Discovery-Oriented Thinking Square Media to Improve Critical Thinking Skills

Rizki Isna Noviarini
SD Negeri Kebonagung 01
Demak, Indonesia
noviaarieni@gmail.com

Eva Banowati
Universitas Negeri Semarang
Semarang, Indonesia

Sarwi
Universitas Negeri Semarang
Semarang, Indonesia

Abstract-**The purpose of this study was to determine the differences in the improvement of critical thinking skills using discovery-oriented Thinking Squares media in elementary schools. This study was a quasi-experimental study with a pretest-posttest group design research design with 85 students in Sumowono District, Semarang Regency as the research subject. Data collection techniques using tests, observations, questionnaires and documentation. The results showed that students' critical thinking skills in learning using Discovery Oriented Thinking Squares were higher than learning using animated powerpoint media with the t test obtained a significance value of 0.002 <0.05. The average value of critical thinking skills in the experimental class 1 was 68.39 while the experimental class 2 was 59.08. So it can be concluded that the use of discovery-oriented Thinking Square media is more effective to improve critical thinking skills compared to animated powerpoint media.**

Keywords: thinking squares, discovery, critical thinking skill

I. INTRODUCTION

In the 2013 curriculum, learning in primary schools used thematic learning. Ideal thematic learning according to the Ministry of Education and Culture is student-centered learning to foster enthusiasm for learning, motivation, interest, creativity, initiative, inspiration, innovation and independence. In addition to having these advantages, thematic learning in the 2013 curriculum has obstacles in practice. According to Sabri (2014), not a few teachers have minimal readiness in understanding the implementation of the 2013 curriculum, both approaches, methods and assessment mechanisms. In addition, according to Krissandi and Rusmawan (2015), the thematic learning competence in the 2013 curriculum cannot be achieved if the learning scenario does not use innovative methods. Similarly with the Sabri, Krissandi, and Rusmawan's research finding, the reality that researchers found after observing thematic learning in the Public Elementary School in Sumowono District was different from the ideal conditions recommended by the Ministry of Education and Culture. Thematic learning only uses student books as the learning source and has not used the media or other teaching aids to stimulate students to find their own knowledge. In addition, the test given by the teacher at the end of learning are still about cognitive aspects of knowing and understanding, not yet on higher order thinking skills, especially on critical thinking skills.

According to the teacher, students have difficulty in explaining how to save energy. Another difficulty experienced by students is to interpret new ideas about how to save energy, alternative energy and the use of energy for environmentally friendly technology. This is due to the absence of other media besides student books that can stimulate students to interpret ideas on how to save energy, alternative energy and energy for environmentally friendly technology.

In this study, the theme of Kayanya Negeriku, energy material particularly will be examined by using discovery-oriented thinking squares media. The reason for using discovery-oriented thinking squares media is that it stimulates students' critical thinking activities including observing images of objects, identifying characteristics of objects, making hypotheses, collecting data on objects, and making conclusions.

II. METHODS

This research is a quasi-experimental study with a pretest-posttest group design. The design of this study consisted of two groups consisting of: groups that were treated with discovery-oriented thinking squares media called the experimental group I and groups with animated power point media called the experimental group II. Before learning, students are given a pretest to find out their initial abilities. After learning to use discovery-oriented thinking squares and an animated powerpoint, students are again given a post-test to determine the effect of the two media. The effectiveness of the two media can be seen from the difference in the average results of the prestest and posttest.

The population in this study were all grade IV elementary school students in Sumowono District, Semarang Regency in the 2017/2018 school year, which was 432 students. The sampling technique used in this study was purposive sampling. Considerations used in purposive sampling include the similarity of school accreditation, curriculum and the basic similarity of students' knowledge.

Data collection techniques use test. The results of these test then compared and analyzed using SPSS through the Paired Smple T-Test and Independent Sample T-Test.

III. RESULTS AND DISCUSSION

Results on the critical thinking skills in this study were obtained from pre-test and post-test. In summary, the value of critical thinking skills is presented in Table 1.

