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Lateral Thinking Ability Through Challenge-based Learning with Sparkol Videoscribe

Wati Susilawati[1], Poppy Yaniawati[2]

[1]Department of Mathematics Education, UIN Sunan Gunung Djati Bandung, Jl. Cimencrang, Bandung 40292, Indonesia
[2]Department of Mathematics Education, Universitas Pasundan, Jl. Taman Sari No. 6-8, Bandung 40116, Indonesia

ORCID
Wati Susilawati: https://orchid.org/0000-0003-0346-9536
Poppy Yaniawati: https://orchid.org/0000-0003-2718-317X

Abstract.
Online learning during the Covid-19 pandemic was very interesting to observe because learning can be done anytime and anywhere. However, Covid-19 has an impact on the learning process in schools and students' thinking abilities. The purpose of this paper is to analyze the differences in the improvement of mathematical lateral thinking skills between students who received challenge-based learning through sparkol videoscribe and those learning through WhatsApp. The research method used was a quasi-experimental, non-equivalent control group design. The sample was randomly selected from four parallel high school classes in the city of Bandung, namely class X 1 who learned through videoscribe sparkol and class X 3 who studied via WhatsApp. The instrument used is a test of mathematical lateral thinking ability and a test of prior mathematical knowledge. Data analysis was done using two-way ANOVA. Findings: A difference was observed in the achievement of mathematical lateral thinking skills between students who carry out learning through sparkol videoscribe better than those learning through WhatsApp based on prior knowledge of mathematics in the smart, medium, and low categories. Challenge-based learning sparkol videoscribe makes it easier for students to understand the material, the construction process, interaction, and reflection, thereby increasing the ability to think mathematically, laterally.

Keywords: lateral thinking ability, challenge-based learning, sparkot videoscibe

Corresponding Author: Wati Susilawati; email: wati85@uinsgd.ac.id

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1. INTRODUCTION

The Corona Virus Disease (Covid-19) pandemic presents a challenge to the implementation of education in Indonesia, so that the learning process shifts to digital and online. The implementation of online learning is very interesting to do because learning can be done anytime and anywhere [1, 2]. Thus online learning requires professional teachers to try to integrate contemporary learning based on software applications, one of which is through challenge-based learning. with the help of the Sparkol Videoscribe application

during the learning process at home, to train each individual student to solve problems through mathematical lateral thinking skills that can change points of view in different ways and find solutions from new points of view, resulting in innovative thinking [3]. Students need to be supported and encouraged to generate ideas, ideas, and reasons that are contrary to logic because lateral thinking is necessary for creative thinking [4]. Therefore, it is very important that the ability to think laterally in the process is very important teaching and learning mathematics.

Empirically the application of lateral thinking skills in high school students has not been adapted in the school curriculum, even though in fact lateral thinking skills provide a different point of view in producing innovative solutions to a mathematical problem [5]. The low ability to think creatively in solving math problems is a trigger that lateral thinking skills must be immediately socialized to students at school [5]. The demands of teachers in schools that lateral thinking skills must be immediately included in the school curriculum [4]. Thus, cognitively, students' lateral thinking abilities whose quality is still low need attention to be adapted into the curriculum [5].

Empirically online learning is a challenge for teachers and students because of limited verbal communication, material accessibility, time management and internet network facilities as well as student financial problems in buying quotas [6–9]. Online learning has many obstacles in its implementation such as uneven internet networks, ineffective online learning processes, especially abstract mathematics learning, so that teachers and students find it difficult to adapt online learning [10]. In the online mathematics learning process, teachers are faced with difficulties understanding mathematical concepts to students, as well as difficulty students. to understand abstract mathematical concepts, students assume that mathematics is difficult and boring [11]. Cognitively, students' low quality lateral thinking skills need attention to be adapted into the curriculum [5]. The results of the research by [12] show that most students lack the ability to think laterally in solving trigonometric problems. The teacher does not provide sufficient teaching materials and student worksheets for lateral mathematical thinking skills. On the other hand, learning is still centered on the teacher, so that the transfer knowledge k less than the maximum [13].

