

## The Effectiveness of Problem-Based Learning Assisted by Edpuzzle on Students' Critical Thinking Skills

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### Abstract:

Applying critical thinking skills is one of the important things in the learning process. This research aims to determine the differences in students' critical thinking skills between the class that applies the problem-based learning model through Edpuzzle and the class that applies the expository learning model. The method used is a quantitative quasi-experimental design using pretest and posttest control. The sample of this research was participated by 66 students. They were selected by applying the technique of cluster random sampling. The data was obtained from the result of pretest and posttest based on the indicator of critical thinking skills. The result showed that there were differences and an increase in the critical thinking skills of students who applied the problem-based learning model assisted by Edpuzzle compared to the expository model. It is proven by the result of the 1<sup>st</sup> hypothesis test through t-test which the posttest result shows the score of 0,014, which means the score is less than the error level of 0,05. Therefore, it can be concluded that both of the classes have significant differences ( $H_0$  is rejected). On the other, the 2<sup>nd</sup> hypothesis test that used the gain test indicates the score of 0,41 for the experimental class and the score of 0,28 for the control class, which means an increase in critical thinking in the experimental class.

**Keywords:** Critical Thinking Skills; Edpuzzle; Problem-Based Learning

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## Introduction

Along with the development of information technology and the internet, it is growing rapidly in various sectors of life, one of which is in the field of education. Students are easier in accepting and exploring learning material by using the internet. Therefore, teachers and students are demanded to improve their mastery of technology through computers or gadgets (Susilaningih & Sumarti, 2019).

In the education era 4.0, the government asked educational institutions to carry out many learning innovations to supports the development era. Applying critical thinking skills is one of the important things in the learning process (Cahyani & Putri, 2019). According to Facione et al. (2016), critical thinking is an ability that allows students to analyze, evaluate, and do reasoning, which enables students to respond responsively to information from their thinking with logical reasons. So that students can think critically and get maximum learning results, the teacher needs to create strategies to stimulate student's critical thinking skills.

The problem of low critical thinking skills is caused by the difficulty of students in solving problems. It can be seen when the teacher gives a question or opinion to the students, but they do not answer it and passive. Meanwhile, when carrying out group presentations, the questions given by other students were only basic questions that were only limited to the knowledge that had been previously presented. This question makes the presenter group only answer questions by delivering the previous material. This way makes the students cannot develop their critical thinking maximally.

The indicator of critical thinking skills used in this research are indicators of critical thinking skills from Facione's theory (2011), including interpretation, analysis, evaluation, inference, explanation, and self-regulation. Interpretation is the ability to interpret the meaning of data, activity, experience, process, or condition. Interpretation includes three things, namely skills, interpreting the important things, and explaining a meaning. The analysis is the ability to identify a definition, idea, description that aims to express something in a statement which is it can be represented in many forms, namely information, argument, opinion, or conclusion. The evaluation is the ability to make a judgment of statement integrity that can be from an experience, argument, information, or opinion of a person to relate its validity with the actual data. The inference is the ability to identify and select important components to make a conclusion, a hypothesis, and predicting the relevant sources to relieve the consequence. The explanation is the ability to present the result and explain the conclusion in detail with the supporting arguments that make other people believe. Self-regulation is the ability to self-correct related to cognitive aspects, thinking components, creativity, analysis skill, giving an opinion, and make a conclusion.

The appropriate learning model that can improve the student's critical thinking is problem-based learning. Problem-based learning is learning that involves students in solving problems in real life. The purpose of problem-based learning is to be able to find solutions and finish a problem is given by the teacher so that it can develop a student's critical thinking skills. One of the advantages of the problem-based learning model is that it can change the student's mindset and stimulate the student's participation in positive debates such as debating a problem they face so that it can improve their Higher Order Thinking Skill (HOTS) (Ismail et al., 2018).

In the Covid-19 pandemic condition that has attacked countries in the world, including Indonesia, the government has decided to make a new policy to modify the education system from direct meeting to indirect (online) meeting. Online learning is implemented as an effective way to replace the learning meeting at school. The use of online learning platforms is being alternative for vocational high school to fulfilling online learning needs. The teacher is expected to give some innovative learning in the learning implementation so that it can produce effective and successful teaching and learning process (Mishra, Gupta, & Shree, 2020).

Media is one of the important components in the learning process. Internet is the media that can help teachers or students in conducting efficient learning. The teacher can introduce the digital environment to the students through the internet. Edpuzzle is one of the video conferencing software platforms. It is useful in education because it can help the teacher to deliver the material through video, which is free to be accessed. Also, the teacher can add audio, note, and quiz to the video. Edpuzzle facilitates the students to learn the material through the video first before the learning meeting begins so that learning can run efficiently and can train student's abilities to learn independently (Abou Afach, Kiwan, & Semaan, 2018).

