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Research Artikel

IMPLEMENTATION OF DIGITAL ASSIGNMENTS TO IMPROVE HIGH ORDER THINKING SKILLS (HOTs) ABILITY OF SENIOR HIGH SCHOOL STUDENTS IN THE CONCEPT OF NEWTON'S LAW

IMPLEMENTASI PENUGASAN DIGITAL UNTUK MENINGKATKAN HIGH ORDER THINKING SKILLS (HOTs) *PADA KEMAMPUAN SISWA MENENGAH ATAS DALAM KONSEP HUKUM NEWTON*

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Abstract

The research was conducted in SMAN 7 South Tangerang in the even semester of academic year 2017/2018 with the aim to know the improvement of HOTs of senior high school students after using digital assignment. The research method used is quasi experiment with design of non-equivalent control group. The numbers of respondents in this research are 80 students. Instruments used in the form of a high order thinking ability, instrument that has been tested for its validity and reliability. The numbers of questions in use as many as 23 questions. Conclusion: Digital assignments can improve students' HOTs. All classes that use digital assignments have a higher order of HOTs than a print-based (conventional) class. Use of the Digital assignment method can be: teacher's main consideration in training and improving students' HOTs; and tools for teacher correcting student assignment results; Digital assignment can be applied to the students to deepen the material or concept, to train the national exam questions in digital form.

Keywords: digital assignment; high order thinking skills; schoology; quizizz.

Abstrak

Penelitian ini dilakukan di SMAN 7 Tangerang Selatan pada semester genap tahun akademik 2017/2018 dengan tujuan untuk mengetahui peningkatan High Order Thinking Skills (HOTs) *siswa SMA setelah menggunakan tugas digital. Metode penelitian yang digunakan adalah quasi eksperimen dengan desain kelompok kontrol tidak setara. Jumlah responden dalam penelitian ini adalah 80 siswa. Instrumen yang digunakan berupa kemampuan HOTs, instrumen yang telah diuji validitas dan reliabilitasnya. Jumlah pertanyaan yang digunakan sebanyak 23 pertanyaan. Kesimpulan: Tugas digital dapat meningkatkan HOTs siswa. Semua kelas yang menggunakan tugas digital memiliki urutan HOTs lebih tinggi daripada kelas berbasis cetak (konvensional). Penggunaan metode penugasan Digital dapat berupa: pertimbangan utama guru dalam melatih dan meningkatkan HOTs siswa; dan alat untuk mengoreksi hasil tugas siswa; Tugas digital dapat diterapkan pada siswa untuk memperdalam materi atau konsep, untuk melatih soal-soal ujian nasional dalam bentuk digital.*

***Kata Kunci**: penugasan digital;* high order thinking skills; schoology; quizizz

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INTRODUCTION

High Order Thinking Skills (HOTs) ability is an ability that must be possessed by everyone to deal with demands in the 21st century (Kemendikbud, 2016). HOTs not only require the ability to remember, but require higher abilities, such as analytical thinking skills, critical and creative (Anderson, 2010).

At the international order Indonesian students have lower order thinking skills. The results of the PISA survey show that Indonesian students are ranked 64 out of 70 countries in science and mathematics abilities (OECD, 2016). Students in South Tangerang are still few who are able to answer questions that require HOTs. Of the 40 students, only 5-10 students completed the analysis problem (Fatimah, 2017).

The concept of physics that is difficult to understand by students one of them is the concept of Newton's law. In Newton's law concept students are required to have good analytical skills. Students still experience difficulties in analyzing problems with Newton's law concept (Suwarna, 2016).

The low achievement and HOTs of students, namely students not yet trained in working on questions that require HOTs and student interest in learning physics, especially at the time of assignment (Brookhart, 2010). Students feel lazy to do the assignment from the teacher because after doing the assignment, the students do not immediately know the results of the work that has been done (Suwarna, 2014). If done continuously it will make students become unaware of the understanding of the concept that is owned correctly or not if the old teacher gives feedback on the task that has been done (Suwarna, 2014).