The complexity of the problem demands that the learning process be improved to be an interesting thing to observe. One alternative to learning mathematics used during the COVID-19 pandemic is the challenge-based learning approach, because it has the potential to build students' skills in solving challenging problems to get the best solution [14]. According to the research results [15] that challenge-based learning can improve students' lateral thinking skills and character in the mathematics learning

process [16] that challenge-based learning can improve spatial mathematics skills [17] that challenge-based learning can improve students' mathematical representation skills. Research results [18] that challenge-based learning in the form of projects can increase students' mathematics learning independence. Thus, challenge-based learning facilitates students to learn based on challenging and interactive experiences [19].

The application used in challenge-based learning is Sparkol Videoscribe on the grounds that learning mathematics through presenting animated videos with hand gestures drawing a mathematical concept will create long term memory because the concept appears on the screen, students are more enthusiastic about learning, like someone explaining on the blackboard directly. [20] revealed that the use of Sparkol videoscribe learning media can improve scientific literacy skills. Sparkol learning effectively improves students' mathematical understanding skills [21]. Thus, learning using the Sparkol Videoscribe application can make it easier for teachers to understand mathematical concepts and increase motivation and can be an alternative media that can increase student interest in learning [22].

Cognitive aspects that are improved through challenge-based learning sparkol videoscribe are the ability to think laterally in mathematics. [23] defines four main aspects of lateral thinking: the recognition of dominant polarizing ideas, the search for different ways of looking at things, a relaxation of the rigid control of vertical thinking, the use of chance. In the theory of lateral thinking, people must distance themselves from the standard thinking patterns as well as the unthinkable thinking. According to De Bono, the creativity of someone who finds himself in unimaginable situations can reach a solution by thinking about things that are unthinkable [24]. The results of the study [10] that students' lateral thinking skills have increased through learning cognitive conflict strategies. In a survey conducted [25] revealed that teachers' lateral thinking during pre-service has increased significantly. [26] revealed that male teachers' lateral thinking disposition is better than female teachers. [27] developed a scale for lateral thinking. [28] identifies students' lateral thinking dispositions. So that the ability to think laterally can significantly improve cognitive behavior [29].

In addition to the empirical above, there are other factors that can contribute to the improvement of mathematical lateral thinking skills, namely students' prior mathematical knowledge which is categorized into three levels, namely good, medium, and low. Considering that high school students' prior mathematical knowledge of different school backgrounds, there are students whose secondary school comes from Islamic boarding schools, madrasas, and junior high schools from the regions. According to

the research results of [30] that the role of prior knowledge of mathematics as motivation in learning activities for the success of learning mathematics. Prior knowledge of mathematics is useful for successful studies and more precisely as a support for studies before and when studying advanced mathematics [31]. Thus there is an opportunity to complement new innovations in analyzing mathematical lateral thinking skills through challenge-based learning with the help of sparkol videoscribe and conventional learning is reviewed based on students' initial mathematical abilities.

2. RESEARCH METHOD

The research method uses a quasi-experimental design, with a pretest-posttest control group design. With a population of high school students class X from four parallel classes in Bandung. The sampling technique of cluster random sampling carried out by the researcher was only one stage, namely determining the sample in the form of a class from the population of class X. The population of class X students was tested for homogeneity of the value of the odd semester final Test. The results of the homogeneity test showed that the sig. = 0.672 which means sig. more than 0.05, indicating that the population data is homogeneous. To determine the sample, the researcher conducted a lottery for each class. From the results of the draw, two classes were obtained, namely class X 1 with 35 students as the experimental class who will be given learning treatment using challenge-based learning sparkol videoscribe and class X 3 with 38 students as the control class will be given learning treatment via whatsApp. The instrument used is a test of mathematical lateral thinking ability and a test of early mathematical knowledge. After testing the validity, reliability, discriminatory power and level of difficulty. Data analysis was carried out by testing the assumptions of normal distribution and having homogeneous variants, using an independent T-test and two-way ANOVA test followed by a Post Hoc test on the type of learning and initial knowledge of students' mathematics which were categorized at the smart, medium and low levels.

