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## Analysis of Creative Thinking Skills Through the Application of a Scientific Approach Based on Academic Ability Disparity

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### ABSTRACT

43 Creative thinking skills are crucial for students in facing challenges and obstacles in the future. 1 This study aims to analyze the creative thinking skills of students based on differences in academic abilities. This type of research is comparative with the ex post facto research design. The sample selection technique using purposive sampling obtained a sample of 114 students. The results showed that there were significant differences in creative thinking skills ( $p < 0.05$ ) between students with higher, moderate, and lower academic abilities. 54 creative thinking skills of students with higher academical abilities were significantly different ( $p < 0.05$ ) from students with lower academic, but not significant ( $p > 0.05$ ) from students with moderate academic. 20 Creative thinking skills of students with moderate academic abilities were not significantly different ( $p > 0.05$ ) with students with lower academic. 5 The average value of creative thinking skills in each group is low because students experience difficulties in empowering 7 creative thinking skills. The benefit of this research is to find out the creative thinking skills of students so that they can be used as a reference in evaluating learning.

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### INTRODUCTION

29 Thinking skills are one of the important things in the 21st century. The competencies needed in the 21st century are creative, critical thinking, collaboration, and communication (Trilling & Fadel, 2009). In addition, 41 the importance of creative thinking skills is also mandated by the Regulation of the Minister of Education and Culture of the Republic of

Indonesia No. 21 of 2016 which states that students are required to have creative, productive, critical, independent, collaborative, and communicative thinking skills. Creative thinking in general is a part of life skills that are needed by students in facing the increasingly rapid progress of science and technology as well as challenges, demands, and increasingly fierce global competition (Hanipah, et al. 2018). Therefore, creative

11 thinking skills are very important for students in facing life in the future.

33 Creative thinking is a way of thinking used by someone to come up with new ideas in overcoming problems. As stated by some experts, among others: Duff, et al. (2013) stated that 21 creative thinking skills are the ability to generate original ideas or answers. 10 Creative thinking is also called divergent thinking, namely providing various possible answers based on the information provided by Munandar, (1999). Creative thinking can produce something new in concepts, understanding, inventions, and works of art (Rohaeti, 2008). 21 Creative thinking skills that can be developed in a lesson include aspects of 3 fluency, flexibility, originality, elaboration, metaphorical thinking (Treffinger, et al., 2002).

7 There is a relationship between creative thinking skills and a scientific approach, this research was conducted by Inganah (2016) in his research on class VIII junior high school students in Malang City who concluded that during learning activities with a scientific approach 18 there was an increase in their creative thinking skills as when observing, students listen to the teacher's explanation while observing the worksheet. In the questioning activity, students experienced an increase in the ability to ask questions. 27 At the time of the trial activity, students experienced an increase in completing the worksheet. During the association activity, many students were able to express ideas and rebuttal to the results of their friends' work. The scientific approach is to organize learning experiences in a logical order. The advantages 24 of learning with a scientific approach are: 1). Improve intellectual abilities; 2). Forming the ability of students to solve a problem; 3). Train students in communicating ideas (Pratiwi, 2018). Through a 23 scientific approach, students can carry out learning activities, such as 23 observing, asking questions, gathering information/

testing, reasoning/ associating, and communicating (Permendikbud No.103 of 2014). So that one way to develop creative thinking skills in science learning is the scientific approach. 5

Giving the same learning experience to students including a scientific approach will produce different learning achievements, this is due to differences in academic abilities (Prayitno, 2010; Nasution, 2000).

30 Academic ability is the intellectual or cognitive ability of individuals based on the scores they get with reference to standardized assessments (Cady, 2013). The academic abilities of students in the classroom can be classified into students with upper, moderate, and lower academic abilities (Prayitno, 2010; Nasution, 2000). Students with high academic abilities are better able to plan, choose strategies in carrying out tasks, and be able to evaluate what they have done compared to students with low academic abilities (Permata et al, 2019). Students with higher levels of academic ability in school will get higher achievements (Coetzee, 2011).