Digital assignments can be used as a solution to overcome students' weaknesses in HOTs and the slow feedback provided by the teacher. Digital assignments can contain physics practice questions that require HOTs and provide fast feedback. Providing feedback on the learning process is one of the principles of effective teaching that must be applied to the learning process (Joshua, 2012). Assignments can be a place to practice to solve problems, allow students to think comprehensively, foster conceptual understanding of the material being studied, and practice HOTs such as critical thinking and creative thingking (Demirci, 2010).

The formulation of the problem in this study is "How to enhancement the HOTs ability with implementation of digital assignments in the concept of Newton's law?"

The aim of the research is to know the enhancement of students' HOTs through the implementation of digital assignments to the concept of Newton's law.

METHOD

The research method used was the quasi-experimental method with the non-equivalent control group design (Sugiyono, 2015). The study population consisted of 313 students of class X at SMAN 7 Tangerang Selatan. The research sample consisted of 80 students consisting of 40 students in the experimental class (the class that applied digitally assignments, in the class use quizizz and homework use schoology) and 40 students in the control class (the class that applied the assignments in print). The sample was chosen by purposive sampling technique (Sugiyono, 2015).

Data Collection

The students' HOTs measured in this test refer to the revised Bloom Taxonomy proposed by Anderson and Krathwohl. The ability HOTs student is measured by a HOTs ability test instrument. Test instruments in the form of multiple choice questions as many as 23 items with the number of C4 questions as many as 9 questions, C5 as many as 7 questions and C6 as many as 7 questions. HOTs tests are given before and after giving different treatments to the experimental class and control class.

Data Analysis

Research data in the form of test results of HOTs ability processed and in statistical analysis, through normality tests using the Shapiro wilk test, homogeneity test with the barlett test and hypothesis testing using the t'-test (Kadir, 2015).

RESULT AND DISCUSSION

The recapitulation of HOTS pretest , posttest, and N-Gain data in the experimental and control class was presented in Table 1.

Table 1 shows the difference in the improvement of students' HOTs between the experimental class and the control class. The experimental class has increased the order of thinking ability of 0.54 with the medium category, while the control class has increased by 0.41 with the medium category. Comparison of mean scores of pretest, posttest, and N-Gain students' HOTs in the experimental class and control class are presented in Figure 1.

Table 1: The data of pretest, posttest, and N-Gain score of students' HOTs.

	Experimental class				Control class			
	Pretest	***Posttest***	***N-Gain***	**Category**	***Pretest***	***Posttest***	***N-Gain***	**Category**
Score Min	0.00	10.00			3.00	3.00		
Score Max	12.00	20.00			12.00	21.00		
Average Score	6.50	15.48	0.54	Medium	6.50	13.33	0.41	Medium

Based on Figure 1, the average pretest scores of the experimental and control classes were almost the same, namely 6.50 for the experimental class and 6.53 for the control class. But for the average value of the posttest the experimental class got a higher score than the control class, with each score of 15.48 and 13.33. Increase in the average value of pretest and posttest obtained from the N-Gain value of the experimental class and the control class in percent, namely 5.4 and 4.1. The experimental class has a higher order of HOTs ability compared to the overall control class.

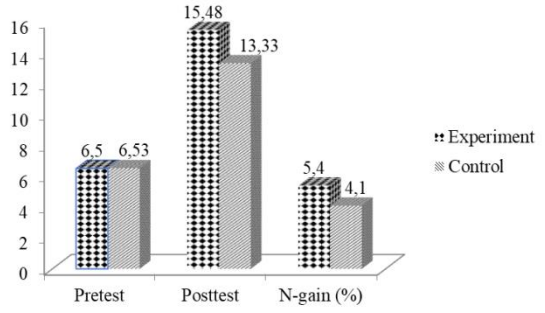

Figure 1: Graph of Comparison of Average Pretest, Posttest, and N-Gain Orders of Students' HOTs in Experiment and Control Classes

There are differences in the improvement of HOTs in the experimental class and control class. This is because the experimental class is given a treatment in the form of digital assignments, so that students immediately get feedback from the assignments given by the teacher which causes their knowledge to increase. Giving feedback to students in the learning process is one of the principles of effective teaching that is very important and needs to be applied to the learning process (Sabriani, 2012). In the control class only given (conventional) print assignments so that students do not immediately get feedback from the tasks they are working on so that the knowledge obtained is less than optimal, even students can experience misconceptions if they do not know the correct answers to the tasks they are doing (Suwarna, 2014).

