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The Effectiveness of Science Learning Media Using Focusky Software on Junior High School Students' Higher Order Thinking Skills

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a b s t r a c t

This research aimed to identify the effectiveness of science learning media using Focusky software on junior high school students' Higher Order Thinking Skill (HOTS). Quasi-experiment is applied in pre-test – post-test non-equivalent control group design. The sampling technique applied wass cluster random sampling. Meanwhile, the instrument used was HOTS pre-test – post-test question. Data analysis techniques used were normality test, homogeneity test, Paired Sample T-test, Independent Sample T-test, and effect size. The result of this study indicates that the increase in HOTS of students in the experimental class was 50. It is higher than in the control class, which was only 30. The average post-test of the experimental class was 75.90, with 87% of students achieving the minimum criterion, while the average post-test of the control class was 60.25, with 75 % of students reach the minimum criterion. Based on the result of the Independent Sample T-test, it was shown that there were differences in HOTS abilities between the experimental class students and the control class students, and the effectiveness of the medium-sized learning media assisted by science learning media with an effect size of 0.7.

1. Introduction

21st Century education is the digital period of education where information and communication technology (ICT) must be integrated in learning. The development of technology that evolves continuously is directly proportional to the changing of life complexity. According to Osman, and Hamid (2009), Soh, et al., (2010), and Afandi, et al., (2016), the 21st century is characterized by technological development and competition that occurs in the labor market so as to bring the transformation of people who have knowledge towards the information era and modern economy. The transformation of the global economy accompanied by the swift flow of information technology development has brought the changes in orientation in various sectors of life, such as the emergence of "information explosion." Each is faced with the fact that the information entered is not fully by reality. In addition, it is necessary to equip the students with

the ability to choose and sort out relevant information and use clear objectives. Therefore, the need to develop 21st century skills education is a must.

The proficiency of the 21st century skill is needed for the students as their provision to face the change of life complexity in this century. Learning skills that need to be mastered by students to face the development of the 21st century are life and career skills; learning and innovation skills; and information, media, and technology skill (Trilling & Fadel, 2009). It is important to know that learning and innovation skill is supported by several skills; one of them is thinking skill. Thinking skill needs to be trained in learning to be able to answer the problems they face, and education must be able to facilitate to develop this thinking ability. According to the Organization for Economic Cooperation and Development (OECD) (2015), the ranking and achievement of Indonesia's International Student Assessment (PISA) Program for 2015 increased from 71 in 2012 to 64 in 2015 as measured by 72 OECD members. The highest surge was in the science sector, from 327 points to 359 points. The following result of PISA has reflected the ability of Indonesian students that they have experienced the improvement but are still under average from the country that follows PISA. Therefore, they still need improvement in learning so that PISA performance ratings can continue to increase. Efforts that can be done are to improve learning that trains thinking skill, one of them is Higher Order Thinking Skill (HOTS). This is based on the results of classroom observations. It shows that the average teacher is still focused on the taxonomic level of C1-C3.

HOTS is a high-level thinking skill that demands critical thinking, analysis, creativity, and constructs and transforms the knowledge and experience of information or data used to solve problem (Abdullah et.al, 2017; Pretorius et al., 2017; Fanani & Kusmaharti, 2018). In science learning, HOTS is a foundation that is by the substance of science; those foundations are a scientific process, scientificp, and scientific attitude. Training HOTS in science learning is important to train students to classify similarities and differences in phenomena found; evaluate a particular phenomenon or object; see and analyze information effectively in order to make wise decision; and provide opinion or create product to solve problems (Saido, et al., 2018; Jerome et al., 2017).

Science learning is a way of thinking about problems related to natural phenomena or the surrounding environment that are systematically obtained through a scientific process or method

(Carin & Sund, 1989; Chiappetta & Koballa, 2010; Trowbridge & Byebee, 1996; Tillery & Ross, 2007). Sunarijah et al., (2016), Mahulae et al., (2017), Suryawati & Osman (2018) argued that science education has several main elements which consist of scientific, psychological, scientific, and application processes. The scientific process is a step to investigate the problem. Scientific products are a collection of knowledge that consists of fact, concept, principle, law, and theory. Scientific attitude is an inherent value in scientific processes. Application is the scientific practice, scientific product, and scientific processes in daily life. By the nature of science learning, learning ideally refers to the learning activity, which enables the students to be able to empower their thinking potential optimally.