So far, teachers at SMP N 1 Pringsewu teach the subject matter of Interaction of Living Things and Their Environment by using a scientific approach to students with different academic abilities. Therefore, researchers are interested in conducting research to analyze whether the scientific approach that has been used by teachers produces different thinking skills. 35 This study aims to determine creative thinking skills on the subject matter of the interaction of living things based on the level of academic ability of the students of SMP N 1 Pringsewu and 48 the results of the research can be used as reference material in the development of science. 38

## METHODS

37 The type of research used in this research is comparative quantitative with ex post facto design. The subjects in this study

were class VIII SMPN 1 Pringsewu and sampled using a purposive sampling technique with the following conditions: 1) had studied the interaction of living things and the environment; 2) provide a smartphone for the implementation of the test; 3) willing to be involved in research, so that a sample of 114 students was obtained.

The test instrument used is in the form of 2 sets of descriptions, each set contains 5 questions. Each student only works on 1 set of questions. The test questions relate to indicators of creative thinking skills: fluency, flexibility, originality, elaboration, and metaphorical thinking according to indicators (Treffinger et al., 2002). This Description Test is used to measure the ability to think creatively. This description test is given to students after the learning activities have been carried out.

Furthermore, the instrument test was carried out on students who had studied the subject matter of the interaction of living things and the environment and an analysis of the test instrument was conducted to determine whether the questions were suitable to be used as research instruments. The analysis used is the validity test and the reliability test of the research instrument using SPSS 23 for windows with Cronbach's Alpha model. Then questions that have been valid and reliable are given to the subject. The creative thinking skills test results data obtained consisted of 2 types of data, namely the data from the creative thinking skills test results and data from interviews and teacher questionnaires. The results of the creative thinking skills test were statistically tested using Anova (Analysis of variance). Prior to the Anova test, the data from the creative thinking skills test were tested for normality and homogeneity. The ANOVA test used to test the hypothesis in this study uses a mathematical model of one-way analysis of variance. Further tests are used if differences

in creative thinking skills are found, in this case, significant creative thinking skills with different academic abilities from the BNT test (Least Significant Difference). Data from interviews and filling in teacher questionnaires were analyzed descriptively in the form of percentages.

## RESULTS AND DISCUSSION

This study investigates creative thinking skills among students with different academic abilities. Meanwhile, based on the results of the study in Table 1, it can be seen that the highest average value of creative thinking skills was achieved by the group of students with high academic abilities, while the lowest scores were obtained by groups of students with higher, moderate and lower academic abilities.

The results of the normality test of creative thinking skills test data showed a significant value of more than 0.05 ( $\text{sig} > 0.05$ ), which means the data is normally distributed. Furthermore, the results of the homogeneity test using Levene's Test of Equality of Error Variances show that the statistical values of  $F = 0.246$  with a significance of 0.783 greater than 0.05. Thus, the dependent variable of creative thinking skills has a homogeneous variant between treatment groups.

The results of the ANOVA test at the 5% significance level are known that the value of  $F = 3.417$  with a significance number of 0.036 ( $\text{sig} < 0.05$ ), so the null hypothesis is rejected. Thus, there are significant differences in creative thinking skills between students with higher, moderate, and lower academic abilities.

Based on the results of the BNT test, it is known that the creative thinking skills of students with higher academic abilities are not significantly different ( $\text{sig} = 0.406$ ) with students with moderate academic abilities,

but are significantly different from students with lower academic abilities (sig = 0.014). Furthermore, the creative thinking skills of

students with moderate academic abilities did not have a significant difference (sig = 0.066) with students with lower academic abilities.

Table 1. Data Recapitulation of Students' Creative Thinking Skills

Data	Higher Ability	Moderate Ability	Lower Ability
Number of students (n)	31	44	39
Average	47.25	45.11	40.64
Standard Deviation	11.01	11.38	10.39
Maximum Value	70	65	65
Minimum Value	25	25	25
Normality (Shapiro-Wilk)	0.560	0.066	0.113
Homogeneity	Sig. 0,783		
Anova	Sig. 0,036		

Table 1. Proportion of the Average Value of Students' Creative Thinking Skills

Category	Academic Ability		
	Higher	Moderate	Lower
Adequate (%)	19	11	8
Low (%)	13	13	5
Very Low (%)	68	75	87

