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Mataram, Nusa Tenggara Barat, Indonesia

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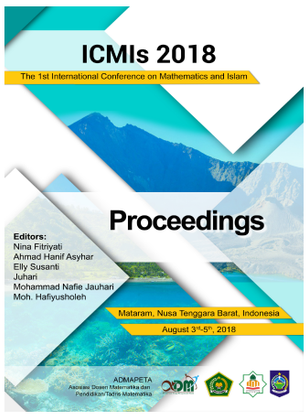

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Foreword: The 1st International Conference on Mathematics and Islam (ICMIs 2018) is an academic event held by UIN Mataram Indonesia and ADMAPETA (Asosiasi dosen matematika dan pendidikan/Tadris Matematika). This event was held on August 3rd-5th, 2018 in Mataram, Nusa Tenggara Barat, Indonesia. the theme of the conference is “Contextualization of Mathematics Through Islamic Values Integration”. The Organizing committee have successfully compiled articles written by scholars, researchers, experts and those who have keen interests in mathematics, applied mathematics, mathematics education, Integration of Mathematics and Islam. Mathematics as logical thinking methods and tools is used to help a person solve problems that occur in surrounding environment. Those happens because generally, education accommodating the complete form of human, a human who can maximize their potential for self-interest also for their community. Integration between Islamic values and Mathematics can help achieve its goal. **(More)**

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The Increasing Students' Critical Thinking Skills through Learning Cycle "5E" using Dice in Learning Probability

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Keywords: Learning Cycle"5E" Model, Critical Thinking, Probability.

Abstract: To improve a good critical thinking skill of students, a teacher needs to innovate in choosing an appropriate model using in classroom learning. A learning cycle "5E" model is one of models that can be used to enhance students' critical thinking skills. The purpose of this study is to determine the increasing of students 'critical thinking skills in learning probabilities by using a learning cycle "5E" model, and to determine the differences of students' critical thinking skills that are taught by applying the learning cycle "5E" model than students who are taught without applying the learning cycle "5E" model. The data was analyzed by using t-test. The data analyzing indicates that there is the enhancing of students' critical thinking skills by using the learning cycle "5E" model and found that 29.17 % of students are highly critical and 58.33 % of students are critical. The results showed that the students' critical thinking skills that are taught by applying the learning cycle "5E" model using a medium dice is better than students' critical thinking skills of students who are taught without applying the learning cycle "5E" model.

1 INTRODUCTION

Mathematics learning process in school should pay attention on the need of improving and developing students' critical thinking ability for the use of it in student's real world (Filsaime, 2008; Samsudin, 2009; Karim, 2015) as the competency on curriculum 2013 (Permendikbud, 2013). However, in fact, by based the TIMSS and PISA result showed that the Indonesian education is poor quality (Nur, 2013; Wasis, 2015; Karim, 2015).

The survey of Programme for International Student Assessment (PISA) in 2015 showed that the mathematical abilities of Indonesian students in the 63rd ranking of 72 countries (Gewati, 2018). As well as PISA survey, Trends in the International Mathematics and Science Study (TIMSS) survey in 2015 show that Indonesia is still at a lower level, Indonesia occupied 45th out of 50 countries with a score of 397 (kompas.com, 2016). These indicate that an effort to increase students' mathematical abilities through increasing critical thinking skills is needed.

On the other hand, the critical thinking ability is not an ability that could not develop by itself, but, it needs a learning model or a learning strategy for developing it (Zubaidah, 2010). The critical thinking could be learnt, predicted improved and taught to other (Facione, 2013). The critical thinking ability relate to the abilities to identify, solve problem creatively and thinking logic for making a good decision.

The improving of critical thinking skills should be conducted by teachers in each areas of instruction, especially, mathematics instruction. To increase students' critical thinking skills, the teachers should innovate the learning models in classroom learning.

One of teaching and learning model that focused on student-centered is learning cycle "5E" model. In this model there are 5 activities namely *engagement*, *exploration*, *explanation*, *expansion* and *evaluation* (Sastradi, 2016). Fajaroh and Dasna (2007), furthermore, stated that learning cycle is applying of social constructivism by Vigostkyand meaningful learning.

Based on the introduction above, there are some research questions:

1. Is the applying learning cycle 5E model with using dice could enhance students' critical thinking skills in students grade XI SMAN 11 Banda Aceh?
2. Is students' critical thinking skills that taught by learning cycle "5E" is better than students'

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critical thinking skills that taught without learning cycle "5E".

The study is expected to have some benefits:

1. Teachers: Teachers will use this type of teaching for improving students' critical thinking.
2. Students: It is expected that students' critical thinking ability would improve after applying the model learning

2 METHOD

A Quasi Experimental Design with control group pretest-posttest design was used in study. The population is all students of grade XI IA SMAN 11 Banda Aceh year 2017/2018. The samples were two classes which each class has 25 students in the experimental class and 24 in the control class. Both of these classes have the same level of mathematical ability. The data was collected by using technique test of students' critical thinking.