Table 1. Results of the Pre and Posttests' Critical Thinking Skills

Data	Class	Lowest Score	Highest Score	Average	Category
Pre test	Experiment$_1$	16	84	50,93	Sufficient
	Experiment$_2$	32	88	56,25	Sufficient
Post test	Experiment$_1$	28	92	68,39	Good
	Experiment$_2$	28	88	59,08	Sufficient

From table 1 it can be seen that the average initial critical thinking skills of students in the experimental class 1 is 50.93 while the experimental class 2 is 56.25. Both are included in the sufficient category. After learning, the average critical thinking skills of students in experimental class 1 increased to 68.39 included in good category. In the experimental class 2, after learning, the average critical thinking skills increased to 59.08 with sufficient categories.

Table 1 shows the average initial critical thinking intelligence of the experimental class according to sufficient categories. After learning, the average critical learning of the experimental class 1 students increased to a good category while the experimental class 2 still remained in the sufficient category. Experimental class 1 with learning using Thinking Squares media received higher scores than experimental class 2 using animated powerpoint media.

To test a hypothesis, a prerequisite test is required first. The prerequisite tests used in this study were normality and homogeneity tests. Normality test is used to find out the data of the pretest and posttest results in experimental class 1 and experiment 2 with normal distribution or not. The normality test in this study uses SPSS version 25.0.

Pretest results data in the experimental group 1 and experiment 2 were normally distributed. The significance value of experimental class 1 was 0.200 and experiment 2 was 0.169. The significance value of the two classes is more than the significance level of 0.05 (0.200> 0.05 and 0.169> 0.05). The results of the experimental group 1 posttest and experiment 2 were normally distributed. The significance value of

experimental class 1 was 0,200 and experiment 2 was 0,190. The significance value of the two classes is more than the significance level of 0.05 (0.200> 0.05 and 0.190> 0.05). Based on the results of the analysis, it can be concluded that all data in the two experimental classes are normally distributed. Thus, the next step can be done homogeneity test.

Homogeneity test in this study using SPSS version 25.0. Data is homogeneous if the significance value in the Sig column in all rows (rows based on mean, based on median, based on median and with adjused df, and based on trimmed mean) is more than 0.05. Pretest result data in experimental group 1 and experiment 2 were homogeneous. The significance value on the line based on mean is 0.677. In the line based on the median of 0.717. In the line based on median and with adjusted df of 0.717. In the line based on trimmed the mean is 0.672. The fourth significance is more than the significance level of 0.05. Pretest result data in experimental group 1 and experiment 2 were homogeneous. The significance value on the line based on mean is 0.993. In line based on median 0,947. In the line based on median and with adjusted df of 0.947. In the line based on trimmed the mean is 0.958. The fourth significance is more than the significance level of 0.05.

Paired Sample T Test requirements is the normality and homogeneity test. Because the results of the two prerequisite tests are fulfilled, the Paired Sample T Test can be performed. Paired Sample Test T Test is used to test the difference in the average results of the pretest and posttest. Summary of the Paired Sample T Test using SPSS 25.0 is shown in table 2.

Table 2. Summary of Test Results Paired Sample T Test

		T	Df	Sig	Rata-rata	*Lower*	*Upper*
Exp. 1	*Pretest*	-8,074	40	,000	50,93	-21.834	-13,092
	Post test				68,39		
Exp. 2	*Pretest*	-2,025	47	,049	56,25	-5,647	-,0191
	Post test				59,08		

Based on table 2, t calculate experiment class 1 is -8,074 with a significance of 0,000. T table in the statistical table at a significance of 0.05: 2 = 0.025 with degrees of freedom n-1 or 41-1 = 40 of -2.021. From the results of these calculations, it is known that the -ttest <-table (-8.074 <-2.021) and the significance <0.050 (0.000 <0.050) then Ho is rejected and Ha is accepted. Thus, there are differences in the results of pretest and posttest in learning using discovery-oriented Thinking Squares media.

T calculate the experimental class 2 of -2.025 with a significance of 0.049. T table in the statistical table at a significance of 0.05: 2 = 0.025 with degrees of freedom n-1 or 48-1 = 47 of -2.012. From the results of these calculations, it is known that -ttest <-ttable (-2.025 <-2.012) and significance <0.050 (0.049 <0.50) then Ho is rejected and Ha is accepted. Thus, there are differences in the results of the pretest and post test in learning using animated powerpoint.

