The creativity of Prospective Teachers in Mathematical Patterns Problem Solving Based on Emotional Intelligence

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Abstract. Creativity is the ability that must be possessed by teachers in order to stimulate the creativity of their students. Teachers must also have emotional intelligence because emotional intelligence has a positive relationship with creativity. This research aims at describing the creativity of prospective teachers in mathematical patterns problem based on emotional intelligence. The research method used was a qualitative method. Three prospective teachers, representing each type of Goleman's emotional intelligence types, were selected as the research subjects. The data were collected from the test of creativity, the mathematical patterns problem, and interviews. The prospective teacher's creativity is described based on the Torrance test of creativity. The results of this research revealed that, of the three categories of emotional intelligence, only prospective teachers who have self-motivation abilities that meet three indicators. He was able to make many solutions to the problem of mathematical patterns, was able to make variations on the solutions of mathematical pattern problems and was able to find unique solutions.

1. Introduction
Creativity has an important role in everyday life. In addition, creativity also plays a role in the progress of a nation. Creativity has the meaning of an ability to produce something [1] or find solutions to problems. There are four design of creativity task namely fluency, flexibility, originality and elaboration. For assessors who are not creativity understanding about indicators of elaboration, Torrance's recommendation is to use only three namely fluency, flexibility and originality [2]. Several studies, especially in mathematical research, many use only three indicators to know creativity or measure creativity [3] [4] [5].

Furthermore, if viewed from GCI [6], Indonesia's creativity index was still far below Thailand. Though Indonesia first developed than Thailand. Therefore, creativity enters in one of the goals of national education [7].

Schools that are an important part of the world education is expected to realize the goal of national education. The role held by this school is then submitted by the teachers. So it can be said that teachers have an important task to stimulate the creativity of learners. But the first teacher must have the creative ability as well.
The results of Vale's research revealed that the creative dimensions of teachers are still on the dimension of fluency and slightly on the flexibility dimension [3]. Based on this, it is important to know how the creativity of the prospective teachers.

There are various ways to find out how the creativity. One of them through the provision of problems that have many solutions [8] [9]. The problem in mathematics that can be used in the research was the mathematical patterns problem. In general, the pattern is identical with a result of creation or creativity. But in mathematics patterns are used as a tool to provide an understanding of mathematical concepts [4] [10].

Speaking of creativity, it must also pay attention to the matter of emotional intelligence. Emotional intelligence is the ability to reduce emotion, emotional control, the ability to use humor and play in challenges, and the ability to deal with conflicts in a positive and confident [11]. A person with good emotional intelligence can create a creation rather than a person who lacks good emotional intelligence [12]. Emotional intelligence consists of two aspects namely personal skills and social skills [13]. This study chooses to use the emotional intelligence of personal skills including self-awareness, self-control, and self-motivation. Self-awareness is knowing what is being felt in a condition that is being experienced and using it as a guide in making decisions for yourself. Self-control is overcoming emotions in such a way that positively impact the execution of tasks and able to return from emotional stress. Self-motivation is using the deepest desire to move and guide toward the goal, helping to take the initiative and act very effectively and to endure failure and frustration [14]. Because the problem used in this research is a problem that must be solved alone.

Based on this, this study discusses how the creativity of prospective teachers in making solutions to mathematical patterns problem based on emotional intelligence.

2. Method

The method used in this study was a descriptive qualitative approach to know how the creativity of prospective teachers in making solutions to mathematical patterns problem based on emotional intelligence. Especially personal skills namely self-awareness, self-control, and self-motivation.

| Categories         | Definitions                                                                 |
|--------------------|-----------------------------------------------------------------------------|
| Self-awareness     | knowing what is being felt in a condition that is being experienced and using it as a guide in making decisions for yourself |
| Self-control       | overcoming emotions in such a way that positively impact on the execution of tasks and able to return from an emotional stress |
| Self-motivation    | using the deepest desire to move and guide toward the goal, helping to take the initiative and act very effectively and to endure failure and frustration |

The first step was to choose 3 research subject in a 6th class at a college in Jombang by giving a test of emotional intelligence. Furthermore, the three subjects were given problems of mathematical patterns and asked to make many solutions to the problem.