One of the contents of science materials that can train HOTS is about cigarette addictive substance contained in the core competence 3.6 and 4.6 in 2013 curriculum. The content of the material can train HOTS well when presented with the experiment in the laboratory. However, this laboratory experiment has its obstacles, that is the limitation of cigarette tools and chemical that are difficult to describe simply in the experiment. This problem can be solved by using interactive learning media. Interactive learning media is the use of learning media by utilizing information technology to combine text, image, animation, audio, and video conference with the link and the tool that allows them to create, interact and communicate (Jusoh & Jusoff, 2009). According to Ahyar et al., (2014), the advantage of interactive media is helping students to describe complex things to be simple and by the level of encryption so they can easily understood. Interactive multimedia that can be used includes power point, macromedia flash, houdini animation software, power animation, focusky, and prezi (Husain, 2014).

Based on an interview with science teachers, they have difficulty in making learning media, and they also feel that making media is expensive. They prefer to explain the material to students directly. Using Focusky software is one of the interactive media that can be used. It provides easy access, free and unnecessarily requires the help of another device. Focusky is a software used to create interactive and interesting teaching material with the effect of magnification and shifting easily without having the design/display skill of the media because the user just needs to choose the appropriate template and download the template (Idaharyani, 2017). The advantages of Focusky software in learning are attracting attention and curiosity, motivating learning, and be able to train students to think through inserting learning content through tool used to add new

object, image, edit text, music, graphic, video and import file from power points or swf format (Najmul et al., 2017 & Fatahullah, 2016). Based on those descriptions, this research is aimed to find out the effectiveness of science learning media using Focusky on the junior high school students' High Order Thinking Skill (HOTS).

2. Research Methods/Methods

The method applied in this study is quasi-experiment. The design of the research is pre-test post-test non-equivalent control group design adopted from Sugiyono (2014) that it is illustrated in Table 1.

Tabel 1. Pre-test Post-test Non-equivalent Control Group Design

Group	Pre-test	Treatment	Post-test
E	O_1	X_1	O_2
K	O_3	X_2	O_4

Information :
E = experiment class
K = control class
X_1 = muse media software Focusky
X_2 = use teachers' book
O_1 = pre-test group experiment
O_2 = post-test group experiment
O_3 = pre-test group control
O_4 = post-test group experiment

The sampling technique used was random cluster sampling. This research was conducted at SMP Negeri 2 Gamping. The study population was students of class VII D and VII F in the academic year 2018-2019, each class consisted of 18 students. Class VII D was the experimental class, while class VII F was the control group. The instruments used in this study were about the pre-test and the HOTS post-test.

The data analysis used in this study is a hypothesis test consisted of normality test and homogeneity test using SPSS 16, Paired Sample T-Test, side-effect test with Independent Sample T-Test using SPSS 16. Effect Size formula is used to calculate the effectiveness of the application of learning media using Focusky software on the students' HOTS. According to Cohen (1992) for calculating the effect size on the t-test, the following formula is used.

$$d = \frac{M_1 - M_2}{\propto polled}$$

(Cohen, 1992)

Information :
d = Cohen's d effect size
M_1 = Experimental class average
M2 = Control class average
α polled = Standard deviation
The result criteria of effect size as following.
ES ≤ 0,2 = Low
0,2 < ES < 0,8 = Moderate
ES ≥ 0,8 = High

3. Result and Discussion

The implementation of learning begins with distributing a pre-test question to find out the initial ability of students before being distributed treatment in both the experimental class and the control class. The experimental class is given treatment using interactive presentation media with Focusky software that has been copied on the school computer and can be accessed by students, while the control class uses the textbook. After completing the treatment, post-test was conducted to find out how high-ability students to think after carrying out the learning process in both experiment and control class. The result of the pre-test and post-test experimental and control class were observed in Table 2.

Table 2. Data value pre-test and post-test

Description	Experimental Class		Control Class	
	Pre-test	Post-test	Pre-test	Post-test
N	18	18	18	18
Maximum Value	50	100	50	80
Minimum Value	20	70	30	60
Averages	40,05	75,90	40,75	60,25

Based on the data in the Table 2. above, it can be seen that in general, students experience an increase in high-level thinking skill (HOTS) between the experimental class and the control class. In the experimental class, the value of pre-test minimum of 20 becomes 70 so that it experiences a 50 increase with an average of 40.05, while the maximum post-test value of 50 becomes 100 so that it increases by 50 with an average of 75.90. In the control class, the pre-test minimumof 30 value

becomes 60 so that it increases 30 by an average of 40.75, while the post-test value is a maximum of 50 to 80 so that it increases by 30 with an average of 60.25. If it is seen from the increase in the value and average of the pre-test and hypnotic between experimental and control class value, the magnitude of the increase in the experimental class is more significant than in the control class.

