Analysis effect of creativity on the learning outcome of middle-school students in the earth structure and layer topic

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Abstract. This research aimed to find out the effect of high and low creativity on the students' learning achievement. This research was conducted at MTs Negeri 2 Surakarta 2017/2018 Academic Year. The research method used was experimental research. The sampling was done using simple random sampling technique. The data were collected using multiple choice objective test to obtain the learning achievement data in the Structure and Earth Layer topic and observation sheet to obtain creativity data. The data analysis used was parametric statistical test with one-way ANOVA test. Based on the statistical analysis performed, it was obtained that the sig. value was 0.000. Because the sig. value is < 0.05, it can be concluded that Ho is rejected. This shows that high and low creativity has an effect on the students' learning achievement in the Structure and Earth Layer topic. The result indicates that students who have high creativity have higher learning achievement.

1. Introduction

The ideal learning process is a learning process that is packaged by considering the existence of various aspects cognitive, affective and psychomotor. If the learning process can be carried out by considering the balance of the three aspects, the output of learning will be able to anticipate changes and progress in society. Therefore, education must be packaged in a good learning process. In other words, in the learning process the creativity aspect must be considered [1]. The teacher must be able to attract the students’ attention during the learning process by asking challenging questions, in the hope of stimulating the students' acceptance and creating curiosity according to the theory put forward by Gagne [2].

Creativity is an important component for the students in the stages towards 21st century skills [3-5]. In essence, the word creative is the discovery of something new, and not the accumulation of skills or knowledge obtained from textbooks. Creative is also interpreted as a mindset or ideas that arise spontaneously and imaginatively, reflecting scientific results, scientific discoveries, and mechanical creations [6]. According to Winkel [7], in thinking creativity or creative thinking, creativity is an act of thinking that produces creative ideas or ways of thinking that are new, original, independent, and imaginative. Creativity is seen as a mental process. The power of creativity refers to thinking skills that
are more original than most other people have. According to Brown & Keeley [8], creative thinking arises from the habits of the mind that are trained by animating the imagination, paying attention to intuition, opening extraordinary perspectives, and generating unexpected ideas. Creative human resources cannot grow naturally but must go through a process that is carried out systematically, consistently, professionally and continuously [9]. One of them is by training them creatively in every learning activity at school. Mei Tan [10] said that creativity in a person is developed based on knowledge, and school is one of the places where someone acquires and builds that knowledge. Creative personal formation requires a process that does not occur instantly.

Another thing that also needs to be a concern in a learning process is the student's knowledge of the material that has been taught. The learning activity ends with the process of evaluating learning achievement as a measure of the student’s knowledge. Learning achievement is the result shown by a number of students in a country [11].

Learning achievement is one indicator of the learning process. Learning achievement does not always coincide with problem solving skills. One might assume that people with good problem-solving skills will tend to exhibit higher levels of learning achievement and produce more original solutions [12]. Learning achievement achieved by students is one indicator of whether or not a learning process is achieved, including science learning. Science Learning is included in one of the subjects at the middle-school level. The results of the science subject did not show a positive development. This can be seen in the results of the National Examination (UN) of Science in the last 3 years. In the 2014/2015 academic year, the average UN score reached 59.88 while in 2015/2016 it decreased with a national average of 56.26 and in 2016/2017 it was 52.19 [13].

Several factors can influence learning achievement [14]. The basic issues that affect learning achievement such as those explored by a group of researchers include family background, learning environment, and government policy [15-16]. This research revealed other factors that have the potential to affect students’ learning achievement, in addition to what has been done by other researchers.

2. Methods
The research was conducted at MTs Negeri 2 Surakarta, in the even semester of April 2017/2018 Academic Year. The population in this research was class VII of MTsN 2 Surakarta 2017/2018 Academic Year. The samples used in this research were 2 selected classes, namely VII A1 and VII A3. The sampling technique was simple random sampling. Simple random sampling is a method of selecting samples from a population or universe in a certain way that each member of the population or universe has the same opportunity to be selected or taken. This technique is used because there are no levels or differences in population. In this case, class VII is homogeneous so that samples can be taken randomly with the same possibilities.

