

## The Influence of a Heuristic Approach with Blended Learning on Students' Critical Thinking Abilities

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### ABSTRACT

The students lack of habit in critical thinking is the background in this research. Lack of abilities due to the use of conventional learning models, so that learning activities are passive. The purpose of this study was to determine whether heuristic learning with blended learning method had an effect on the critical thinking skills of eight grade students of SMPN 12 Yogyakarta. This research is a type of quasi experimental. The population in this study were student of class VIII SMPN 12 Yogyakarta. Where class VIII D is the control class and VIII E class is the experimental class. The object of this research is the use of a heuristic approach with the help of the blended learning method. Data collection was carried out using test techniques. The instrument use in collecting data about students critical thinking skills. The test instrument used is the content validity test. Data processing is done by using descriptive analysis and inferential analysis. Based on the research that has been done, this study shows that the use of a heuristic learning approach with the help of eighth grade students if SMP N 12 Yogyakarta. The result of this study can see from the result of  $t_{count} = 2.142$  and  $t_{table} = 1.99$  which means that  $t_{count} > t_{table}$  so it can be said if there is an effect of using a heuristic approach with the help of the blended learning method on student's critical thinking skills.

**Keywords:** Blended Learning, Critical Thinking, Heuristic

### ABSTRAK

Kurangnya kebiasaan berpikir kritis siswa menjadi latar belakang penelitian ini. Kurangnya kemampuan akibat penggunaan model pembelajaran konvensional, sehingga kegiatan pembelajaran bersifat pasif. Tujuan penelitian ini adalah untuk mengetahui apakah pembelajaran heuristik dengan metode blended learning berpengaruh terhadap kemampuan berpikir kritis siswa kelas VIII SMPN 12 Yogyakarta. Penelitian ini merupakan jenis penelitian quasi eksperimen. Populasi dalam penelitian ini adalah siswa kelas VIII SMPN 12 Yogyakarta. Dimana kelas VIII D sebagai kelas kontrol dan kelas VIII E sebagai kelas eksperimen. Objek penelitian ini adalah penggunaan pendekatan heuristik dengan bantuan metode blended learning. Pengumpulan data dilakukan dengan teknik tes. Instrumen yang digunakan dalam mengumpulkan data tentang keterampilan berpikir kritis siswa. Instrumen tes yang digunakan adalah uji validitas isi. Pengolahan data dilakukan dengan menggunakan analisis deskriptif dan analisis inferensial. Berdasarkan penelitian yang telah dilakukan, penelitian ini menunjukkan bahwa penggunaan pendekatan pembelajaran heuristik dengan bantuan siswa kelas VIII SMP N 12 Yogyakarta. Hasil penelitian ini terlihat dari hasil  $t_{hitung} = 2,142$  dan  $t_{tabel} = 1,99$  yang berarti  $t_{hitung} > t_{tabel}$  sehingga dapat dikatakan jika terdapat pengaruh penggunaan pendekatan heuristik dengan bantuan metode blended learning terhadap kemampuan belajar siswa. kemampuan berpikir kritis.

**Kata kunci:** Berpikir Kritis, Heuristik, Pembelajaran *Blended*

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### Introduction

Education has a big and important role in the era of globalization. The development of science and technology (IPTEK) which is quite significant indirectly leads the word of education to be able to improve the quality of education, where the quality of education start from the students. The role of the students in the classroom is an object of education. For this reason, in this necessary to make improvements, changes in all aspects that effect education.

In reality, it can be seen that there are still many students who think that mathematics is difficult subject to understand, this is one of triggers for the low quality of mathematics educations today.

The factors causing the dislike of mathematics include educators or teacher, learning media and models, learning media, and teaching aids used in the learning process.

Education is expected not only to prepare students with their environment, but education I also expected to be able to achieve national education goals. The goals of national education are, among others, to produce Indonesian people who are creative, productive, affective and innovative through the skills, knowledge and attitude strengthening listed below. In Permendikbud number 17 of 2013. In learning activities students are not only required to have learning outcomes in the form of values, but students are required to be able to get used to high-level thinking which includes aspects of critical, creative and communicative thinking skills.