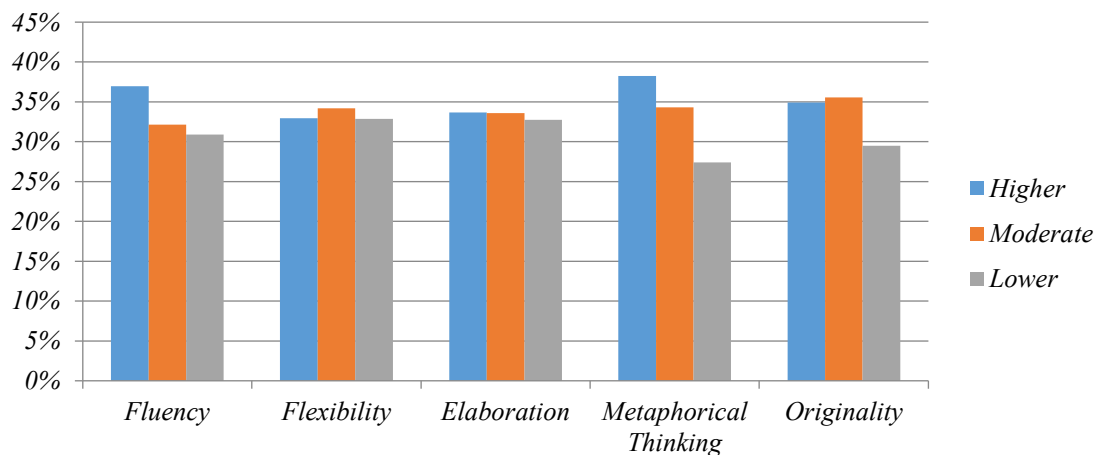


Figure 1. Percentage of Creative Thinking Skills on Each Indicator among Students with Higher, Moderate, and Lower Academic Ability

Based on Table 2 above, it is known that the three largest percentages of academic abilities show similarities, namely in the "very low" category of creative thinking skills. Furthermore, the creative thinking skills of students on each indicator turned out to have different percentages among the three academic abilities, as shown in Figure 1.

students with higher academic abilities has the largest percentage. Furthermore, the ability to think flexible and original in students with moderate academic ability who has the largest percentage. Meanwhile, the elaboration ability of students with higher and moderate academic abilities is higher than those with lower academic abilities.

In Figure 1, it can be seen that the ability to think fluently and think metaphorically in

## Discussion

This study investigates creative thinking skills among students with different academic abilities. The results of the study indicate that there are differences in creative thinking skills between students with higher, moderate, and lower academic abilities. The results of this study are in line with the research findings by (Jamaluddin, 2010) which shows that there are differences in creative thinking skills in students with different academic abilities. Academic ability plays an important role in the learning process and affects the creative thinking skills of students. This is because students with high academic abilities have met various indicators of creative thinking skills. They are able to understand problems, provide solutions, and communicate ideas clearly and coherently. Meanwhile, students with lower academic ability have not been able to fulfill various indicators of creative thinking skills. They find it difficult to understand the problem and predict the solution (Lisliana, 2016).

The creative thinking skills of students with higher academic abilities are not significantly different from students with moderate academic abilities, but are significantly different from students with lower academic abilities. Furthermore, the creative thinking skills of students with moderate academic abilities were not significantly different from students with lower academic abilities. The highest average value of creative thinking skills was achieved by groups of students with high academic abilities, while the lowest scores were obtained by groups of students with high, moderate and lower academic abilities. The value of students with higher academic abilities on the creative thinking test is higher than those with lower academic abilities (Anwar, *et al.*, 2012).

The creative thinking skills of students on each indicator turned out to have different percentages among the three academic

abilities. Fluency and metaphorical thinking skills in students with higher academic abilities have the largest percentage (Figure 1). This is because students with high academic abilities are able to provide ideas or answers smoothly, while students with moderate academic abilities are able to provide ideas or answers smoothly, albeit incomplete. In addition, students with lower academic abilities have not been able to provide ideas or answers smoothly within a certain time. According to Amidi (2018), students with lower academic abilities have not been able to solve problems by providing more than one relevant idea or answer nor able to provide answers in their own manner.

