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Reasoning Ability Through Challenge-Based Learning Kahoot

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Abstrak

Tujuan utama menganalisis kemampuan penalaran matematis pada soal examination for Japanese University melalui challenge-based learning aplikasi kahoot. Suatu studi eksperimen, desain pre-test post-test control group design. Subjek populasi seluruh siswa kelas XI Sekolah Menengah Atas Negeri 26 Bandung, dengan melibatkan sampel tiga kelas melalui teknik random sampling dari lima kelas paralel yang tersedia. Instrumen tes penalaran matematis. Hasil temuan: Terdapat peningkatan kemampuan penalaran matematis siswa yang memperoleh challenge-based learning berbantuan aplikasi kahoot dengan format soal examination for japanese university, challenge based-learning tanpa aplikasi kahoot, dan pembelajaran konvensional; dan peningkatan kemampuan penalaran matematis siswa yang memperoleh pembelajaran challenge-based learning berbantuan aplikasi kahoot dengan format soal examination for japanese university lebih baik dari pembelajaran challenge-based learning tanpa aplikasi kahoot dan ekspository. Challenge based-learning apikasi kahoot dapat memfasilitasi proses konflik, proses penemuan, proses interaksi sosial, dan proses reflektif, sehingga mampu meningkatkan kemampuan penalaran matematis siswa.

Kata kunci: Challenge-based learning, Kahoot, Penalaran Matematis

Abstract

The main objective is to analyze the improvement of mathematical reasoning ability through the challenge based learning with kahoot application. An experimental study, pre-test and post-test control group design. The population subjects were all students of class XI of the SMAN 26 Bandung, by involving a sample of three classes through random sampling techniques from five parallel classes available. Instrument for mathematical reasoning tests. Findings: There was improvement in mathematical reasoning abilities of students who obtained a challenge-based learning assisted by the kahoot application, challenge-based learning without a kahoot, and conventional learning. Improvement of mathematical reasoning abilities of students who obtained a challenge-based learning with kahoot application is better than challenge-based learning without the kahoot, and expository learning. Challenge-based learning kahoot applications can facilitate conflict processes, discovery, social interaction, and reflective to improve students's mathematical reasoning abilities.

Keywords: *Challenge-based learning, Kahoot, Mathematical Reasoning*

1. INTRODUCTION

Global competitiveness of reliable science and technology is a challenge in improving the quality of human resources that cannot be avoided anymore. Human resources that able to meet these challenges is those who have the ability to think logically, systematically, critically, creatively, so they are able to face the challenges independently with confidence and responsibility. This effort can't be achieved by procedural old mindset, this effort needs to be developed by someone who has the potential to optimally develop their mindset based on logical principles of reasoning, systematically, analytically, and accurately.

National Council of Teacher of Mathematics (NCTM) Martin Bernard (2015) one of the goals of students learning mathematical reasoning is making conjectures, proofs, and mathematically constructing arguments. Fadillah, (2019) one of the learning objectives of mathematics is to enable students to: Use reasoning in patterns and traits, make mathematical manipulations in generalizing, compiling proofs, or explaining mathematical ideas and statements. Soemarmo, Heris (2014) reveals that mathematical reasoning is classified into two types: inductive reasoning and deductive reasoning. In general, inductive reasoning is defined as drawing conclusions based on limited data, while mathematical deductive reasoning based on assumptions, which is the truth of a concept or statement obtained as a logical consequence of the previous truth. Indicator of deductive mathematical reasoning Shadiq (2014); Dewi (2019) include: (1) The ability to present mathematical statements in writing and pictures, (2) Ability to do mathematical manipulation, (3) Ability to examine validity of an argument, (4) Ability to draw conclusions. Mathematical reasoning is packaged in examination for Japanese University format question, through interactive digital learning media applications, to adapt and prepare high school students to continue to the University level in Japan.

Empirically, in reality, there's lack of interactive digital learning media applications in mathematics learning, the stigma that mathematics is a very difficult and boring subject is still strong among students. This is similar to Jonsson, Norqvist, Liljekvist, Lithner (2014); Ahmad (2015); Andityi & Murtiyasa (2016); Susilawati (2017); Astuty, Waluya, Sugianto (2018); Norqvist, Jonsson, Lithner, Qwillbard, Holm (2019) statement's that most high school students consider mathematics to be a subject that is hard to learn and also frightening, so students experience troubles in solving mathematical reasoning problems. The low rate in mathematical reasoning abilities of students start become worrying as the competitiveness of Indonesian students entering universities in Japan also become lower.