This research is included in quantitative research by analysing the data quantitatively. As it is included in the quantitative research, the statistics used are inferential statistics. This research has two variables, namely the dependent variable and the independent variable. The dependent variable is obtained from the students’ learning achievement in the Earth Structure and Layer topic, while the independent variable is the creativity obtained during the learning process.

The research instruments used in this research were the objective test and observation sheet. The objective or multiple choice tests were made based on the indicators of Earth Structure and Layer topic with 25 items. The data were obtained through the objective test given after the students learnt the Earth Structure and Layer topic. The researcher can find out the students’ achievement by looking at the objective test results. In addition, to obtain creativity data observation sheets were used when learning activities took place. The observation sheet was used to find out the level of students’ creativity in learning. This observation sheet in the form of rating scale of 1-4 contains the categories of never done until often done (can be seen in table 1), based on 13 descriptions of indicators of creativity. The creativity data collection was done three times to get complete and comprehensive observation results.
The first thing to do after making an instrument is to conduct an instrument test by an expert called a content validity test or content test. The content validation coefficient can be done qualitatively and quantitatively by several experts [17]. After the content validity test, the achievement test instruments used in the research were tested first by using validity, reliability, level of difficulty, and discriminating power tests.

The research instrument trial was conducted at a different school from the research location. This was done to keep the research instruments confidential. The selection of schools used for the research instrument trial considers the school level with the aim that between the research population and the subjects used as trials are in the same level or homogeneous. Therefore, the research instrument becomes more relevant for use in data collection.

The data analysis in this research used the statistical test of one way Anava. Before using the statistical test, prerequisite tests were carried out first. The prerequisite tests used consisted of normality and homogeneity tests. Normality of Test was used for the normality test and for the homogeneity test Levene test was carried out using SPSS version 23 software.

### 3. Results and Discussion

The research was conducted by collecting two data, namely creativity data and learning achievement data. The creativity data were obtained by giving the students creativity assessment during the learning process. The assessment was carried out using creativity observation sheets for students. The observation sheet was used with the aimed that in assessing the students’ creativity, the data obtained is more objective.

The other data used were the students’ learning achievements. The learning achievement data were obtained from the results of the cognitive test about the Earth Structure and Layer topic. The test was given to the students after learning about the Earth Structure and Layer topic had been given. The test results were then analysed according to the answer rubric and the student scores were obtained. The test scores were used as the learning achievement data. The learning achievement data were obtained in the form of interval data. After the students’ learning achievements were obtained, they were grouped in each of the student's scores based on high and low creativity. The results can be seen in Table 2.

| Creativity | Students (N) | Mean of Learning Achievement |
|------------|--------------|------------------------------|
| High       | 25           | 82.48                        |
| Low        | 23           | 65.91                        |

Based on table 2, it can be seen that creativity is categorized as high and low. 25 students have high creativity and 23 students have low creativity. The average learning achievement of the high-creativity group is 82.48 and of the low-creativity group is 65.91. The students’ average result in both categories has a considerable difference of 16.57.

Prerequisite tests were carried out on the data obtained in Table 2 to determine the statistical test to be used. There were prerequisite tests carried out, namely normality and homogeneity tests. The data
are considered normal and homogeneous if the significance value is > 0.05. The results of the normality test are shown in table 3.

### Table 3. Normality-Test Results

| Creativity               | Sig.  |
|--------------------------|-------|
| Learning Achievement     |       |
| High                     | .098  |
| Low                      | .056  |

Based on table 3, it can be seen that the high category has a sig. value of 0.098. Because 0.098 > 0.05, the high creativity sample comes from a normally-distributed population. For the low category, it has a sig. value of 0.056. Because 0.056 > 0.05, the low creativity sample comes from a normally-distributed population.

