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# Creative Thinking Level of Student in Measuring Situation Map Area through Multiple Solution Tasks (Case Study on Nganjuk State-1 Vocational High School)

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## ABSTRACT

This research intended to know the components of creative thinking which were owned by student and student creative thinking level in analyzing the measuring result of situation map area through multiple solution task. Type of this research was as quantitative descriptive which was conducted on 2015 in Nganjuk State-1 Vocational High School with the samples of 33 students. The instrument which was used in this research was a writing test and interview. The methodology consisted of data collecting by writing test and interview, and then analyzing the data by using descriptive analysis. There were 7 methods for measuring situation map such as 1) right angled coordinate; 2) trilateral circuit; 3) grid; 4) polar; 5) column; 6) perpendicular coordinate; and 7) digital/ CAD. Result showed that the students has the ability to analyze situation map area as follow: 31.3% by the first method, 75.8% by the second method, 57.6% by the third method, 66.7% by the fourth method, 18.2% by the fifth method, 0 % by the sixth method, and 6.1% by the seventh method.
**KEYWORDS**: Multiple Solution Tasks, creative thinking level, situation map area

## INTRODUCTION

Nganjuk State-1 Vocational High School is as one of the Vocational High Schools which has the expertise competence of survey and mapping. The principal subject for this expertise competence is to study geodesy. One of the materials in geodesy is to measure and analyze area. Therefore, the ability of measuring and analyzing an area becomes as an important thing. There are many methods in measuring area so it is needed a creative thinking level. Based on the simple observation which is carried out, evidently student experiences difficulty if there is required to analyze area with some methods, so it is necessary to be analyzed the student creativity level accurately. By knowing the student creativity level, it is easier to increase the student creativity. The rapid development of technology like this, there are many ideas or methods to solve a problem. The idea will need the high creativity level because there has not been a satisfied method in facing up the problem about technology increasing nowadays [1].

Creativity becomes as the precondition which determines for individual in increasing the life quality as presented by Lubis [2]. For facing up it, it is needed some importance competences which one of them is creativity [3][4].[5]. Creativity is as the peak of high level thinking and the skill is often assumed as one of the future competence [6] and it is very important for the graduates of Vocational High School who will work immediately after pass [7]. Someone creativity is also indispensable in job world based on the Career Center Maine Department of Labor [8] which mentioned that some competences that were expected in job world were self-esteem, motivation to achieve, basic skills, technical knowledge, skill in thinking which covered problem posing, problem solving, decision making, analytical thinking, and creative thinking. Someone creativity is not something that cannot be developed or trained, but creativity can be increased. Therefore, for increasing the creativity, someone has to be known formerly the creativity which is owned and then it can be planned the development. The process for knowing high or low level of someone creativity and the indicators of creativity, it is needed the truly valid and reliable instrument. Therefore, the measuring result can be truly reflected the creativity that is measured.

The problem is how high the creativity level and what creativity indicators which are owned by the student of Nganjuk State-1 Vocational High School? This research intended to describe the creativity level and indicators which were owned by the student of Nganjuk State-1 Vocational High School. In further, this research wanted to know the components of creative thinking which were owned by the students and student creative thinking in analyzing the measuring result of situation map area through the multiple solution tasks.

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## MATERIALS AND METHODS

### Creative thinking

Thinking is a moral ability of someone that is categorized as some types such as logical, analytical, systematical, critical, and creative thinking [9], while Suryabrata [10] described that thinking was a dynamic process that can be illustrated according to the process. Boyd and Goldenberg [11] expressed that creative was a thinking and working process that needed creativity which not had to go out from customs, but also in the customs. Meanwhile, Liu and Schonwetter [12] said that creativity had the hierarchy beginning from the creativity of expressive, technical, inventive, and innovative until the creativity was appeared.