The complexity of the problem in terms of mathematical reasoning ability and technological development, it needed an effort to facilitate mathematical reasoning ability by packing examination questions for japanese university on the kahoot application through challenge-based learning. The kahoot application encourages students to learn from assignments, teaching materials, and projects, by constructing themselves contextually stimulated divergent problems, which challenge students to explore their projects in front of the class. According to Shaidullina, Evsyukova, Mikhailov, Gazizova, Masalimova, Khairullina. & Galimzyanova (2015) the quality of the education system always changes according to the needs of the society which involves the development of student potential.

Improving the quality of education in the 21st century can be realized through 4C which includes communication, collaboration, critical thinking, and creativity. Collaboration requires students to

work together in groups and carry out their respective responsibilities (Octriana, Putri, Nurjannah, 2019). Collaboration challenge-based learning consists of three important parts, i.e. problem-based learning, contextual learning and project-based learning. Challenge-based learning with the kahoot application is seen as learning that is able to implement students' demands to work hard using their reasoning when faced with problems that conflict with their cognitive structure. Kahoot is an online application arranged containing quizzes in the form of test questions presented in the game format Dewi (2018). Giving points to students who answer correctly and are involved in the game, their names will be listed in players list who will add to the challenging situation during the learning process. The advantage of this application is that the answers will be represented by images and colors and the display on the teacher's device and student devices will automatically change according to the number of questions being displayed Lime (2018) Kahoot is an interactive learning media that can be used in teaching and learning activities such as pre-tests, practice, material, remedial, lesson enrichment, etc. One of terms to make kahoot is to have a gmail account or other account Dewi, (2019).

In accordance with expression Maron (2016) that teachers as facilitators must prepare problems to build student's competencies and skills in solving challenging reasoning problems, in order to get the best solution, this condition can't rely only on problem submission from students but it also needs the direction of the kahoot application by providing continuous training. As expressed by Gold, B., Simons (2008); Susilawati (2017) philosophically, there are two ways that are carried out in the mathematics teaching and learning process, namely the way of understanding such as theorem, proof entry item, problem and solution, the second is the way of thinking to develop thinking skills. Challenge-based learning syntax with the kahoot adaptation application (Johnson, L., & Adam, S, (2011) includes: (1) The big idea, (2) Essential questions, (3) The challenge, (4) Guiding questions, (5) Guiding activities, (6) Guiding resources, (7) Solution, (8) Assessment, (9) Publishing.

Explicitly the purpose of this paper is to analyze; 1) The improvement in student's mathematical reasoning abilities who obtained challenge-based learning with kahoot application learning for examination of Japanese University, challenge based learning without kahoot, and expository learning. (2) the improvement of student's mathematical reasoning abilities of who obtained challenge-based learning with kahoot application for examination of japanese university was higher than challenge-based learning without kahoot applications and expository.

2. METHOD

Experimental research method with nonequivalent control group design. Implementation in SMAN 26 Bandung. Involving three sample classes with 60 people and each class consisting of 20 people, namely class XI MIPA 1 as an experimental class I that will do the challenge-based learning assisted by kahoot application using examination for Japanese University question format, class XI MIPA 2 as experimental class II implementing the challenge-based learning without kahoot application, and class XI MIPA 5 as a control class with expository learning. Test instrument for examine mathematical reasoning abilities. Results of pre-test and post-test used one-way ANOVA Test analysis, and Post Hoc Test.

3. RESULT AND DISCUSSION

Pretest results of experimental class I, experiment II, and control class with the acquisition of average score can be seen in the graph below.

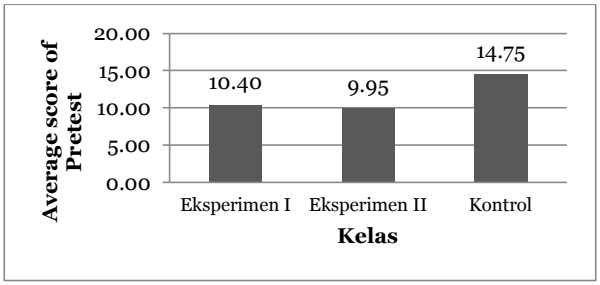

Figure 1. Average score of Pretest for all three classes

Figure 2 shows data on the pretest scores of each class, respectively 9.95, 10.40, and 14.75. The highest average pretest score was obtained by the control class and the lowest average pretest score was obtained by the experimental class II. The following is a descriptive information table for data analysis for the pretest scores for each class:

Table 1. Pretest Data Descriptive Statistics

Class / Description	Experimental Class I	Experimental Class II	Control Class
Average	10,40	9,95	14,75
Standard Deviation	6,870	5,763	6,889
Minimum	2	4	2
Maximum	25	24	31

Table 1 shows the Pretest scores of each class, in the experimental class I, the lowest score is 2 and the highest score is 25. Then, the experimental class II, lowest score is 4 and the highest score is 24. While the control class gets the lowest score 2 and the highest 31.

