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Critical Thinking Through Learning Models Based on Edmodo Eliciting Activities

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Abstract. COVID-19 pandemic requires professional teachers to use digital technology, but some students experience obstacles in technology so that it has an impact on their low critical thinking abilities. This paper aims to analyze mathematical critical thinking abilities between students who carry out learning models eliciting activities assisted by Edmodo and conventionally assisted by WhatsApp based on prior knowledge of mathematics. The research method used a quasi-experimental, non-equivalent pretest-posttest control group design. The sample was selected through a homogeneity test from 4 parallel classes of one junior high school in Bandung Indonesia, two classes were selected, namely class VIII A as the experimental class and VIII D as the control class. The instrument used initial mathematical ability test and critical thinking abilities. Data analysis uses: Two-way ANOVA test. Findings: There is a difference in the improvement of mathematical critical thinking abilities between experimental class and control class students. There are differences in the achievement of mathematical critical thinking abilities based on prior knowledge of mathematics in the smart, medium and weak categories. Learning models eliciting activities assisted by Edmodo can facilitate the process of construction, interaction and reflection so as to improve students' critical thinking abilities.

INTRODUCTION

The era of covid pandemic has had a massive impact on various parts of life, including academic life at school. The education system demands a quality e-learning format. Trustworthy global science and technology competitiveness is a challenge in improving the quality of students' thinking. By applying the Edmodo application in mathematics learning to prepare individuals for transformation in the era of globalization, science and technology are marked by change, uncertain circumstances, and competitiveness. The purpose of learning mathematics in schools is to improve students' logical, analytical, systematic, critical and creative thinking skills [1]. Students are expected to have thinking skills that will help them make strong decisions to acquire new knowledge quickly, such as critical thinking skills which are very much needed in the 21st century [2,3]. Thus, students who think critically can explore and assess information with deeper thinking of problems and questions. They can formulate questions and problems more clearly. They also can assess and conclude facts using abstract ideas, open-minded thinking, and effective communication [4].

Empirically the process of learning mathematics during the COVID-19 pandemic outbreak with less conducive physical conditions, students had difficulty learning mathematics with many calculations and limited funds to purchase internet quotas in online learning as well as teachers having difficulty understanding mathematical concepts. [5] In the application of the mathematics learning system in schools, currently it is not yet oriented to critical thinking skills but is still oriented to presenting concepts and practicing procedural questions. Students only receive information and remember concepts given by teachers at schools which are considered as obligations in receiving learning, only accept raw formulas given by teachers without proof of concept. [6] Students cannot apply mathematical concepts as problem solving in critical thinking in accordance with their daily activities. Some teachers and students still have difficulty integrating technology in the mathematics learning process [7–9]. Their technology is only used to play games [8–10]. Thus, the importance of technology in the pandemic situation will improve critical thinking skills and develop authenticity for school and work.

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The complexity of learning problems during the COVID-19 pandemic provides an opportunity to improve students' critical thinking skills through eliciting activities learning models (MEA) with the help of Edmodo. Some research results that can improve critical thinking abilities include: guided inquiry learning models can improve students' critical thinking skills [11]. The results of the study showed that motivation and critical thinking abilities increased through PBL [12]. A professional educator must be able to create learning that trains students' critical thinking skills, explores basic mathematical concepts independently and is active in creating cognitive structures. Several MEA research results were effectively carried out by teachers to increase students' potential [13,14]. MEA learning can improve mathematical creative thinking skills [15]. MEA learning can improve students' mathematical problem - solving abilities [16].

There are various types of learning media that can be used in the midst of the COVID-19 pandemic, one of which is the Learning Management System (LMS). Several types of LMS include google classroom, schoology, Edmodo, other software applications that can facilitate the learning process so that material concepts are easier to understand because they can be studied anytime and anywhere [17,18]. Edmodo e-learning as a learning management system with video that optimizes online learning, the Edmodo application is integrated as a learning medium. In accordance with the findings that learning with the Edmodo application can improve students' mathematical connection skills [19]. Thus, efforts to form students' thinking skills optimally are carried out by teachers as mediators, facilitators, and motivators who must assist students in the MEA learning process [20]. The objective is to analyze the critical thinking capacities of students who learn MEA aided by Edmodo and conventional learning assisted by WhatsApp based on student's prior understanding of mathematics in the smart, medium, and weak categories.