The homogeneity test in this research used the Levene test. The homogeneity test results are shown in Table 4.

### Table 4. Homogeneity-Test Results

| Learning achievement | Levene Statistic | Sig.  |
|----------------------|------------------|-------|
| Based on mean        | .155             | .696  |

Based on table 4, it can be seen that the significance value is 0.696. Because 0.696 > 0.05, it can be said that the two groups of samples come from the homogeneously-distributed population. The prerequisite tests show that all the data are normally distributed. Therefore, the statistical test used is using the parametric statistical test.

One-way variance analysis was used because this research aimed to find out the differences in the effect of the independent variable on the dependent variable. The results of the statistical test are shown in table 5.

### Table 5. Statistical Test Results

| Learning Achievement | F     | Sig.  |
|----------------------|-------|-------|
|                      | 43.546| .000  |

The result indicated by Table 5 is that the sig. value is 0.000. The hypothesis in this research is: Ho: there is no effect of the students’ learning achievements on the high and low creativity; and H1: there is an effect of the students’ learning achievements and the high and low creativity. The decision-making criterion of the statistical test used is that Ho is accepted if the sig. value is > 0.05. If seen from table 5, it shows that sig. value is 0.000 < 0.05. Because Ho is rejected, it can be stated that there is an effect of the high and low creativity on the students’ learning achievements. Based on this analysis, it can be stated that the students who have high creativity have higher learning achievements with a mean of 82.48 than those who have low creativity with a mean of 65.91.

Based on the description above, creativity has an effect on the students’ learning achievements. This agrees with the results of the research from Restanti, Vahlia, and Deta stating that students with high creativity have better learning achievement than those with low creativity [1,18-19]. Students who have high creativity tend to have a high enthusiasm in learning, independent in thinking, broad mind, have bright ideas to solve problems meaning that they have many alternatives to solve a problem, a high imagination, ability to make definite decisions and spirit to achieve something tirelessly [26]. These traits can be integrated in students to provide a solid foundation in achieving better achievement results.
Students who have low creativity tend to be passive, very dependent on other students, easy to give up, lazy, and not to have a strong stance and ideas in solving problems that their learning achievements are low.

Creative students have strong characters in terms of individual motivation, scientific uncertainty, self-confidence, persistence, flexibility and good cognitive flexibility and relatively high intelligence [20-21]. Rhodes' considered creativity as "four p's of creativity; person, process, press, product "[22]. The definition that illustrates that creativity is related to the creative person that involves the creative process, and is supported by encouragement (press) from the environment, and will produce creative products. Creativity in terms of "person" shows the potential of creative power that exists in each person. Creativity as a "process" can be formulated as a form of thinking where individuals try to find new relationships, get answers, new methods or ways of dealing with problems. Creativity as a "press" that comes from individuals is in the form of strong desires and motivations for creation. Creativity in terms of "product" is everything that someone creates as a result of his personal uniqueness in interaction with his environment [23-25].

When someone has creativity in solving a problem, divergent thinking produces many ideas that are useful in solving problems. In creative thinking two parts of the brain will be very necessary. The balance between logic and creativity is very important to bring up new ideas or concepts as a result of a combination of ideas that already have. If one puts too much logical deduction, then creativity will be ignored. Thus to create creativity, freedom of thought is required and not under control and pressure.

Based on the description above, then this creativity needs to be considered and developed in learning especially science learning. In science learning, creativity is needed by students to find various alternative answers or ways to solve problems given in the learning process.

4. Conclusion
Based on the research that has been done, it is concluded that high and low creativity affects students’ achievements. Students who have high creativity have higher learning achievements than those who have low creativity.

In designing learning, it is necessary to pay attention to the students’ creativity as one component to achieve 21st century skills so that learning becomes a supporting tool for the students to master 21st century skills. The results of this research can be used as a reference for similar research with different subjects. This research can also be developed by adding other variables so that the knowledge study is deeper.

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