In addition to the pretest data, to determine the differences in students' mathematical reasoning abilities after carrying out the learning process, post-test was conducted in each class. The following graph shows the average Post-test scores from all three classes.

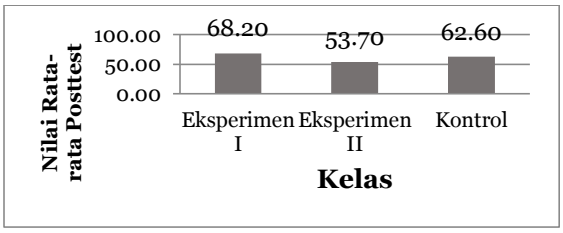

Figure 2. Average Posttest scores for all three classes

Based on Figure 3, the graph of the average post-test score of the three classes is clear that the highest average posttest score is owned by the Experiment I class (challenge-based learning with kahoot application using the examination for Japanese University format question) with an average of 68.20 and the lowest average score is in Experiment II class (challenge-based learning without kahoot application using examination for Japanese University format question) with an average score of 53.70, The following is presented a descriptive information table for post-test data analysis of the three classes:

Table 2. Post-test Data Descriptive Statistics

Class / Descriptive	Experiment I Class	Experiment II Class	Control Class
Average	68,20	53,70	62,60
Standard Deviation	10,273	15,468	11,283
Minimum	40	27	44
Maximum	78	71	82

Table 2 shows the Post-test score of each class, in the experimental class I the lowest score is 40 and the highest score is 78. Then the experimental class II, the lowest score is 27 and the highest score is 71, while the control class gets the lowest score is 44 and the highest score is 82.

While the data used for the ANOVA test that provides data to determine the difference in the improvement of students' mathematical reasoning skills is the normalized gain score data whose average results are presented in the following table.

Table 3. Average Student's Improvement Score

Class	Gain Score
Experiment I	0,64
Experiment II	0,48
Control	0,56

One-way ANOVA test for N-gain data was carried out using SPSS. The decision criteria are that H0 is rejected if Sig. <0.05 and H0 are accepted if Sig.> 0.05. Using the SPSS software, the following summary of the results from one-way ANOVA test for the N-gain data are presented in the table;

Table 1. N-gain Data ANOVA Test Results

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0,26	2	0,13	6,65	0,003
Within Groups	1,12	57	0,02		
Total	1,38	59			

Table 4 informs that the if Sig. is 0.003 0.05, then H0 is rejected, meaning there is a difference in the improvement in mathematical reasoning ability between students who get challenge-based learning kahoot application using examination for Japanese University format question, challenge-based learning without kahoot application using examination for Japanese University format question, and expository learning. Other than that, in Table 4 it also shows that the F score is 6.65 F table (3.16) which means Ho is rejected.

Based on the calculation of one-way ANOVA test analysis, H0 is rejected or H1 is accepted, then Post Hoc Advance Test is done, LSD Test, where this test is used because the assumption of N-gain data is normally distributed data and has homogeneous variance, the results can be seen in Table 5 below.

Table 5. LSD Post Hoc Test

Class compared		Average Difference	Sig.
Experiment I	Experiment II	0,16150	0,001
	Control	0,08200	0,069
Experiment II	Experiment I	-0,16150	0,001
	Control	-0,07950	0,078
Control	Experiment I	-0,08200	0,069
	Experiment II	0,07950	0,078

From the things presented by the post hoc analysis of N-gain data, there was a difference in the improvement of students's mathematical reasoning abilities based on N-gain data between the three classes that

carried out the assisted challenge-based learning with kahoot using examination for Japanese University format question, challenge-based learning without kahoot applications using examination for Japanese University format question, and conventional learning. The data of the three classes were tested with basic assumptions first, namely the normality and homogeneity test, the N-gain data obtained from the three classes were normally distributed and the variance was homogeneous.