Experimental class and control class experience an increase in high-order thinking skills in the medium category. This is because both classes have been trained in questions that require HOTs in assignments given. The questions given in the assignment in the control class are the same as the questions given in the experimental class so that the improvement of high order thinking skills in both classes is in the same category.

Improved high order thinking skills at the cognitive order of the experimental class and control class are shown in Figure 2

The highest improvement in HOTs ability in the experimental class is at C4 cognitive order (analyzing) that is equal to 5.6, while the lowest HOTs ability improvement is at C6 cognitive order (creating) which is 4.2. The highest improvement in HOTs in the control class is at C5 cognitive order (evaluating) that is equal to 4.4, while the lowest HOTs ability improvement is at C6 cognitive order (creating) which is 3.1. Overall, the improvement of high-order thinking skills based on cognitive orders in the experimental class is better than the control class. The difference is due to giving feedback to students in the experimental class. Giving feedback on student tasks can improve learning outcomes in a concept that is being studied.

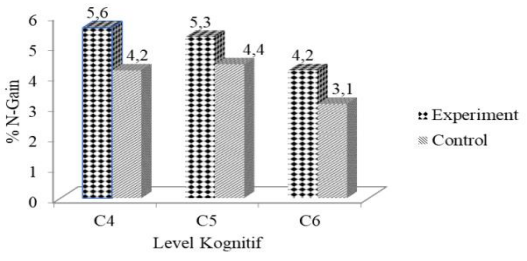

Figure 2: Average Graph of N-Gain Value for Each Cognitive Order

The ability to analyze (C4) the experimental class gets an average N-Gain score higher than the control class in all indicators of high-order thinking skills. The cause of the difference in the average N-Gain score obtained is because the experimental class that uses digital assignments can directly provide feedback in the form of ways or steps to solve the problems. Students immediately know the location of their mistakes and are used as a reference for them rather unmistakably so as to increase the understanding of the concepts they get. Educative analyzing cognitive process (C4) is an extension of the cognitive process of understanding (C2), meaning that understanding a concept that is good enough is needed so that students can achieve higher cognitive processes such as cognitive analysis (C4). In contrast to the experimental class, the control class which uses print assignments of students does not directly receive feedback from the teacher so that the basic understanding gained is not optimal so that it influences its ability in higher cognitive processes.

At the cognitive order of evaluating (C5) the experimental class gets a higher average N-Gain score than the control class. One of the causes of experimental class students to be able to evaluate better than the control class in addition to providing quick feedback is the process of presenting questions at the time of assignment. At the time of assignment, there were several questions that used video in the experimental class, while the control class was presented in the form of pictures and stories. Video can make students have better evaluation skills than control classes that present the problem only in the form of pictures and stories. Presentation of video questions can improve critical thinking skills. The ability to think critically when referring to one bloom taxonomy is the ability to evaluate.

In the cognitive process of creating (C6) the experimental class gets an average N-Gain score higher than the control class. The cause of the experimental class students can create better than the control class because it provides quick feedback on the tasks that have been done. Digital assignments at home can also provide feedback quickly in the form of discussion questions about how to solve problems that are quite systematic. Each student has a different error location in working on the task so that the discussion of the problems in the software varies according to the needs of each student. Experimental class students can learn from previous mistakes according to their needs. While in the control class students do not get fast feedback, it takes approximately 1 week for students to know the discussion of what has been done. In the teacher control class only discusses assignment problems which are considered by some students to be still difficult in their completion, the questions were not discussed entirely because the learning time was quite short.

Increased indicators of high order thinking ability of students based on cognitive processes, namely analyzing (C4), namely distinguishing, organizing and attributing. Indicators of high order thinking skills at the cognitive order evaluate (C5) that is examining and criticizing and indicators of high order thinking skills at the cognitive order of creating (C6), namely formulating and planning. The indicator was analyzed using N-Gain to categorize each indicator of high-order thinking skills based on the scores obtained by each student.