Critical thinking is an important ability for students to have, the goal is that students are able to channel their own thoughts and apply the knowledge previously possessed by the students themselves. Less trained students in critical thinking will make it difficult for students to solve problems in everyday life (Prihatiningsih et al., 2016). Critical thinking is the process of using the ability to think rationally and reflectively with the aim of making decisions about what to believe and do. While critical thinking is the process of analyzing and assessing thinking with a view to improving (Aldeirre et al., 2018). Critical thinking ability is a process of obtaining, searching, evaluating, analyzing, synchronizing and conceptualizing information that is used as a guide to develop thinking with self-awareness, and the ability to use information by increasing creativity and taking risks (Yildirim, & Ozkarahman 2011). Critical rinking skills are the ability to think logically and reflectively which is applied in testing a belief information or knowledge based on support in evidence and subquent coclusionans resulting from it (Ristani et al., 2017)

Based on the results of interviews and also observations that have been made, students have not been accustomed to practicing thinking skills by solving problems, one of the obstacles was the current pandemic condition and also the limitations of the learning activities carried out. In addition, the learning approach used also affects students' critical thinking skills and also activeness during learning activities. Furthermore, the learning approach used still tends to be dominated by the teacher, causing students to lack critical thinking skills.

The teacher's role in problem solving learning as a way to improve students' critical thinking skills is not only as a designer of the teaching process, but also as a guide when learning activities are ongoing. Guidance is given to students who have difficulty during the learning process. One approach used is a heuristic approach. This approach is used to solve problems with a focus on the efforts made such as understanding what is asked of students, what students already know and how the knowledge possessed is used to overcome the difficulties of what students do not know.

The study from home policy or often referred to as online-based learning was issued in circular number 4 of 2020 (Kemendikbud, 2020). In the implementation of learning there are limitations both terms of lack of teachers, limited technology and also a lack of readiness. This is line with research conducted by (Nafrin & Hudaidah, 2021) which stated that during a pandemic teacher's were face with various technical problems during online learning. Likewise with the result of interview conducted by of teachers who less skilled in digital literacy and do not have a minimum rank that can be used for online learning.

Online learning is of the 14 learning principles regulated, namely learning can take place anywhere and utilize communication technology in Kemendikbud no 16. In the future, technology will grow rapidly. In dealing with this situation, it is necessary to understand the use of good technology and also be able to process correct information. (Suyanto et al., 2012) states that in students have a interest in learning, are nor easily bored and are also successful in learning.

The blended learning model is a learning model that integrates technology in the learning process. Based on the result of the initial research (Widyaningsih et al., 2020) 12 teachers from various different school and who have civil servant status have not implemented Blended Learning because they do not know the learning model. The blended learning model packages learning with face-to-face and online systems (Dissriany Vista Banggur & Situmorang, n.d.). Driscoll in (Sari, 2021) States that there are four concepts in learning in blended learning namely 1) blended learning to combine various technologies to achieve educational goals, 2) blended learning a combination of behaviorism, constructivism and cognitivism learning a combination of these various approaches is expected to produce learning achievement with technology or without technology, 3) blended learning combines various learning such as web, video, film and so on. 4) blended learning combines technology and assignments to create a good influence on learning. From the explanation above, it can be concluded that blended leaning can be dine foce-to-fece and online. In learning activities integrate technology and tasks so that learning is maximized.

The purpose if the critical think study was to determine whether there is an influence of heuristic approach with the help of blended learning method on thinking ability of grade VIII students at SMP N 12 Yogyakarta. In practice and the implications of problem solving will lead to the ability to reason. So that it will be able to lead to the critical thinking skills of students. Through a heuristic approach, students are required to find mathematical concepts and find solutions to problems. Based on the problems that have been described, the researchers are interested in conducting research with the title "The Effect of a Heuristic Approach with Blended Learning on Critical Thinking Skills for Students of SMP N 12 Yogyakarta".

### **Research Methods**

This type of research is a quasi-experimental (quasi-experimental). Experimental research in education is a research activity with the aim of testing whether there is an effect of the actions taken when compared to other actions and assessing the effect of educational actions on student behavior. This study took two classes, one class was used as an experimental class and one class was used as a control class. The experimental class uses a heuristic learning approach with the help of the blended learning method, while the control class uses a scientific approach. This study used a "nonequivalent control group design". By using this design, the experimental and control classes are compared with each other, while the class selection is done randomly. The sample in this study is part of the number of characteristics possessed by the population (Sugiyono, 2009). In this study, a sample of two classes was taken using a sampling technique, namely purposive sampling. The samples taken were class VIII D and also class VIII E.

This research data is taken from the test results, according to (Istiyono et al., 2014) the test is a way of to estimate the magnitude of a person's ability indirectly, namely through a person's response to a stimulus or question. The test technique was carried out to obtain data on students'

critical thinking skills from both the control class and the experimental class. The material used in data collection is circle material with pictures and descriptions.