One use of the Edpuzzle platforms is to integrate it with problem-based learning. The students can learn the material and do a quiz through Edpuzzle out of the learning meeting. Meanwhile, the teacher is applying problem-based learning in a direct meeting.

The research that linked to the problem-based learning model for improving the students' critical thinking skills is research conducted by Susanti (2016), who explained the problem-based learning makes a problem as the students' motivation to solve the learning problems. Also, the research of Silverajah & Govindaraj (2018) explained Edpuzzle provides a student-centred learning environment that appropriates the problem-based learning and student-centred approach. Liu et al. (2019) added that the problem-based learning model is active learning that uses real-life problems as the main learning topic, then students encourage to think critically in solving these problems. Furthermore, Silbermans' research (2020) emphasized that group-based learning is the appropriate learning strategy to stimulate the students to think critically in problem-solving.

## Method

This research uses quantitative research. Research quantitative is used to examine data that can be processed. It can be defined that research based on the positivism philosophy that is used for certain populations or samples, the instrument is used to collect the research data, which is statically analyzed to prove the predetermined hypothesis (Sugiyono, 2012). The method in this research used a quasi-experimental design. The research design used to pretest and posttest control. The research was conducted in two-class as the experimental class and the control class. The experimental class was given the treatment of applying the problem-based learning model assisted by the Edpuzzle, while the control class was given the treatment of applying the expository model.

Table 1. Research Design

Class	Pretest	Treatment	Posttest
Experimental	O1	X	O2
Control	O1	X	O2

The sampling technique used in this study was random cluster sampling. The population in this study was 96 students. Samples taken were two classes with a total of 66 students, and the remaining 30 students were used to test the instrument. In this study, the data collection techniques were taken by essay tests and observation sheets. At first, this research began with making an instrument consisting of a lesson plan, job sheet, and essay test based on indicators of critical thinking. The second, the implementation of the pretest. Third, the treatment of each class, the control class uses the expository learning model, and the experimental class uses the problem-based learning model assisted by Edpuzzle. Fourth, the implementation of the posttest. Then, the data analysis and finally the conclusion. The research procedures can be seen in Figure 1.

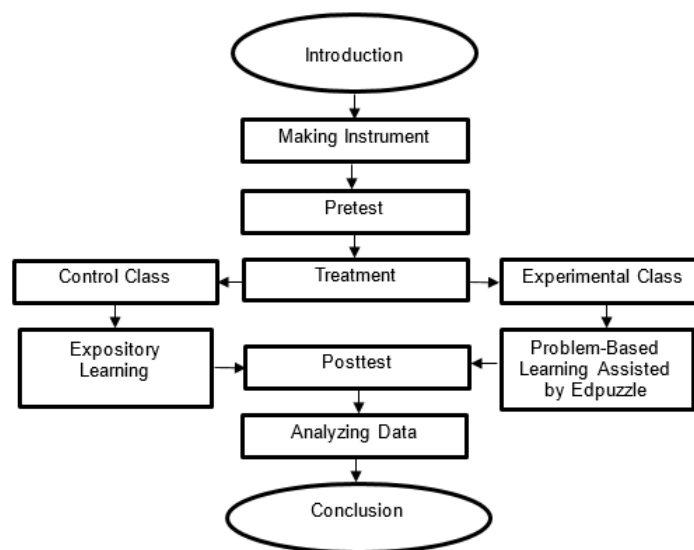


Figure 1. Research Procedure

## Research Finding and Discussion

Before the research was conducted in both classes of experimental and control classes, tryout has distributed to verify the instruments properly or not to be used for collecting the research data. The tests are including the validity test, reliability test, difficulty level test, and power difference test. The instrument test was participated by 30 students who are not research subjects and have already got related material. Based on the tryout result, it can be seen that  $r\text{-table} = 0.361$ . From the result, it is obtained the number of questions that 12 questions which is passed the validity test (six pretest questions and six posttest questions) and eight questions which is discarded. The reliability test result has a score of 0.720 for the pretest and 0.649 for the posttest, and then it can be categorized as a high-reliability score.