3. RESULTS AND DISCUSSION

The research method uses a quasi-experimental design, with a pretest-posttest control group design. With a population of high school students class X from four parallel classes in Bandung. The sampling technique of cluster random sampling carried out by the researcher was only one stage, namely determining the sample in the form of a class from the population of class X. The population of class X students was tested for

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After testing the validity, reliability, discriminatory power and level of difficulty. Data analysis was carried out by testing the assumptions of normal distribution and having homogeneous variants, using an independent T-test and two-way ANOVA test followed by a Post Hoc test on the type of learning and initial knowledge of students' mathematics which were categorized at the smart, medium and low levels. Analysis of lateral mathematical thinking skills between students who received challenge-based learning sparkol videos with conventional learning using n-gain. The average n-gain test of mathematical lateral thinking ability is at the category level of 0.67, which is better than conventional learning at the level of 0.48. To find out the difference in mathematical lateral thinking skills between students who use the challenge-based learning sparkol videoscribe and students who use WhatsApp-assisted conventional learning, the t-test is carried out on the n-gain data. It is clearer that the increase in each indicator of lateral thinking ability in experimental learning is better than conventional learning in the Figure 1 below,

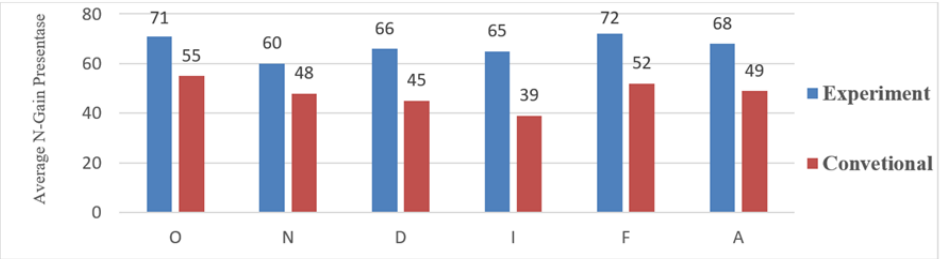

Figure 1: Average percentage <g> of each indicator of lateral thinking.

The assumptions from the results of the normality test and homogeneity test show that the sig value in the experimental class and control class > 0.05. Data are normally distributed and have homogeneous variants. Two assumptions were fulfilled so that the analysis was continued with the t-test, with a sig (2-tailed) value of 0.03 < 0.05. The conclusion of the hypothesis H0 is rejected, meaning that there is a difference in the ability to think laterally in mathematics between students who carry out the challenge-based learning sparkol videoscribe with conventional learning. Thus, it can

be concluded that there is an increase in lateral thinking skills among students who carry out challenge-based learning with the help of sparkol videoscribe better than those who use conventional learning. According to the results of research by [32] that flexible challenge-based learning inspires a comprehensive learning experience. So that the challenge-based learning approach is innovative learning that can increase student learning activities [33].

The difference in the increase in the ability to think laterally in mathematics between students using challenge-based learning sparkol videos and conventional learning based on the level of prior mathematics knowledge (PMK) in the smart, medium, and weak categories. based on preliminary knowledge of smart, medium and weak mathematics each is 78.56. While the conventional class in terms of preliminary knowledge of smart, medium and weak mathematics is 65.12. Learning sparkol videoscribe with conventional learning was analyzed using the two-way ANOVA test. The results of the two-way ANOVA through SPSS can be seen in the Table 1 below.

Table 1: Tes two way anova.