Based on the results of the pre-test and post-test conducted on the experiment and control class, the average of pre-test score for experiment class (40.05) and the control class (40.75) was relatively equal (0.70 in difference). After the treatment was given by using the learning score, the experimental class average score was 75.90, while for control with an average value of 60.25. This result showed a significant difference; there was a difference between 16,65. The increase was further analyzed by using the Paired Sample T-Test. The Paired Sample T-Test was used to identify the difference between the value of the pre-test and post-test before and after learning. Paired Sample T-Test using SPSS 16 with a significance level (α) of 0.05, If the significance value is sig (2-tailed) <½ α, then there are differences in the value of pre-test and post-test before and after learning, whereas if the significance value is sig (2-tailed)> ½ then there is no difference in the pre-test and post-test values before and after learning. The experimental class Paired Sample T-Test results were obtained sig (0,000) <0,025 so there were differences between the value of pretest and posttest before and after learning. The results of the control class Paired Sample T-Test were obtained sig (0,008) <0,025 then there were differences in the pretest and posttest values before and after learning. HOTS ability enhancement of the experimental class and control class students can be seen in Figure 1a and Figure 1b.

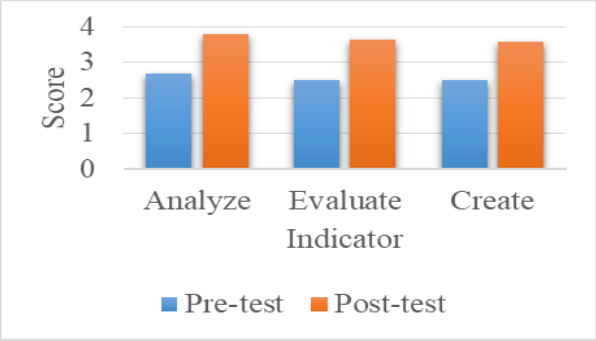

Figure 1a. HOTS Experiment Class Enhancement

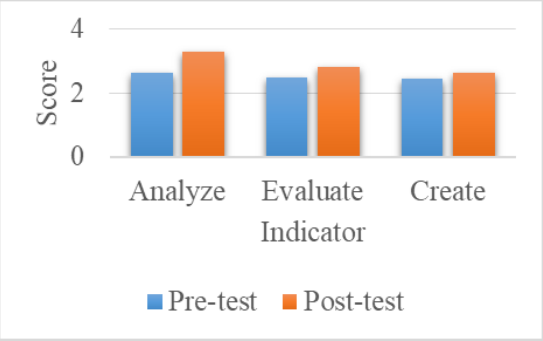

Figure 1b. HOTS Control Class Enhancement

Based on the diagram above, it can be seen that each indicator between the experimental class and the control class has increased. However, the increase in the experimental class indicator was higher than in the control class. The effectiveness of using learning media was chosen from the results of student scores tested through pre-test in the form of a normality test for homogeneity test with SPSS 16, side-effect test by testing Independent Sample Tests with SPSS 16, then calculating

the effectiveness of learning with Focusky software on students' HOTS using formula effect size. The prerequisite normality test was done to find out samples originating from several populations with normal or no distribution. Normality test was done using Kolmogorov Smirnov with SPSS 16. If the significance value is> 0.05, the data is declared normal, and vice versa if the significance value is <0.05 then the data declared abnormal. The result of the normality test of students in the experimental class was obtained sig (0.200)> 0.05, while the result of the normality test of students in the control class was obtained sig (0.187)> 0.05. Thus, it can be concluded that the experimental class and control class were normally distributed.

The next test of the prerequisites is the homogeneity test. The homogeneity test is to find out whether the sample taken from the population originated from the same variance or not. Homogeneity test is carried out with a Test off Analysis method of Variance with the program SPSS 16. The result of the homogeneity test of the experimental class and the control class can be seen from sig (0.349)> 0.05. Therefore, it can be concluded that the variables are declared homogeneous.

If the data of the sample prerequisite test result are said to be normal and homogeneous, then the next test is to know that there is no difference in HOTS ability between the experimental class students and the control class students with Independent Sample T-Test using SPSS 16.