The results of the Paired Sample T Test in the two experimental classes showed that there were differences in the scores between the pretest and posttest. The average value after learning is higher than the average value before learning. Thus, it can be interpreted that learning using Thinking Squares media and animated Powerpoint can improve students' critical thinking skills. Judging from the average post test scores, learning with Thinking Squares media has an average post test score higher than the average post test scores on learning with animated Powerpoint media. It can be interpreted that learning with Thingking Squares media is more effective in improving critical thinking skills compared to learning with an animated Powerpoint media. To test the hypothesis, the next step is the t test.

Hypothesis testing is to determine the conclusions of the study. The data in this study are normally distributed and homogeneous so that the hypothesis test used is the Independent Sample T Test. The Independent Sample T Test is used to test the difference between the two average results of the experimental group 1 and experimental 2 posttests. A summary of the Independent Sample T Test can be found in Table 3.

Table 3. Summary of Independent Sample T Test Results

	F	Sig	T	df	Sig (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	,000	,993	3,243	87	,002	9,30691	2,86959	3,60329	15,01053
Equal variances not assumed			3,241	84,597	,002	9,30691	2,87163	3,59695	15,01687

Before two different tests of the average experimental groups 1 and 2 can be done, an F test (homogeneity test) was carried out to determine the similarity of the variants of the two experimental groups. If the variants are the same, then the t test uses the values in the equal variances assumed line and if the different variants use the not assumed equal variances. In this study, the significance of the F test was 0.993. This value is greater than the significance threshold of 0.05 (0.993> 0.050). Thus, it can be concluded that the experimental group 1 and experiment 2 have the same variant so that the t test (Independent Sample T Test) uses the value of equal variances assumed.

In the t test, there are several test criteria that must be used as guidelines. These criteria are if -ttable <tcount <ttable and significance> 0.050 then Ho is accepted. Whereas if -ttest <-ttable or tcount> ttable and significance <0.050 then Ho is rejected. Researchers used a sample of 89 students, then the degree of freedom (df) = n-2 = 89-2 = 87. with a significance of 0.05: 2 = 0.025. The results of the table obtained are -1,988.

The next step is to compare tcount with ttable. Based on the line of equal variances assumed, it can be seen that the tcount is 3.243. Value -tcount <-ttable (-3,243 <-1,988) and significance <0.050 (0.002 <0.050). Based on the testing criteria, it can be concluded that Ho was rejected. The conclusion of this research is that there is a difference between learning using Thinking Squares media and learning using animated Powerpoint media.

Based on the results of the study, it can conclude data that discovery oriented Thinking Squares media can improve students' critical thinking skills in thematic learning. In the initial data, the average score of critical thinking skills is in the sufficient category. The average scores in both classes are almost the same because the students' critical thinking ability in answering questions has not yet been developed. After learning, the average value of critical thinking skills in learning using Thinking Square media is higher when compared to learning using animated powerpoint media (Table 1).

Rahmatika, et al (2016) argue that learning activities that involve students in direct experience are very effective compared to teacher explanations in verbal form (words). Thinking Square media display

is classified as providing new experiences for students in learning. Students not only sit quietly listening to the teacher, but try directly the media in front of him. This media is played in almost the same way as the snake and ladder game. The difference is, when each student's pawn stops on one box, students must take a picture card that has the same picture as the place where the pawn stops. In addition, according to Jelani, et al. (2016), the presentation of material that is fun, not boring, interesting and easy to understand by students has a positive effect on learning success. Thinking Square media oriented findings containing color images with tools that are easily played by students.

The student's task in learning is to answer the questions with the two cards he got. According to Rahmawati and Kurniawan (2017), learning media that are able to lure students to simply answer questions can practice their critical thinking skills. In this study, three problems were presented at each meeting, namely: depletion of non-renewable energy and energy that is not environmentally friendly. By using two cards in the game using Thinking Square media, students are able to describe ways to cope with the depletion of energy use, namely by: (1) outlining the idea of creating energy-efficient devices and (2) outlining ideas about tools that use energy alternative. While for the problem of energy that is not environmentally friendly, students describe various uses of tools with environmentally friendly energy. Media Thinking Square is discovery oriented inviting students to be active in the process of critical thinking to solve problems.