Students with high and moderate academic abilities have been able to use analogies to make new connections, while students with lower academic abilities have not been able to use analogies to make new connections. Students with lower academic abilities have not answered what interaction patterns occur in the questions. Low academic ability has not been able to provide many ideas, and solve problems, even though they have tried to work, but have not produced the right answer (Suripah & Sthephani, 2017).

The percentage of elaboration abilities of students with higher and moderate academic abilities is higher than those with lower academic abilities (Figure 1). This result is because students with higher and moderate academic abilities have been able to provide ideas or answers by describing or specifying the details of objects, ideas or situations to make them more interesting. Students have been able to explain the interaction between biotic and abiotic components by adding details to expand ideas in the form of research data given in the problem. Meanwhile, students with lower academic abilities have not been able to provide answers by adding details to expand ideas. According to Suripah & Sthephani (2017), students with lower

academic abilities have not been able to provide answers in detailed steps and there are still many mistakes in solving problems.

The creative thinking skills of students on the indicators of flexibility and originality in students with moderate academic abilities have the largest percentage (Figure 1). This result is because students with moderate academic ability have been able to provide ideas or answers where ideas or answers are obtained from different points of view. Students are able to explain the interaction between biotic and abiotic components correctly, namely by answering that the abiotic factor that has no significant effect on the incidence of DHF is wind speed. In addition, the student's answer is accompanied by an explanation using someone's point of view, namely the answer I agree, which explains that the student has the same opinion as that of someone in question. In addition, students with higher and lower academic abilities have not been able to explain the interaction between biotic and abiotic components correctly and are not accompanied by different points of view. Flexibility is a way of thinking that changes one's thoughts or point of view (Treffinger, *et al.*, 2002).

Students with higher academic abilities have been able to provide a large number of ideas or answers where the ideas or answers are unusual or unique. Students are able to explain the interaction between biotic and abiotic components by providing answers,

namely waste treatment, accompanied by complete processing methods, meanwhile students with moderate and lower academic abilities have also been able to provide a large number of ideas or answers that are out of the box or unique, namely not to build a PLTU on the beach and to treat wastewater, but the answers given are incomplete. According to (Treffinger, *et al.*, 2002), the ability to think original (originality) is a way of thinking that produces new and unusual ideas.

The percentage of students' creative thinking skills scores which are the largest in the three academic abilities show similarities, namely in the "very low" category of creative thinking skills (Table 2). This is because students have difficulty in empowering creative thinking skills. This can also be seen from the lack of accuracy of students in solving the questions given by the researcher. The results of this study are in line with the findings of (Suparman & Luvy 2018) that students' mistakes in solving creative thinking skills problems are the cause of low creative thinking skills among students with higher, moderate, and lower academic abilities. Students are less careful in understanding the questions given and fail to identify the concepts contained in the questions, so that the solutions to the questions given are less relevant. Evidence that shows that there are problems regarding students' accuracy in working on questions can be explained in Figure 2.

**Question:**

*If you were asked to determine 3 types of biota apart from the 3 groups of biota in table 1 that died from the impact of hot water waste, how would you explain your answer?*

**Student's Answer:**

Before operating:

1. 82 kinds of coral
2. 20 types of crustaceans
3. 26 types of coral reefs

Thus, bad water can cause biota in marine life to die due to the impact of hot water waste.

- (A)  
Yes, I will determine 3 types of biota other those specified in Table 1, which died due to hot water waste.
- (B)  
Changes in temperature can disrupt the metabolic processes of marine organisms such as fish, insects, benthic invertebrates, zooplankton, phytoplankton and microbes, so that the ability of these marine organisms to survive is highly dubious.
- (C)

Figure 2. Students' Answers with Higher Academic Ability (A); Moderate (B); Lower (C) which shows a lack of accuracy in answering questions

## CONCLUSION

There is a significant difference in creative thinking skills ( $p < 0.05$ ) between students with upper, moderate, and lower academic abilities. The creative thinking skills of students with upper academic abilities were significantly different ( $p < 0.05$ ) with students with lower academic abilities, but not significantly different ( $p > 0.05$ ) with students with moderate abilities. The creative thinking skills of students with moderate academic ability were not significantly different ( $p > 0.05$ ) with students with lower academic abilities. The average value of creative thinking skills in each group of academic abilities is low, this is because students have difficulty in empowering creative thinking skills.

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