The results of the comparison of N-Gain average indicators of high order thinking ability of the experimental class students and the control class can be seen in the following shown in figure 3.

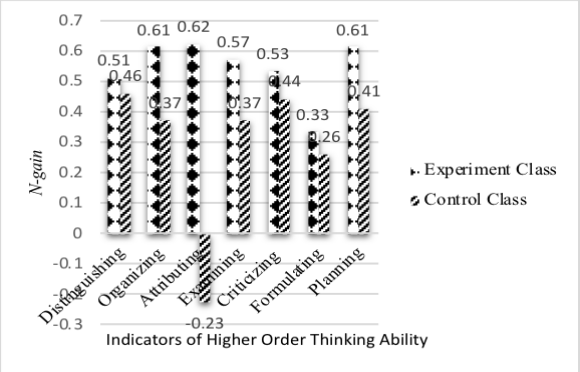

Figure 3: Increased Score in Each Indicator of High Order Thinking Ability for Experimental Classes and Control Classes

In figure 3 illustrates the average score increase for each indicator of high order thinking ability, the experimental class and control students have different increases. The indicators attributing the experimental class have the highest score, while the control class on the attributing indicator has the lowest score.

Table 2. N-Gain Statistical Analysis HOTs Ability in Experimental Classes and Control Classes

Statistic tes	N	α	Sig.	Conclusion
Normality				
Experiment Class	40	0,05	0,580	Normal Distributed Data
Control Class	40	0,05	0,530	
Homogeneity	80	0,05	0,007	Heterogeneous data
Uji-t'	80	0,05	0,000	There are differences

The experimental class is better able to solve problems in the type of question with the attributing indicator while the control class is better able to solve problems in the type of differentiating questions.

Overall the experimental class is superior to the control class because learning using digital assignments can provide feedback and the results of assignments can be seen directly by students. In addition, digital assignments applied in the classroom have an attractive appearance and create a very pleasant competition because the quizizz software values that are obtained by all students are immediately displayed in front of the class with forms such as being competed, and equipped with music features (Barnes, 2017). This makes students motivated to answer the maximum tasks given by the teacher (Bury, 2017). Digital assignments that are applied at home have a simple appearance such as social facebook media and can provide feedback in the form of a fairly systematic discussion (Besana, 2012).

Using quizizz in learning makes students' knowledge, motivation and interest increase in the material taught. Using Learning Network Schoology gives a big role in providing motivation in learning and increasing student learning presetation (Irawan, 2017). Students are very enthusiastic, excited and enjoy work in doing the tasks given by the teacher. While in the control class students do not immediately get feedback and scores from assignments. This makes students lazy to do the task because it takes a long time to know whether or not the correct answer to the task has been done, so that the understanding can be less than optimal. According to Suwarna (2014), students will not be motivated in learning if the work done is not well corrocted by the teacher.

The results of the statistical analysis of the N-Gain value of the HOTs of the experimental class students are presented in table 2.

The normality test is done to find out whether the data is normally distributed or not. This test is carried out in the experimental class and control class. Table 2 shows the sig values. Experimental class and control class above 0.05 that is equal to 0.580 and 0.530. So it can be concluded that the data in the experimental and control classes are normally distributed. Then a homogeneity test is carried out to find out whether the two classes have homogeneous variance or not. Table 2 shows that the value of sig. posttest below 0.05 that is equal to 0.007 then the data is declared heterogeneous. The sig. (2-tailed) N-Gain value uses the t-test 'which is 0,000 smaller than the significance order of 0.05, then H0 is rejected. This means that there is a difference in the improvement of high-order thinking skills in the experimental class and the difference in the improvement of high-order thinking skills in the control class. It can be concluded that digital assignments can improve HOTs of senior high school students on the concept of Newton's Law.

CONCLUSION

The implementation of digital assignments in the concept of Newton's law can improve students' higher thinking skills compared to the application of (conventional) print assignments. In the experimental class and the control class, there is a N-Gain in high-order thinking skills in the medium category. Overall the experimental class experienced a higher increase than the control class. Therefore, one way to improve HOTs of senior high school can be through the implementation of digital assignments.

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