Table 3. Result of independent sample t test

Variant	**Hasil Levene's Test of Equality of Variances**				
	F	**Sig.**	**T**	**df**	**Sig. (2-tailed)**
Equal variances assumed	8,936	0,005	5,032	34	.000
Equal variances not assumed			5,032	24.455	.000

Based on the independent results of Sample T-Test between classes of experiment and control classes, it can be seen that sig (2-tailed) <0.05, so that it can be concluded that there is a difference in HOTS ability between students in the experimental class and students in the control class.

The effectiveness of the treatment given to students' HOTS is known through the size of the effect size. The size of the effect is the difference between the averages stated in the standard deviation. Based on the calculation, the amount of effect size of the treatment given is 0.7. Based on the Cohan criteria, the effectiveness of learning aided by Focusky software is in the moderate category of students' HOTS abilities.

The effectiveness of learning aid is seen at the beginning of learning. Students are enthusiastic about the images/videos displayed by the teacher to motivate students. Learning that displays

image, video, article with HOTS questions adequate to stimulate students to think, and students can also discuss with their group so they can exchange ideas. Learning was ended with students working on the questions which provide in the media made. The questions in the media consist of 5 levels, including very easy, easy, medium, difficult, and very difficult. At the end of the learning activity, the students worked on the problem with the time duration determined; the result showed that students were enthusiastic in working on questions because it consisted of several levels. It caused students to feel challenged and not bored, so learning became not monotonous for them. If seen from the convergence of Edgar Dale experience, learning with Focusky software-assisted aid can absorb learning material by 70% because students can see, hear, talk, and write.

According to Najmul, at al., (2017), and Fatahullah (2016), the use of focusky software in learning is attracting attention, curiosity, and motivating learning. It also enables the students to practice thinking ability about inserting learning content through a tool that can be used to add new objects, images, edit text, music, graphics, videos and import files from a power point or swf format. Another opinion was stated by Idaharyani (2017), she said that the ability of students to think specifically becomes better at the class that uses Focusky software as learning media. The brain processes information and then maps the information that is seen or the visual information contained in the media is about 75% so that relationship and pattern of information in the form of idea or concept with an image can be easily understood. The visual information can be in the form of picture, diagram, video, simulation, and slide show provided in Focusky (Raiyn, 2016; Agustihana & Suparno, 2018).

The use of Focusky learning media can effectively train students' HOTS skills because during the learning process when the teacher displays the material using focusky students, their attentions were focused on the initial appearance of the media that displays many animated images. When entering the material presentation, it is done with the help of pictures, writing, video, and music so that it is interesting and can foster the interest of students to learn.In addition, when the teacher asks students to discuss, they can have a good and enthusiastic discussion. However, the implementation of this learning also had obstacles, when the travel video of cigarette chemicals in the body was displayed 8 minutes long, it makes the students whom initially enthusiastic become bored in the minute 5th. Some of them start chatting one each other, so the teacher overcame it by pausing the video, then inviting students to discuss the new video again.

The use of interactive media makes it easier for students to learn again the material that has not been understood in accordance with their respective time and condition because the media can be stored on a cellphone or laptop, so the learning process is more effective and learning material can

be stored longer / long-term (Angreni, 2017 & Aripin, 2012). Fatahullah (2016) said that the use of innovative media learning could help learning process by providing direct experience to students so that learning is more meaningful, fun, motivating, and provides adequate space for their ability to think creatively, critically, and solve the problem. Interactive and innovative media can help deepen the knowledge of student content, involve them in building their own knowledge, and support the development of complex thinking skills, so as they can enhance the high-level thinking ability (HOTS) and improve the quality of teaching and learning (Hobbs & Jensen, 2009; Halah & Patrick, 2015). Littlejohn et al., (2010), Groff (2012), & Syed (2013) said that media-based information technology and communication (ICT) provides an opportunity to use a lot of information resources, view information from various perspectives, make complex processes easier to understand so as to foster learning skills at the level of a standard (HOTS).

4. Conclusion

Based on the result of the research that has been done, it can be concluded that there are differences in HOTS ability between the experimental class and the control class. The difference can be seen from the result of the Independent Sample T-Test pre-test and post-test scores between the experimental class and the control class which shows sig (2-tailed) <0, 05. Meanwhile, the effectiveness of science learning media assisted by focusky software in the category of HOTS abilities of students based on the result of the effect size of the treatment given is 0.7.

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