Research instrument is a tool used to collect data systematically and objectively with the aim of solving a problem or testing a hypothesis. Meanwhile, according to (Arikunto & Jabar, 2018) research instruments are tools that are chosen and used by researchers in making these activities easier. The instrument used by the researcher was a pretest and posttest in the form of description questions consisting of 5 questions which were first tested for validity and reliability.

The hypothesis test used in this study is a test to determine the difference between the two control classes and the experimental class. The steps in determining the hypothesis test include:

1. Determine  $H_0$  and  $H_1$
2. Mathematical hypothesis formula
3. Determining the significance level
4. Calculating the price of the statistical test with the t test (1), namely,

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} - 2r\left(\frac{s_1}{\sqrt{n_1}}\right)\left(\frac{s_2}{\sqrt{n_2}}\right)}} \quad (1)$$

Where  $\bar{x}_1$  = average control class,  $\bar{x}_2$  = average experiment class,  $s_1$  = control class data variance,  $s_2$  = experiment class data variance,  $n_1$  = number of samples in the class control and  $n_2$  = number of samples in class experiment. From the result of the above formula, it is conclude below:

1. If  $t_{\text{count}} > t_{\text{table}}$ , the  $H_0$  is rejected and  $H_1$  is accepted, which means that there is an effect of the heuristic approach with blended learning on students' critical thinking skills.
2. If  $t_{\text{count}} < t_{\text{table}}$ , the  $H_0$  is rejected and  $H_1$  is accepted, which means that there is no effect of the heuristic approach with blended learning on students' critical thinking skills

## Result and Discussions

Table 1 explains the statistical data on the results of students' critical thinking ability tests.

**Table 1.** Result of Critical Thinking Skills

Aspect	Total
Max Value	100
Min Value	60
Average	79,24
Standard Deviation	6,34

According to (Dimiyati & Mudjiono, 1999) the heuristic approach is a learning approach that develops scientific thinking and puts scientific ways of thinking, in the heuristic learning approach the teacher acts as a facilitator and also as a guide when learning activities take place, so it is hoped that the use of this learning can have a positive impact. good for students. One of them is to improve students' critical thinking skills. One of the reasons for increasing problem-solving abilities is the learning model used. This can be seen from the increase in problem-solving abilities from cycle I to cycles, especially in the problem-solving process (Kodariyati & Astuti, 2016)

The implementation of learning using the blended learning method according to (Husamah et

al., 2018) is a combination of face-to-face learning with e-learning. The implementation of blended learning is carried out because learning activities are carried out in a limited manner where not all students can carry out learning activities at school. The concept of learning with the blended learning method is the concept of learning with learning activities carried out simultaneously online and offline.

According to (Lestari et al., 2016) critical thinking is a series of systematic thinking activities which allow a person to formulate problems and then evaluate their own beliefs and opinions. It can be concluded that critical thinking requires reasonable thinking to relate what is known and also decide what will be done according to their intellectual abilities. The teacher was given a sufficient number of problems that can be solved using one of the above describe strategies. Most often they were such problems in whose case the use one of the strategies results in faster, more efficient or elegant solution to the given problem.

The implementation of learning using a heuristic approach with the help of the *blended* learning method is carried out according to a predetermined school schedule. Blended learning is carried out because the capacity to conduct face-to-face learning at the time of the research is 50% of the number of students, so a schedule of online and offline learning activities is made simultaneously. In the investigation for those who attend online and offline classes are determined from the student absent number. The application of the heuristic approach in learning is to provide students with worksheets that are carried out with discussions between students in accordance with predetermined groups.

For offline classes, the group members are students who do offline learning. As for online classes, discussion activities are carried out online via Whatsapps. Learning activities take place using the Microsoft Teams application for students who do online learning. Meanwhile, the results of the discussion are delivered when the learning activities are finished. Submission of discussion results is carried out by students who do offline learning, while for online classes can be done online or when it is offline, adjusted to the time of learning activities. Meanwhile, to collect the results of the discussion is to use the Microsoft Teams application for both online classes and offline classes.

As for the control class, learning activities use conventional learning with the lecture method. For online classes and offline classes. After doing research using a heuristic approach with the help of blended learning and conventional learning methods, the learning outcomes in the form of critical thinking ability tests are quite different between the two classes. The results of the test conducted in the experimental class and the control class are given according to the assessment rubric in Table 2 below:

**Table 2.** Critical Thinking Ability Assessment Rubric

Indicator	Description
Interpretasi	<ul style="list-style-type: none"><li>• Do not write down what is known and asked</li><li>• Known and asked incorrectly written</li><li>• Known to be written correctly or asked to be written correctly</li><li>• Known to be written correctly but not written completely</li><li>• Known and asked written accurately and completely</li></ul>

