The Learning Cycle 7-E Model Application Effect on Mathematics Critical Thinking Skills (MCTS) of Junior High School Students

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Abstract. This study aimed to check the differences in MCTS between students using the 7-E Learning Cycle and students using the direct learning model. An experimental type was used with quasi-experimental approach. The sampling technique used is purposive sampling. A normality test was carried out to see the study results. A homogeneity test was conducted using the sample's standard deviation and class average. A t-test was performed to determine the differences between the two classes. Results showed that there were differences in MCTS between students learn the 7-E Learning Cycle model and direct learning with the t-count value of 4.83, the average value of the practical class is 88 .04. The average value of the control class is 71.32. The results of this study are one of the results that show that MCTS of students can be improved with appropriate and supportive learning models.
Keywords: *Learning Cycle 7-E, MCTS, Junior High Schools*

1. INTRODUCTION

The teaching and learning process are activities built by teachers to develop students' abilities to understand and manage creative thinking, thinking skills, and construct new knowledge [1], [2]. Critical thinking is one of the objectives of learning mathematics, namely the formation of reasoning abilities in students, which is reflected through critical, logical, systematic thinking, and able to have an objective nature, be honest and disciplined to solve problems both in learning mathematics and other learning, and in everyday life day [3]. Meanwhile, Meanwhile, basically mathematics learning in secondary schools aims to is described in detail in Permendikbud number 21 of 2016, namely so that students have the following abilities (1) Demonstrate logical, critical, analytical, careful and thorough attitude, responsible, responsive, and don't give up easily to find a way to find a solution. (2) Curiosity arises, eager to learn, has self-confidence, and a high willingness to mathematics, (3) The emergence of a sense of self-awareness about the importance of learning mathematics, which is formed and formed from the learning experience, (4) Have a spirit that likes to discuss, be objective during group interactions or in daily activities (5), Have the ability to communicate mathematical ideas clearly, and (6) Identify patterns and use them to guess general rules and provide predictions [4]. Point number (1) of the purpose of learning mathematics explains that MCTS are expected in mathematics learning.

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Given the importance of MCTS in the mathematics learning, it requires a teacher to be able to apply mathematics learning that can improve students' MCTS [1], [2]. This is because, based on the results of observations and field facts, it was find facts about students' low mathematical critical thinking skills. In fact, a student tends to accept learning without finding out the truth or expanding his knowledge. Such learning makes students' critical thinking skills not honed well and becomes low. This statement is also supported by Rifaatul Mahmuzah, who argues that the ability to think critically in learning mathematics or the skills in thinking critically is the skills that every student must have to solve every problem of the learning mathematics, including junior high school students. However, the reality on the ground is just the opposite. The improvement of high-level MCTS of junior high school students is still not as expected. This can be seen from the low achievement of Indonesian students in the international world [5], [6]. Therefore, it is important for a teacher to pay attention to the learning model that will be given in learning as one of the components that can help students improve their MCTS[7].

In this regard, the 7-E Learning Cycle model is appropriate to be used as a learning model that improves students' critical thinking skills. The 7-E Learning Cycle Model is defined as a learning model that consists of seven learning phases, that is, elicit, engage, explore, explain, elaborate, evaluate, and extend [8]. The seven stages of the 7-E Learning Cycle model require students will be more active and fully involved. What students get is not only receiving the teacher's explanation but through this model, students are required to play an active role to be able to explore their knowledge, analyze from their observations, and be able to provide an evaluation of the concepts learned. [9]. Similar to thing was also stated in Einsenkraft quoted by Rahmayani, Each phase or stage in the 7-E Learning Cycle Model requires students to have an in the ongoing learning. This is because at each stage of Learning Cycle 7-E it displays the potential that exists in students, namely, (1) Elicit (raising students' initial understanding), (2) Engagement (involving), (3) Exploration (investigating), (4) Explanation (explains), (5) Elaboration (describes), (6) Evaluation (assess), and (7) Extend (expand). So that through the active role of students, the ability to think critically mathematically can be presented through answers that are arranged based on indicators of MCTS. The indicators of MCTS include how to interpretation, how to analysis, how to evaluation, and how to inference. The advantages of the 7-E Learning Cycle Model itself are: stimulating students to recall previously obtained subject matter, provide motivation to students to learn to express their opinions actively, able to increase the curiosity of students born from the enthusiasm of students in finding a concept based on experiments carried out. Another thing is to give birth to the self-confidence of students to want to express their opinions either orally or in writing and to provide space and time for students to think before conveying their concepts which are based on the concepts studied.