Solutions created by the subject were used to determine the creativity of the subject by using Torrance version of creativity indicators including fluency, flexibility, and originality. Finally, researchers conduct interviews with each subject. Because this research uses Torrance's creativity indicators, the highest creativity was owned by subjects that meet the indicators of originality.

| Table 2. Torrance’s Indicator Creativity for This Research |
| Indicators    | Definitions                                                                 |
|--------------|-----------------------------------------------------------------------------|
| Fluency      | the number of solutions that are true.                                      |
| Flexibility  | variation of strategy or in this research was a variation of pattern form which was represented in the form of a mathematical statement. |
| Originality  | unique solution.                                                            |

3. Result
The problem of mathematical pattern
1. Find a different way to calculate the sun in the image below. Then express the way that you've found the pattern and write down the mathematical formula.

![Sun Image]

2. Make a variety of sequence. Where the second term of each sequence that you create is to be of the form below.

![Sequence Image]

3.1 Self Awareness
For the subject of this category when looking at the problem first, the subject decides to focus and maximize the ability to work on problems was mastering, in this case, was the first mathematical problem. As for the problem of the second mathematical pattern which is not a problem that the subject was mastered, subject to completing it in the run-up time. So the subject can only create solutions that are much less than the second problem.

![Problem Image]

Figure 1. For the second problem, the subject did not fulfill all indicators of creativity.

For the creativity side, the subject meets two indicators of creativity for the first problem of fluency and flexibility. Fluency was seen from the number of solutions made by the subject. Flexibility is seen from the variation of representation. The subject does make many solutions to the first problem but there are only two variations of representation that can be found in the solutions made by the subject ie the representation in which it uses addition and representation operations in which it uses multiplication and addition
operations. As for the problem of the second mathematical pattern, the subject did not satisfy the indicator of creativity.

3.2 Self Control
For the subject of this category, the subject also worked on the mathematical problem he first mastered, namely the first problem. After the subject felt enough to solve the first problem, the subject solved the second problem. Subjects have enough time to answer the second problem. The difference in the number of solutions to the first and second problems was not as large as the difference in the number of solutions made by subjects who entered the self-awareness category.

![Figure 2](image1.png)

**Figure 2.** For the second problem, the subject fulfilled two indicators of creativity.
Fluency, and flexibility.

The solutions made by the subjects in this category satisfy two creativity indicators for the first problem of fluency and flexibility and two indicators for the second problem. For the first problem, the subject did not make the solution as much as the subject in the category of self-awareness but the solution that he made also has 2 variations of representation ie the representation in which there was the addition operation, and the representation in which there were two operations namely the addition operation and the multiplication operation. As for the second problem, the subject only fulfilled two indicators of fluency and flexibility because it was only able to make two solutions to the problem of the second mathematical pattern with different representation.

3.3 Self-Motivation
For subjects of this category, take the same actions as subjects in the category of self-control. But it has differences from the side of creativity.

![Figure 3](image2.png)

**Figure 3.** For the second problem, the subject fulfilled three indicators of creativity.
Fluency, flexibility, and originality.
For the first problem, the subject fulfills two indicators namely fluency and flexibility. For flexibility, the subject made solutions same with another subject. For the second pattern problem, the subject fulfills three indicators namely fluency and flexibility and originality. For fluency, the subject did make many solutions. For flexibility, the subject did make three variations and for originality, the subject did make a different variation with another subject in this research.

4. Discussion

From the research results can be seen that there are differences between the subject with self-awareness category, subject with self-control category, and subject with self-motivation category. The first difference was found in the results of solutions made by the three subjects. For the subject of self-awareness category more make the solution to the first problem but not able to make a solution to the second problem. As for the subject category of self-control and self-motivation able to create solutions for two problems in this research.

The second difference in creativity. Because this research uses Torrance's creativity indicators, the highest creativity was owned by subjects that meet the indicators of originality. For the first problem, the three subjects fulfilled the two indicators of creativity namely fluency and flexibility. As for the second problem, the subject with self-awareness category only fulfilled one indicator. Then the subject with self-control category fulfilled two indicators and the subject with self-motivation category fulfilled three indicators namely fluency, flexibility and originality. Based on this it can be said that the subject with the category of self-motivation has the highest creativity.

5. Conclusion

From the above description, it can be concluded that the subjects, who meet the three indicators of creativity on the first pattern problem, were the subject in the category of self-motivation. While the rest meet the two indicators of creativity that is fluency and flexibility. This shows that motivation was important in learning especially when want to give stimulus creativity to learners by way of giving a problem which has many solutions. In addition, the above description shows that average the subject was more creative when solving problems that are more subjects mastered.

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