Creative thinking is means as thinking by new way which is different from the existing one and it is needed the ability and bravery for free thinking regardless from the existing trap thinking [13]. By creative thinking, it will obtain the different perspective for producing the different solution. Liu and Schonwetter [12] mentioned that four aspects in creative thinking such as fluency, flexibility, originality, and elaborate, while Filsaime [14] mentioned as original name, adapted leadership, conformity, and contribution to domain. In the other side, Pirto [15] described that creative thinking for skill in the 21$^{st}$ century was included the usage of some idea creativity technic to create some new advertise valuable idea for improving and evaluating their idea. Boyd and Goldenberg [16] was also proved that thinking in the box can be learned through systematical inventive thinking. However, the originality is remained as the most difficult aspect for someone who is as new comer in creative training.

### Multiple Solution Test

Multiple solution tasks are a task which explicitly requires the student to find more than one solution method for a problem that is given [17]. The giving of multiple solution task is as task method which is suitable in producing the component criteria of creative thinking. In addition, multiple solution task also gives the chance to student in developing the knowledge that is studies ny understanding the given task.

Leiking and Lev [18] suggested an idea about solution space in multiple solution task which can be used for evaluating the creativity in solving problem such as conventional solution spaces, unconventional solution spaces, individual solution spaces, and collective solution spaces. Meanwhile Leikin [17] suggested by using scoring scheme for evaluating the creativity which was owned by student by analyzing the individual solution task which consisted of fluency, flexibility, and novelty.

### Measuring of situation map area

Mapping is a drawing work which is produced based on the combined ability from engineering and art science. Science is as knowledge with a set theory, while engineering is ability in implementing the theories; however art is an ability to produce the qualified presentation of good drawing [19]. Situation mapping is a measuring work and detail drawing of earth surface part (an area) which is generally drawn in big scale on drawing paper and it is mentioned as a map. Analysis and information of area is one of the basic information that is needed by designer from situation mapping product in the field. The area measuring is used for many interests such as land law, status change of land law, tax of the earth, etc. Area is as area number that is projected on the horizontal field and it is surrounded with is surrounded by boundary line.

There are 7 methods to determine situation map area. First, right angle coordinate is by determining area boundary point (P1, P2, P3, P4, P5, P6) which will be measured, then making line X and Y that is as the axis and ordinate from each point, and the next step is to measure the distance of P1 to P2, P2 to P2, etc. so there is obtain the pedestal and height of a triangle and trapezoidal which is each of them can be known the area number [20]. Second, trilateral circuit is by determining area boundary point (P1, P2, P3, P4, P5, P6) which will be measured, then to determine one of the area boundary point which will be used as the binder to the other area boundary point, and the next step is to measure the distance from the binder point to each area boundary point etc., so there is obtained trilateral circuit of triangle which can be known the area number. Third, grid method is by drawing area on the grid that has been known the area number of each grid in the scale and analyzing the number of grid which is enter to the area boundary point (however, this method has low accuracy). The scale that is used is 1: 1,000. It means that every grid has 100 $m^2$ of area number. Fourth, polar method is by determining area boundary point (P1, P2, P3, P4, P5, P6) which will be measured, then to determine P0 which is in the center of area boundary point, the next step is to measure the angle and distance from P0 to P2, etc., so there is obtained two distance and one angle form the triangle shape which can be known the area number. Fifth, column method is by drawing area on the columns which will be analyzed the length and width that has been determined and to analyze number of column which enter to the area boundary point (however this method has low accuracy). The scale which is used is 1: 1,000. It means every column has thw width of 10 m. Sixth, perpendicular coordinate method is by determining axis and ordinate from each point formerly (P1, P2, P3, P4, P5, and P6). Area number can be analyzed by adding up the multiplication result of axis and ordinate with the

certain pattern [21]. Seventh, digital method/ CAD is by drawing the situation with the scale that has been determined on the computer by using software card.