Based on this description, this research basically aims to see the effect of applying the 7-E Learning Cycle model to student learning outcomes, namely mathematical critical

thinking skills with students applying the direct learning model. To see this effect, the researchers used the results of the analysis of the teacher and student activity observation sheets and tests of critical thinking skills as materials.

2. RESEARCH METHOD

This quasi-experimental study aims to determine the differences in MCTS after the 7-E Learning Cycle model and direct learning model. This study aims to assess the effect of implementing the 7-E Learning Cycle model on students' mathematical critical thinking skills with students applying the direct learning model. To see this effect, the researchers used the results of the analysis of the teacher and student activity observation sheets and tests of critical thinking skills as materials. This research was conducted at As-Shofa Islamic Junior High School Pekanbaru, located at Jalan Tuanku Tambusai/Jalan Raya As-Shofa. This research was born in 2017/2018, even the semester academic year. The population of this study was all eighth-grade students of SMP Islam As-Shofa Pekanbaru. The sampling technique is purposive sampling based on information from the teacher regarding the ability of each class being taught and adapted to the purpose of this study. Before treatment, both types were homogeneous and had the same average ability. The instruments in this research are:

1. Test of MCTS

MCTS test was carried out after giving direct learning at the two classes, namely the 7-E Learning Cycle model in the practical class and the direct learning for the control class. The questions tested in this critical thinking ability test are about building a flat side space consisting of 6 descriptive questions. Each question contains an indicator of critical thinking ability. These questions have been tested valid and reliable. The critical thinking ability test results will be t-tested and previously tested for normality using the Chi-square test and test in this case are in the form of standard deviation and average of each sample class seen.

Furthermore, the average level of progress of the class and the standard deviation of the two classes will also be measured. Meanwhile, based on the existing values of the two classes, the criteria for the category of critical thinking abilities will be seen, namely:

Table 1. Percentage of MCTS Category

Value	Category
81 – 100	Very Good
61 – 80	Good
41 – 60	Quite Good
21 – 40	Not enough
0 - 20	Very Less

Source: Modification Researcher

2. Teacher and Student Activity Sheet

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This instrument is an instrument of observation during the implementation of learning with the application of two learning models for the practical class from five meetings carried out. The results of these calculations will see the average activity of teachers and students from each meeting, the overall average, and the category of implementation. The implementation categories are:

Table 2. Learning Implementation Criteria

Value	Category
76 – 100	Very Good
51 – 75	Good
26 – 50	Quite Good
1 - 25	Not Enough

3. RESULTS AND DISCUSSION

Based on field data from research that has been carried out by researchers. Researchers get the following results:

Analysis Results of MCTS

Analyzing the results of the two tests carried out in the form of MCTS in both classes. Researchers get the following results:

Table 3. Results of Posttest Analysis

Class	N	Lowest Value	The highest score	Average
Experiment	28	68	100	88,04
Control	28	44	100	71,32

Based on table 3, it is found that the two classes have different average abilities. The difference between the two class average abilities is 16.72. Both classes have the same highest score of 100 and have different lowest scores, namely the experimental class with a value of 68 and the control class 44. By comparing the two, it can be concluded that the experimental class is superior to the control class. The average value of the experiment, which is 88.04, has a very good critical thinking ability category compared to the control class average, which is 71.32 with a good critical thinking ability category. As for the scores found in both classes with the same number of 28 students, if analyzed based on the category of MCTS, it is found as shown in the table below.

Table 4. Learning Implementation Criteria

Value	Category	The number of students	
		Experiments	Control
76 – 100	Very Good	23	10
51 – 75	Good	5	8

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26 – 50	Quite Good	0	10
1 – 25	Not Enough	0	0

Based on table 4, it is found that MCTS of students in the experimental class has a very good critical thinking ability category for 23 students and the rest have good MCTS. Meanwhile, in the control class, the students' critical thinking abilities were spread in the very good category as many as ten students, both eight students and good enough as many as ten students. Comparing the two results obtained, it can be concluded that the critical thinking ability in the experimental class is better than the control class, considering that the two classes were homogeneous.

