show that the students could easily understand the concept of static fluid related to the daily life, so the presentation of existing problems can improve the level of thinking that affects the cognitive results of the students (Asfiah & Mosik Purwantoyo, 2013). Contextual learning leads the student to the problem-solving process because by solving the problem, the students will develop completely, not only intellectually, but also mentally and emotionally (Hamruni, 2012). Contextual learning is learning on how children should deal with problems. In conclusion, learning through the contextual module is effective in improving the learning outcomes and student concepts understanding (Jaya, 2011).

CONCLUSION

Based on the data of the research and discussion, it can be concluded that: The use of contextual learning module of Static Fluid material based on multiple representations is effective in improving the students' conceptual understanding in terms of problem-solving (posttest) proved by the N-gain obtained in the experimental class of 0.56 which falls into medium category and in control class of 0.46 which falls into medium category.

The other researchers who want to use contextual learning modules based on multiple representations in their research, it is suggested to add the number of meetings in learning so that each learning process can be conducted optimally.

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