The type of question in this test is an essay that must be solved by students in 90 minutes. The test was given to students after they learned the subject with the learning cycle "5E" model. Through these tests, the data obtained from students' critical thinking skills in accordance with indicators of critical thinking. To measure and analyze students' critical thinking skills in this study is as follows:

2.1 Data Analysis of the Increasing of Critical Thinking Ability

There are indicators of the instrument used to assess critical thinking ability:

1) Score 1 not able to solve problem correctly,
2) Score 2 able to problems but no reasons given,
3) Score 3 able to solve but the reason given is not correct,
4) Score 4 able to solve the problem correctly and with correct reasons.

The collecting score will be converted to 100 scale by divided the number of students took by the number of maximum scores multiply by 100 (Sudijono, 2001).

Table 1: The Critical Thinking Ability Criteria.

Score	Classification
81 – 100	Highly critical
66 - 80	critical
56 - 65	Enough
41 - 55	Less critical
0 – 40	Not critical

2.2 The Analysis of Comparison of Students' Critical Thinking

The collecting data was analyzed by using t-test of 5 % significant. Hypothesis:

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 > \mu_2$

H_0: Students' critical thinking ability taught by using learning cycle "5E" model is the same to students' critical thinking ability taught without using learning cycle "5E" model.

H_a: Students' critical thinking ability taught by using learning cycle "5E" model is better than students' critical thinking ability taught without using learning cycle "5E" model.

3 RESULT

3.1 The Analysis of Critical Thinking Improvement

Table 2: The Percentages of Critical Thinking Ability Increasing.

Criteria	Pra-Treatment	Post-Treatment
Highly critical	0 %	29.17 %
Critical	0 %	58.33 %
Enough	4.17 %	8.33 %
Less critical	37.5 %	4.17 %
Not critical	58.33 %	0 %

Based on table 2, it is showed that percentages of students' critical thinking after treatment increase compare to before treatment. After the treatment, the number of highly critical students increase from 7 students or 29.17% to 14 students or 58.33%. The result showed that there is an increasing of students' critical thinking ability by using learning cycle "5E" model.

3.2 The Analysis of Comparison of Students' Critical Thinking

Based on significant $\alpha = 0,05$ dan degree o freedom 47, from table *t-distribution* found that $t_{(0,95)(47)} = 1,67$, as the result $t_{hitung} > t_{tabel}$ or $3,32 > 1,67$ and H_a is accepted. It showed that Students' critical thinking ability taught by using learning cycle "5E"

model is better than students' critical thinking ability taught without using learning cycle "5E" model.

4 DISCUSSION

By using analysis data, it is found that there is an increasing of students' critical thinking ability by comparing *pretest* and *posttest* achievement. From the test, it is found that learning cycle "5E" model enable to increase students' critical thinking ability: 29.17% highly critical students and 58.33% critical students. The results are the same with the previous studies that conducted by Khairuna (2017).

By using statistic *t-test* using significant $\alpha = 0{,}05$ and df = 47 found that $t_{\text{count}} = 3{,}32$ and $t_{table} = 1{,}67$ as the result $t_{\text{count}} > t_{(1-\alpha)}$ or $3{,}32 > 1{,}67$ because $t_{\text{count}} > t_{(1-\alpha)}$ thus H_o is rejected and H_a is accepted. In addition, based on the learning conducted by learning cycle "5E" model showed that students' activity is more dominant than teacher's activity.

The results are the same with the previous studies that conducted by Noer (2009), Ismaimuza (2010), Fachrurazi (2011), and Somakim (2011) which concluded that critical thinking skills can be improved by using innovative learning models and demanding students more active and skilled in learning.

The study result is relevant with theory by Eggen and Kauchak (2001) stated that the instructional learning was effective if students' active during the learning. On the other word, students are not only passive but trying to explore the knowledge by teacher helping.

5 CONCLUSIONS

Based on data analysis and discussion, it can be concluded that:

1. There is an increase in students' critical thinking skills before applying the learning cycle "5E" model that is compared to after applying the learning cycle "5E" model. After conducting learning, it is obtained that 29.17% of students are very critical, 58.33% of students are critical. Whereas before the applying of the learning cycle "5E" models the level of critical thinking of very critical and critical was 0%. It is showed that there is an increase from 4.17% to 8.33%, less critically reduced from 37.5% to 4.17% and not critical from 58.33% becomes 0% after learning.
2. The results of hypothesis testing at significance level at α = 0.05 obtained $t_{(count)} > t_{(table)}$ or 3.32> 1.67. Thus, the null hypothesis H_0 is rejected and the alternative hypothesis H_a is accepted. It is concluded that the critical thinking skills of students taught by applying the learning cycle learning "5E" model using dice media are higher than the critical thinking skills of students taught without applying the learning cycle learning "5E" model using dice media in grade XI of probability concepts in SMAN 11 Banda Aceh.

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