Teacher Activity Sheet Analysis

Based on the existing observations, the learning carried out in the practical class using the 7-E Learning Cycle model for five meetings can be presented in table 5 below.

Table 5. Percentage of Teacher Activity Observation Results

Teacher Observation Sheet Calculation Results	**Meeting**				
	1	**2**	**3**	**4**	**5**
Percentage	71,4	85,7	87,5	87,5	100
Category	B	SB	SB	SB	SB
Average	86,4 (Very Good)				

Based on these observations, it was found that there was an increase in teacher activity in almost every meeting. So, the average teacher activity is 86.4, and it can be concluded that learning with the 7-E Learning Cycle model has been carried out very well.

Student Activity Sheet Analysis

Observations of learning are not only carried out on teachers but also on student activities. This is to see whether the 7-E Learning Cycle model has been well received by students who show progress in their learning, especially in their critical thinking skills, by being actively involved in learning. The results of the observations are shown in the table below.

Table 6. Percentage of Observation Calculation

Teacher Observation Sheet Calculation Results	**Meeting**				
	1	**2**	**3**	**4**	**5**
Percentage	58,3	73,3	88,3	96,7	100
Category	B	B	SB	SB	SB
Average	83,3 (Very Good)				

Table 6 showed that an increase in student activity in each lesson that applied the 7-E Learning Cycle model from the initial meeting to achieve a perfect score in the very good category and average score of 83.3. This increase in student activity will certainly improve

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MCTS of students because the three stages in the 7-E Learning Cycle model involve MCTS.

Post-test Descriptive Data Analysis

This study aims to see and examine differences in MCTM of students on the effect of the applied learning model. The results of testing this hypothesis can be seen from Table 7.

Table 7. Post-test Results

t_{-count}	t_{-table} 5%	Description
4,83	2,01	H_a accepted

Table 7 viewed that the t-count is greater than the t-table, so that H_o is rejected and H_a is accepted. The conclusion is that there are differences in MCTS between students using the 7-E Learning Cycle model and students using the direct learning.

As for the overall comparison and analysis of each research result based on the research instrument, It was concluded that the MCTS of Students in the practical class was better compared with the control class. For this reason, students are accustomed to using their MCTS during learning in the practical class. Students' MCTS can be raised at every stage of the 7-E Learning Cycle Model. [10]. In particular, it was concluded that the MCTS of students in the practical class was better than in the control class. For this reason, the MCTS of students in the practical class was better than the direct instruction in the control class. It can be seen directly in the implementation of the Learning Cycle model, namely analytical skills used in the explore phase, inference skills used in explore and elaborate stages, and explanation skills performed by students in detailed and extended steps.

Thus the 7-E Learning Cycle model is appropriate to be used as an effort to improve students' MCTS [8]. Where the 7-E Learning Cycle Model treatment has a more positive influence on students' MCTS than the control class with direct learning. This is in line with what Sugiyono said that if the treatment group is better than the control group, then the treatment given to the treatment group has a positive effect [11].

Research conducted by Laily Nur Faziah concluded that the 7-E Learning Cycle model can train students' MCTS. This information according to the post-test average score has acquired [13]. With the research results that the researchers found, this research is one of the studies that conclude that implementing the 7-E Learning Cycle model on students' critical thinking skills [12][13]as concluded from previous studies.

4. CONCLUSION

Based on the research and discussions that have been studied by researchers, it is concluded that there are differences in students' MCTS abilities between students who study with the 7-E Learning Cycle model and students who learn using direct learning. The average post-test results obtained by the practical class using the 7-E Learning Cycle model were higher than the control class using direct learning. Every learning activity from

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time to time will increase so that both MCTS and learning activities will be better with applying the 7-E Learning Cycle model. The application of this model must also pay attention to time and the students' ability to make learning interesting. Students also want to be involved in learning because the 7-E Learning Cycle model will require a lot of time to implement the stages. Sometimes, 7-E Learning Cycle makes students bored if they are constantly told to think. Therefore, researchers concerned with this are expected to pay attention to learning time and be able to make exciting learning.

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