One of the students' idea in experiment 1 class who were given a discovery-oriented Thinking Square media engagement with the question of how to save energy is to create devices that use energy-saving principles. The idea of a device that was created is a lamp with a sensor of human existence. When there are humans in the room, the lights will automatically turn on. However, if there are no humans, the lights will automatically turn off. According to Widiana, et al. (2018), critical thinking skills are the skills of developing logical reasoning patterns based on the analysis of arguments and the appearance of ideas from each student's interpretation. The idea raised by one of the students in the study is in accordance with Widiana's opinion, namely students interpreting ideas based on logical reasoning and argumentation analysis. Electrical energy can be saved by not activating a lamp when not in use.

Although the use of discovery-oriented Thinking Square media has advantages, in practice there are also limitations. The limitations of Thinking Square media are oriented to the discovery of this research, that is, it can only be used for one material (in this study the material used is about energy). According to Sarwi, et al (2012), critical thinking is not a teaching material but a process or activity that can be included in any material learning at a certain level of education. Thus, to improve students' critical thinking skills on a variety of material, Thinking Square media oriented to discovery needs to be developed again. One way is to make Discovery oriented thinking square media in digital format, so that it can be played through gadgets and can cover a variety of learning materials.

IV. CONCLUSION

Based on data analysis and discussion, it can be concluded that discovery oriented thinking square media is more effective in improving critical thinking skills compared to animated powerpoint media. Discovery oriented thinking square media can lure students to interpret students' ideas based on logical reasoning and argumentation analysis. Thinking Square medias' displays can provide new learning experiences for students. In addition, discovery-oriented Thinking Square media is presented in the form of interesting and not boring images for students. Although it has advantages, Thinking Square media also has limitations that can only be used for one material. Need to develop discovery oriented Thinking Square media in digital form.

REFERENCES

[1] Jelani Elan., Wahidin, Roviati Evi. (2016). Penerapan Media Ular Tangga Bercerita untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Kelas VII pada Konsep Pencemaran Lingkungan di MTs Al-Muatawally Kuningan. *"Scientiae Educatia"*, 5(1) 25-38.

[2] Krissandi Apri Damai Sagita., Rusmawan. (2015). Kendala Guru Sekolah Dasar dalam Implementasi Kurikulum 2013. *"Cakrawala Pendidikan"*, 34(3): 457-467.

[3] Rahmatika Eviana., Banowati Eva., Sulistyorini Sri. (2016). Pengaruh Model Discovery Learning Berbantu CD Interaktif terhadap Kemampuan Berpikir Kritis dan Aktivitas Siswa. *"journal of Primary Education"*, 5(2) 97-103.

[4] Rahmawati Afifah Miftah.; Kurniawan Riza Yonisa. (2017). Analisis Pengembangan Media Kokami (kotak dan Kartu Misterius) untuk Meningkatkan Keterampilan Berpikir Kritis, Aktivitas Belajar dan Ketuntasan Belajar SMP-SMA. *"Jurnal Pendidikan ekonomi (JUPE)"*, 5(3).

[5] Sabri Ahmad. (2014). Paradigma Implementasi Kurikulum 2013 di Sekolah Dasar: Problem dan Penyelesaiannya. *"Jurnal Tarbiyah al-Awlad"*, 4(2): 461-471.

[6] Sarwi., Rusilowati A., Khanafiyah S. (2012). Implementasi Model Eksperimen Gelombang Open-Inquiry untuk Mengembangkan Keterampilan Berpikir Kritis Mahasiswa Fisika. *"Jurnal Pendidikan Fisika Indonesia"*, 8(2012) 41-50

[7] Widiana Galuh Tisna., Ulum Maufuzul., Nurrohmah Triya., Arobi Achmad Zainul Hasan. (2018). Efektifitas Media Becak dalam Pembelajaran IPA untuk Meningkatkan Ketrampilan Berfikir Kritis Siswa SD /MI. *"Jurnal Pendidikan Dasar Nusantara"*, 3(2) 189-195.