METHOD

The study methodology used kuasi experimental, with a non-equivalent pretest-posttest control group design. The research population was students in junior high school in Bandung. The sampling technique was carried out through a homogeneity test from four parallel classes, two classes were selected consisting of class VIII A totaling 32 students as the experimental class who carried out learning models eliciting activities assisted by Edmodo, and class VIII D totaling 30 students as the control class that carried out WhatsApp-assisted conventional learning is reviewed based on prior knowledge of smart, moderate and weak mathematics. The instrument used is an initial mathematical ability test and a mathematical critical thinking ability test. The research procedure consists of: 1) Planning stage, a series of activities carried out such as preliminary studies to analyze students' initial mathematical critical thinking skills. Followed by making a test instrument for critical thinking skills, testing trials and analyzing results, 2) The implementation phase begins with a pretest and four times the learning process, the last is a post test. 3). Data analysis using two-way ANOVA test

RESULT AND DISCUSSION

Analyzing the improvement of mathematical critical thinking skills among students who received MEA learning assisted by Edmodo and students who received conventional learning assisted by WhatsApp, n-gain data was used, the average mathematical critical thinking ability of students who carried out MEA learning assisted by Edmodo was n- gain of 0.72 is better than students with whatsApp-assisted conventional learning, which is 0.51. Students in the Edmodo-based models eliciting activities class are motivated to think more critically in solving mathematical problems. [21] research results reveal that Edmodo learning can improve students' conceptual understanding skills. Students become more active and highly motivated to understand the concept first before the learning process. [22] that Edmodo learning can improve the ability of mathematical relational understanding and independent learning of students. Thus, the use of multi-media interaction with the Edmodo application is very supportive in the mathematics learning process.

The assumptions that must be met are the normality test and the homogeneity of variance obtained from the normalized n-gain data. Testing the normality of the data using the Kolmogorov - Smirnov technique with SPSS software as follows:

TABLE 1. The results of *N-Gain* Normality Test

Class	Kolmogorov-Smirnov		
	Statistic	Df	Sig.
Experiments	0.176	32	0.143
Conventional	0.120	30	0.197

Based on table 1. Sig value of Kolmogorov - Smirnov for class with learning models eliciting activities based on Edmodo is 0.143. While the sig value for classes with conventional learning assisted by WhatsApp is 0.197. Because the value of Sig experimental class and conventional class Sig > 0.05. So that the class n-gain data is normally distributed. And testing the homogeneity of variance data using Fisher's exact test with SPSS software as follows:

TABLE 2. The Results of N-Gain Homogenity Data Test

1. Levene Statistic	df1	df2	Sig
3.415	1	60	0.073

The homogeneity test of Sig value is 0.073 at a significance level of 5%, meaning that with Sig value of 0.073 > 0.05, the variance of both experimental and conventional n-gain class data is homogeneous. Based on normality and homogeneity tests, it is known that the n-gain data is normally distributed and both classes have homogeneous variance.

To analyze the increase in mathematical critical thinking skills of students who study Edmodo-assisted eliciting activities models based on the level of prior prior mathematical knowledge (PMK) in the high, medium and low categories, the average score was 78.56, respectively. While the conventional class in terms of initial knowledge of smart, medium and weak mathematics is 65.12. The next test uses a two way ANOVA test through SPSS in table 3 below:

TABLE 3. Two-way ANOVA test results

Source	Type III Sum of Squares	df	Mean square	F	Sig
Corrected Model	2253.381[a]	5	450.696	7.465	.000
Intercept	164020.021	1	164020.021	2716.854	.000
LM	267.751	1	267.751	4.435	.040
PMK	1372.748	2	686.374	11.369	.000
LM*PMK	169.406	2	84.703	1.403	.254
Error	3380.793	56	60.371		
Total	299025.000	62			
Corrected Total	5634.274	61			

a. R Squared = .400 (Adjusted R Square = .346

Based on the results of the two-way ANOVA test with a sig value of 0.040 <0.05, Ho is rejected. This means that there is a difference in the achievement of increasing mathematical critical thinking skills of students who learn using the Edmodo-assisted eliciting activities model better than conventional learning assisted by WhatsApp. According to the results of the study, the eliciting activities learning model can improve students' mathematical representation skills. According to the results of the study, students' mathematical understanding abilities can be improved through eliciting activities learning models.