After the basic assumption test, then one-way ANOVA test to find out whether there are differences in improvement between the three classes, and the results are it has differences in the improvement of mathematical reasoning ability between the three classes. However, the difference doesn't apply to the experimental class I and the control class as well as the experimental class II and control class, after the LSD test, the results showed no difference in improvement of mathematical reasoning abilities between students who get challenge-based learning with kahoot application using examination for Japanese University format question and conventional learning as well as students who get challenge-based learning without kahoot applications using examination for Japanese University format question and conventional learning.

However, different results indicate that there is a difference in improvement of reasoning ability between students who get challenge-based learning with kahoot application using examination for Japanese University format question and challenge-based learning without kahoot application using examination for Japanese University format question. This shows the influence of giving learning models to the increase in student's test results since if we compare the average pretest and post-test, the difference will be clearly seen. The order of the highest score for the average pretest among the three classes: control class (conventional learning), experimental class I (challenge-based learning with kahoot application using examination for Japanese University format question) and experimental class II (challenge-based learning without kahoot application using examination for Japanese University format question). Meanwhile, the order of the average posttest among the three classes from the highest score is the experimental class I (challenge-based learning with kahoot application using examination for Japanese University format question), the control class (conventional learning) and the experimental class II (challenge-based learning without kahoot application using examination for Japanese University format question).

Researchers found that using kahoot application when learning mathematics became very influential than just using the challenge-based learning model. But it doesn't make the challenge-based learning model have no effect at all. However, based on the findings, with Kahoot's application inserted into the challenge-based learning, it's very helpful to improve students' mathematical reasoning abilities compared to using the challenge-based learning model syntax only. So that challenge-based learning with Kahoot application using the Examination for Japanese University format question is better to improve student's mathematical reasoning ability than Challenge-Based Learning using Examination for Japanese University format question without Kahoot application.

Based on presented findings Rofiyarti & Sari (2017), technology can be an interesting learning media and utilizing the kahoot application during the learning process, it can facilitate teachers in managing and delivering messages to students, then Sigid (2016) revealed that the concept of learning using the Kahoot application will improve student interest since learning by using games is more interesting and can change emotions and feelings for the better. Lime (2018) revealed that the superiority of the kahoot application is the answers will be represented by images and colors, and the display on the teacher's devices and student

devices will automatically change according to the number of questions being displayed, students will easier developing the potential to maximum, so that it can improve learning outcomes. Nugraha (2018) said that the learning process with the kahoot application can improve students' mathematical understanding skills. According to Dewi (2018), the quiz in the form of test questions developed and presented in game format made students become more enthusiast in completing the challenges. So, it can be seen clearly from the improvement data, students who obtained challenge-based learning with Kahoot's application using the Examination question for Japanese University gave students a higher mathematical reasoning improvement than students who carried out the Challenge-Based Learning process without application Kahoot using Examination question for Japanese University and students who carry out conventional learning processes.

Based on the data sequences of pretest and post-test can be compared that there is a change in position between the two experimental classes and the control class. This indicates a change before and after the treatment. According to Johnson & Adam (2011); Lime (2018) challenge-based learning can improve student's involvement in the learning process, efficiency in solving challenges, interaction between students with each other, causing students to get satisfaction or pleasure in learning so it become easier to understand the material which can improve learning outcomes. More clearly, as stated by Susilawati (2017) that multimedia-assisted challenge-based learning processes can facilitate the process of conflict, the process of discovery, the process of social interaction, and reflective processes that can help express the ideas of cognitive conflict to be lighter. The results of Susilawati, Abdullah, Maryono, Widiastuti (2018) that challenge-based learning is done in a social constructivist way, creating, and developing knowledge through assignments, not only receiving information from the teachers. Even in modern situation, professionally can't rely solely on the knowledge acquired alone, the involvement of teachers and other students to reconstruct the concept of learning material to overcome conflict and practice completing continuous tasks is needed, to meet the challenges.

4. CONCLUSION

There is an improvement in student's mathematical reasoning abilities who get Challenge-Based Learning with Kahoot application learning using Examination of Japanese University, Challenge-Based Learning without Kahoot, and conventional learning. The improvement of student's mathematical reasoning abilities of who obtained Challenge-Based Learning with Kahoot application learning was higher than Challenge-Based Learning learning without Kahoot and conventional. Challenge-based learning with kahoot applications can facilitate conflict processes, discovery, social interaction, and reflective to improve students' mathematical reasoning abilities.

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