Based on the posttest result, it shows that the student's critical thinking skills in the experimental class have a higher average percentage than the control class. In this study, there are six indicators measured by using the essay test in this study. The first indicator of critical thinking skills is interpretation. According to Facione (2011), interpretation includes three things, namely skills, interpreting important meanings, and explaining a meaning. The results of the achievement of critical thinking skills interpretation in the control class got an average percentage of 77,2% with a good category, while the experimental class got an average percentage of 84,8% with an excellent category. The second indicator of critical thinking skills is analysis. Hayudiyani et al. (2017) suggested that analysis relates to the skills of recognizing a concept, description, or another form that aims to reveal a matter in the form of a statement. The result of the achievement of critical thinking analysis in the control class got an average percentage of 81,0% with an excellent category, while the experimental class got an average percentage of 82,5% with an excellent category. The third indicator of critical thinking skills is evaluation. Hayudiyani et al. (2017) emphasized that evaluation is the skills to describe the relationship among definitions, statements, and concepts on a problem. The results of the achievement of critical thinking skills evaluation in the control class got an average percentage of 81,8% with an excellent category, while the experimental class got an average percentage of 91,6% with an excellent category.

The fourth indicator of critical thinking skills is the conclusion. According to Facione (2011), the conclusion is the ability to identify and recognize the important components for concluding. The result of the achievement of critical thinking skills conclusion in the control class got an average percentage of 75,0% with a good category while the experimental class got an average percentage of 82,5% with an excellent category. The fifth indicator of critical thinking skills is the explanation. The explanation is the ability of students to explain the solution of the problems described through some questions, in line with the opinion of Ullynuha et al. (2015) in his research, which states explaining skills can be seen when the students can express and explain their opinions to find out the solution for a problem. The result of the achievement of critical thinking skill explanation in the control class got an average percentage of 59,0% with a fair category, while the experimental class got an average percentage of 66,6% with a good category. The sixth indicator of critical thinking skills is self-regulation. According to Facione (2011), self-regulation is the ability to self-correction. In this context, it is linked to the cognitive aspect of thinking skills. The result of the achievement of critical thinking skills self-regulation in the control class got an average percentage of 54,5% with a fair category while the experimental class got an average percentage of 65,1% with a good category.

The table below describes the analysis data result of the student's critical thinking skills based on the essay test indicator.

Table 2. The Result of Pretest of Students' Critical Thinking Skills

No	The Indicator of Critical Thinking Skills	Control Class		Experimental Class	
		%	Category	%	Category
1.	Interpretation	39,3	Poor	37,8	Poor
2.	Analysis	76,5	Good	78,7	Good
3.	Evaluation	78,0	Good	77,2	Good
4.	Conclusion	60,6	Fair	75,0	Good
5.	Explanation	56,8	Fair	55,3	Fair
6.	Self-regulation	43,9	Poor	52,2	Fair
	<b>Average</b>	<b>59,18</b>	<b>Medium</b>	<b>62,70</b>	<b>Good</b>

Table 3. The Result of Post-test of Students' Critical Thinking Skills

No	The Indicator of Critical Thinking Skills	Control Class		Experimental Class	
		%	Category	%	Category
1.	Interpretation	77,2	Good	84,8	Excellent
2.	Analysis	81,0	Excellent	82,5	Excellent
3.	Evaluation	81,8	Excellent	91,6	Excellent
4.	Conclusion	75,0	Good	82,5	Excellent
5.	Explanation	59,0	Fair	66,6	Good
6.	Self-regulation	54,5	Fair	65,1	Good
	<b>Average</b>	<b>71,41</b>	<b>Good</b>	<b>78,85</b>	<b>Good</b>

Table 2 shows the result of the average percentage of the critical thinking skills indicator. In the control class, the average percentage of students' critical thinking skills indicators was 59,18% in the medium category. In the experimental class, the average percentage of students' critical thinking skills indicators was 62,70%, in the good category. When viewed from each indicator, the highest score in the control class is the evaluation indicator at 78,0%, and the lowest score is the interpretation indicator at 39,3%. Meanwhile, the highest score in the experimental class was the analysis indicator at 78.7%, and the lowest score was the interpretation indicator at 37,8%.

Table 3 shows the result of the average percentage of the critical thinking skills indicator. In the control class, the average percentage of student's critical thinking skills indicators was 71,41% in the good category. In the experimental class, the average percentage of student's critical thinking skills indicators was 78,85% in the good category. When viewed from each indicator, the highest score in the control class is the evaluation indicator at 81,8%, and the lowest score is the self-regulation indicator at 54,5%. Meanwhile, the highest score in the experimental class was the evaluation indicator at 91,6%, and the lowest score was the self-regulation at 65,1%. For more details, it can be seen in Figure 2.