Source	Type III Sum of Square	Df	Mean Square	F	Sig.
PMK	2321,557	2	1560,628	6,521	0,001
Class	634,355	1	617,213	3,231	0,003
PMK*Class	357,241	2	169,490	0,853	0,042

Based on the results of data processing using the two-way ANOVA test with a Sig value of 0.001 <0.05, then H0 is rejected. That is, there is a difference in the achievement of an increase in mathematical lateral thinking skills between students in the experimental class better than conventional class students in terms of their initial knowledge of mathematics (smart, moderate, weak). The factor of students 'initial knowledge of mathematics has a significant effect on the achievement of students' mathematical general thinking skills. This is relevant to the findings [34] that cognitive processes can be carried out well if students can understand and relate all the information that has been learned. The results of research by [35] show that students who have the ability to think laterally have an effect on creativity in solving math problems. According to the findings of [36] that active learning innovation has a significant effect on students' lateral thinking skills. So that the advantages of lateral thinking can produce creative concepts in various aspects [37].

Types of learning and students 'initial knowledge of mathematics have an effect on the improvement of students' mathematical lateral thinking skills with a Sig value of 0.042 < 0.05, so that H0 is rejected. This means that there is an influence between challenge-based learning sparkol videoscribe and conventional learning as well as initial

knowledge of mathematics in categories (smart, medium, weak) on students' mathematical lateral thinking skills. According to the research results of [38] that challenge-based learning has an effect on increasing student creativity in solving non-routine math problems. [39] revealed that challenge-based learning has a positive effect on problem solving in various aspects of transverse competence in society. According to the research results of [40] challenge-based learning can improve students' communication skills and self-confidence. Thus, challenge-based learning can improve deep skills in solving problems [33].

The experimental class students are better than conventional class students in terms of their initial knowledge of mathematics (smart, moderate, weak). Then the Post Hoc test for the type of learning was carried out, the probability value was $0.019 < 0.05$, so H0 was rejected, so it could be concluded that there was a difference in the ability to think laterally in mathematics between students who used challenge-based learning with the help of sparkol videoscribe which was better than conventional learning. Relevant to the research results of [41] that learning using a Sparkol Videoscribe-based application shows that the category is quite effective. The Post Hoc test of the initial knowledge of mathematics test, obtained a probability value of $0.004 < 0.05$, then H0 is rejected, so it can be concluded that there is a difference in the ability to think laterally in mathematics between students who use challenge-based learning with the help of sparkol videoscribe which is better than conventional learning based on ability. early mathematics in the smart, medium and weak categories. In line with the results of research [42] that learning using videoscribe can improve students' critical thinking skills in mathematics significantly better than students who use power point media. So that learning using sparkol videoscribe affects student learning outcomes [43].

The interaction between the types of learning and the initial knowledge of mathematics on the ability to think laterally in mathematics are as follows: (1) Classes that use challenge-based learning sparkol videoscribe with initial knowledge of mathematics in the smart category are better than the medium and low categories, and are better than the class with using conventional learning based on early knowledge of mathematics categories smart, medium, and weak. (2) The class that uses challenge-based learning with the help of sparkol videoscribe with the moderate early knowledge category of mathematics is better than the low category and better than the class using conventional learning with moderate and weak initial knowledge of mathematics. (3) Classes that use challenge-based learning with the help of Sparkol Videocribe with the category of early knowledge of weak mathematics are better than those in the medium and low categories, than classes using conventional learning.

4. CONCLUSION

There is a difference in the increase in mathematical lateral thinking skills between students who carry out challenge-based learning sparkol videoscribe with conventional learning. There is a difference in the achievement of mathematical lateral thinking abilities between students in the experimental class and the conventional class based on their initial knowledge of mathematics in the smart, medium, and weak categories. There is an effect of the type of learning and initial knowledge of mathematics based on smart, moderate, and weak categories on the ability to think laterally in mathematics. Sparkol videoscribe challenge-based learning facilitates the process of mathematical concept construction, interaction, reflection, easy-to-understand material so that it can improve students' mathematical lateral thinking skills.

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