The results of the ANOVA test with a value of 0.000 <0.05 then Ho is rejected which indicates that there are differences in the achievement of increasing mathematical critical thinking skills based on early mathematical

abilities in the high, medium and low categories. The factor of students' initial mathematical knowledge has an effective effect on the achievement of students' mathematical critical thinking skills. This is relevant to the conclusion that cognitive processes will improve students' understanding to correlate all knowledge that has been understood.

The type of learning and students' prior knowledge of mathematics has no interaction with increasing students' mathematical critical thinking abilities with a Sig value of 0.254 > 0.05, so Ho is accepted, meaning that there is no effect between learning models eliciting activities assisted by Edmodo and conventional learning assisted by WhatsApp and prior knowledge of mathematics in the category (smart, moderate, weak) on students' mathematical critical thinking abilities. The results of the study showed that interactive media based on Edmodo can be used as an alternative media to improve students' critical thinking skills [23]. According to research results show that the Edmodo blended learning model can improve students' critical science thinking skills. [24] Also relevant to the research results classroom action research conducted revealed that project-based learning through blended learning Edmodo can improve students' critical thinking skills in natural science from cycle I to cycle II [9].

Experimental class students are better than conventional class students in terms of previous mathematical knowledge (smart, moderate, weak). Then a Post Hoc test was conducted for this type of learning with a probability value of 0.024 < 0.05 then Ho was rejected, so it can be concluded that there was an increase in mathematical critical thinking skills of students who used the eliciting activities model assisted by Edmodo better than conventional learning students assisted by WhatsApp. According to the findings that Edmodo's innovation in the learning process also improves students' critical thinking skills.

Post Hoc test of prior knowledge of mathematics test obtained a probability value of 0.004 < 0.05, then Ho is rejected, so the conclusion is that there is an increase in mathematical critical thinking skills, students who use the Edmodo-assisted eliciting activities model are better than students who use WhatsApp-assisted traditional learning based on mathematical knowledge previously in the high, medium and low categories.According to the conclusions, integrates the Edmodo application can improve students' communication skills and mathematics learning anxiety. [25] Findings revealed that the application of e-handouts with the use of the Edmodo PBL model can improve the critical thinking skills and ICT literacy of secondary school students [26]. It showed STAD cooperative learning assisted by Edmodo can improve the quality of learning in the classroom.

The research findings reveal that the Edmodo media can increase student interest and reduce errors in answering questions. [19,27] According to the research results of shows that: 1) There is a significant increase in student learning outcomes in the experimental class using Edmodo-based e-learning with an average of 92.81 compared to the kotroll class which uses conventional face-to-face learning with an average result of 78.35. 2) The use of Edmodo-based e-learning is considered quite effective because the n-gain test value reaches 75.82% for the experimental class [28]. Edmodo e-learning has a significantly positive effect on enhancing learning results and is feasible to be involved in sustaining the learning approach. The study shows that blended learning using (Predict-Observe-Explain) learning model can enhance students' notional understanding. Students are more engaged and maintain high motivation [21,29]. Research results show that Edmodo-based E-learning activities must be developed based on social constructivist theory that facilitates the process of interaction, collaboration and communicativeness [23,24].

The relationship between the type of learning and earlier knowledge of mathematics on critical thinking abilities in mathematics is as follows: (1) The class that utilizes Edmodo-assisted standards of stimulating activities with prior knowledge of math in the smart category is better than the middle and low category class and is better than the middle and low category. In addition, classes that use WhatsApp-assisted conventional learning are based on prior knowledge of mathematics at high, medium, and low levels. (2) The class that uses Edmodo-assisted models of eliciting activities with reasonable prior knowledge of mathematics is better than the class that uses conventional learning with average and weak prior knowledge of mathematics. (3) Classes that use learning models eliciting activities assisted by Edmodo in the category of weak prior knowledge of mathematics are better than classes that use conventional learning.

CONCLUSION

Students' mathematical critical thinking skills have increased after implementing the Edmodo-based electing activities model learning. Students who use Edmodo are better than students who study conventionally based on WhatsApp and have increased critical thinking skills. This research is based on the initial knowledge of mathematics which is categorized as smart, moderate and weak students. There is no effect between the types of learning through

Edmodo and WhatsApp on students' mathematical critical thinking skills. For further researchers to use mathematics applications to make it easier for students to understand mathematical concepts and solve unstructured math problems.

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