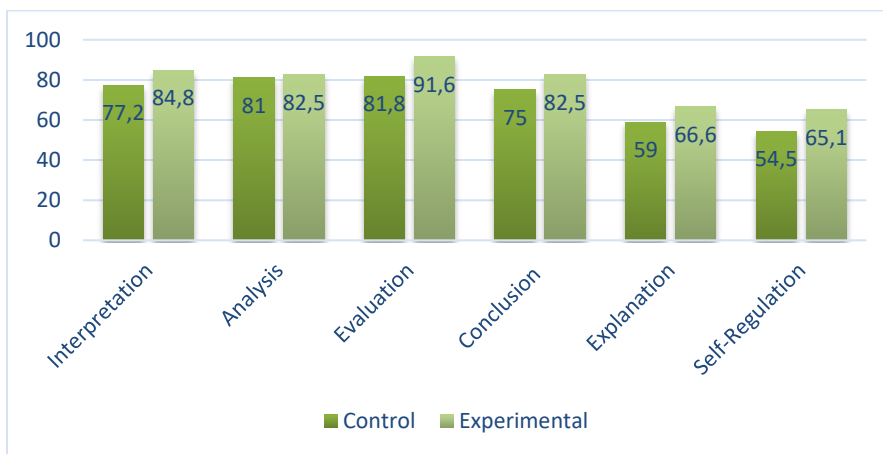


Figure 2. Graph of Critical Thinking Skills

Table 4. The Result of First Hypothesis

Test	Sig. (2-tailed)
Critical Thinking	0,014

Table 4 shows the t-test result is 0,014, which means the score is less than the error level of 0,05. It can be concluded that the two classes have a significant difference ( $H_0$  is rejected). Therefore, it can be concluded that there are differences in students' critical thinking skills between the class that applies problem-based learning assisted by Edpuzzle and the class that applies the expository learning model.

Table 5. The Result of Second Hypothesis

Class	Gain Standard	Information
Experimental	0,41	Medium
Control	0,28	Poor

Table 5 shows that the standard gain results in the experimental class are greater than the control class ( $0,41 > 0,28$ ), so there is an increase in the critical thinking skills, which is  $H_1$  is accepted and  $H_0$  is rejected. So, it can be concluded the class that applies the problem-based learning model assisted by Edpuzzle is more effective to improve the students' critical thinking skills than the class that applies the expository learning model.

Susanti (2016) argued that problem-based learning is a learning model that can develop the students' critical thinking skills through discussion in solving the problems presented. The result of the research explains that there is an increase in the students' critical thinking skills both in asking, answering, analyzing, and solving problems. The research was conducted by Liu et al. (2019) explained that the problem-based learning model is more effective than the conventional lecture-based learning model in increasing students' learning interest, independence, and problem-solving. Furthermore, the research was conducted by Silberman's research (2020) explained that group-based learning could increase the students' critical thinking. It means the problem-based learning model, which used group-based learning, is affecting the students' critical thinking skills. Also, the research result of Silverajah & Govindaraj (2018) showed Edpuzzle as the learning media that can support the development of student learning skills and students' independence training.

Based on the results of this research, the control and experimental classes use online-based learning even though they are using different learning models. In the experimental class is using the problem-based learning model assisted by Edpuzzle, the students can get information to solve some problems and look for some ideas through the material that has been uploaded on the Edpuzzle. It is different from the control class, which only received the soft file material from the teacher. Also, in the experimental class, the students can discuss with their friends to discuss the progress related to the problem presented, which discussion can trigger critical thinking skills between one student and another. In contrast to the control class, which only discussed progress without presenting problems as a trigger for students' critical thinking skills. The results of this research indicate that the problem-based learning model assisted by Edpuzzle is effective to improve the students' critical thinking skills.

## Conclusion

Based on the analysis of research data, it can be concluded that there are differences in the students' critical thinking skills between the problem-based learning model assisted by Edpuzzle and the conventional learning model. The differences can be seen from the calculation by using the t-test that shows sig of  $< \alpha$  is  $0,014 < 0,05$  at the 5% significance level so that  $H_0$  is rejected and  $H_1$  is accepted. The test result shows that the experimental class average percentage was higher (78,85%) than the control class (71,41%). Also, there is a significant increase in the students' critical thinking skills in the class that applies the problem-based learning model assisted by Edpuzzle so that they have a higher effectiveness than the class that applies the expository learning model. The statement is supported by the calculation result of the gain test, which indicates the score of 0,41 with medium criteria for the experimental class and the score of 0,28 with low criteria for the control class. Therefore, it can be concluded that the class that applies the problem-based learning model assisted by Edpuzzle has increased the students' critical thinking skills and is more effective than the class that applies the expository learning model.

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