Analysis	<ul style="list-style-type: none"> <li>• Mathematical models are not made from the given problems</li> <li>• Mathematical models are made from the questions given but incorrectly</li> <li>• Mathematical models are made from the questions given but no explanation is given</li> <li>• Mathematica; models are made from questions the are given correctly but there are errors in the explanation</li> <li>• Mathematical model are made from questions thar are given correctly and given a complete and correct explanation</li> </ul>
Evaluation	<ul style="list-style-type: none"> <li>• Not using strategies in solving problems</li> <li>• Solving by using the right strategy, but it is not complete or the strategy used is not quite right, the solution is correct</li> <li>• Completed problems using right strategy, but made mistakes when doing calculations or when giving explanations</li> <li>• Complete and correct problem in performing calculations, complete with explanation and using the right strategy.</li> </ul>
Inference	<ul style="list-style-type: none"> <li>• Conclusions are not written down</li> <li>• Conclusions written are not appropriate in the context of the question</li> <li>• Conclusions are made incorrectly even though the have been adjusted to the contextual of the question</li> <li>• Conclusions are made correctly and in accordance with the context of the problem are still incomplete</li> <li>• Conclusions are made correctly and in accordance with the context of the problem and are written in full</li> </ul>

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The result of the critical thinking ability test obtained from the two classes were then analyzed. The analysis used is statistical analysis and inferential analysis. The result of the two analyzes are as follows:

**Table 3.** Statistical Analysis of Critical Thinking Ability Test Result

Statistics	Class	
	Control	Experiment
Sample Ideal Value	33	33
Ideal Value	100	100
Max Value	100	100
Min Value	60	60
Average Value	74	

Based on the Table 3 of statistical analysis results in the table above, the results obtained that after being given treatment, namely the average value of the results of students' critical thinking skills in the experimental class and the control class. The results of critical thinking skills for the control class are 74 and learning outcomes for the control class is 79.24.

The result of observations of teachers show that the learning model used is a scientific learning model while the method and also questions and answers. This method is applied at SMP N 12 Yogyakarta in every class by teacher of Mathematics subjects. The level of understanding of students is said to be still lacking due to the passivity of student when learning activities are in progress.

Furthermore, to determine the effect of the heuristic approach using the blended learning method on students' critical thinking skills, hypothesis testing is used. The hypothesis test used is the t-test. Here are the t-test results from the students' critical thinking ability test results:

**Table 4.** T Test Result

Group	$T_{\text{count}}$	$t_{\text{table}}$	Decision
Control	2,142	1,997	$H_0$ Rejected
Experiment			

The results of hypothesis testing using the t-test obtained the calculated value of  $t_{\text{count}} = 2.142$  and  $t_{\text{table}} = 1.997$ . Based on table 4, it can be seen if  $t_{\text{count}} > t_{\text{table}}$  so that  $H_0$  is rejected and  $H_1$  is accepted. Or it can be interpreted that there is a significant average difference between critical thinking skills using a heuristic learning approach with the help of blended learning and using conventional learning.

When viewed from the results of critical thinking skills before learning using a heuristic approach with the help of blended learning and after learning activities using a learning approach with the help of blended learning, it is known that the results of critical thinking skills have increased, where at the pretest stage the results of critical thinking skills are quite a lot. in the sufficient category and the less category, while in the posttest results the percentage is more in the good category and the very good category. it can be concluded that the heuristic learning approach with the help of blended learning has an influence on students' critical thinking skills.

This is in line with the research conducted by Hardi Tambunan with the title "Impact of Heuristic Strategy on Higher Order Thinking Ability". The results of his research show that heuristic strategies greatly affect students' mathematical abilities in higher order thinking. This is in accordance with research which shows that learning strategies can improve critical thinking skills (Fauziah, 2010) and the heuristic approach is better than conventional on student achievement.

### Conclusion

From the discussion and also the research that has been done, it can be concluded that the application of the heuristic approach with the help of the *blended learning* method has an effect on the critical thinking skills of class VIII E students of SMP N 12 Yogyakarta in the 2021/2022 school year. This is indicated by the acquisition of hypothesis testing using the t test. By using the t test, it is obtained that  $t_{\text{count}} = 2.142$  which is greater than  $t_{\text{table}} = 1.99$  so that a significant difference is obtained between the average learning outcomes of the two classes, which means that there is a significant difference in the learning outcomes of students' critical thinking skills taught using a heuristic learning approach with the help of *blended learning* methods with students being taught using conventional methods. It can be seen if the use of the Heuristic learning approach with the help of the *blended learning* method affects students' critical thinking skills, and the application of Heuristic learning also makes students more active during learning activities.

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