**Method**

This research is as a quantitative descriptive research which has been conducted on 2015 in Nganjuk State-1 Vocational High School, East Java Province of Indonesia with the samples of 33 students. The instrument which is used in this research is writing test in the general form, description for analyzing area number that has been validated on face as well as content validity by using judgement expert and the result has fulfilled the requirement of validity. Then the result of writing test is more studied by using the technique of depth interview due to the interview guide which has also been validated by the same method. Technique of data analysis that is used is descriptive analysis with the setting chronology uses expert solution space, to analyze individual solution spaces, and to analyze the creative thinking level. To determine the creative thinking level and the components of creativity which are owned by student is used the guide as follow:

**Table 1 The formulation of creative thinking**

| TBK | Component of creative thinking | | |
|---|---|---|---|
| | fluency | flexibility | Novelty |
| TBK 4 | √ | √ | √ |
| | - | √ | √ |
| TBK 3 | √ | - | √ |
| | √ | √ | - |
| TBK 2 | - | - | √ |
| | - | √ | - |
| TBK 1 | √ | - | - |
| TBK 0 | - | - | - |

Source: Siswono [9]
Note:
TBK : level of creative thinking
√ : eligible
- : non eligible

## RESULTS AND DISCUSSION

The student ability in analyzing the situation mapping area with kinds of manner can be described as in Table 2.

**Table 2 The distribution to analyze situation mapping area**

| Solution | Distribution of data | |
|---|---|---|
| | Number of student | Percentage |
| 1 | 11 | 31.3% |
| 2 | 25 | 75.8% |
| 3 | 19 | 57.6% |
| 4 | 22 | 66.7% |
| 5 | 6 | 18.2% |
| 6 | 0 | 00.0% |
| 7 | 2 | 6.1% |

Based on the table as above, it can be described that the student ability in analyzing situation map area as follow; there are 11 students (31.3%) use method-1; 25 students (75.8%) use method-2; 19 students (57.6%) use method-3; 22 students (66.7%) use method-4; 6 students (18.2%) use method-5; no student using method-6; and 2 students (6.1%) use method 7. The method that is no student uses it is method-6 such as perpendicular coordinate.

However, the methods which are frequently used are the method-1, 2, 3, and 4. These methods are often used because most of books that are used by the students as the references to discuss about the four methods. In addition, it is due to the examples that are used by the teacher in analyzing area number more uses one or some examples of the four methods. The method-5, 6, and 7 is seldom used even the method-6 is not used at once because there are only several books that discuss it and it is supported by the reading habits for the students of vocational high school are not too good. As there was expressed by Samani *et.al.* [6] that the reading habits of vocational high school students are needed to be increased. Therefore, it is quickly seen that the student creativity in analyzing area is still less creative by the many methods which can be used which have generally been taught.

The creativity components that are owned by the student in analyzing situation map area consists of fluency, flexibility, and novelty which are distributed as in Table 3.

**Table 3. Distribution of creativity component**

| Creativity component | Data | |
|---|---|---|
| | Number of student | Percentage |
| **Fluency** | 6 | 18.2% |
| **Flexibility** | 23 | 69.7 |
| **Novelty** | 4 | 6.1% |

Fluency is ability to measure area at least with 3 methods. Students of vocational high school who are able to use at least 3 methods in analyzing area are as 18.2% or 6 students. This number is less enough, it is due to the student's weakness in reading which construct their knowledge that is obtained. Flexibility is ability of student to measure an area with one method and the other different one more method. Numbers of students who have this ability are 23 students (69.7%). This percentage is high enough so it can be said that most of the creativity of vocational high school students just reach on the flexibility. However, novelty is ability of student to analyze area with one method that is seldom used or it is used not more than 15%. Number of students who have student creativity ability mainly in the novelty component is 4 students (4.1%). This percentage is very small because the ability of students find or use the method outside the common used method is very low. Based on the interview with the students, it is due to be indeed formally not to be demanded for analyzing with several methods. The demand is only to be able to analyze only by using one method and that is enough. As the study result of Nurlela and Ismayati [22] which presented that the motivation to self-develop the vocational high school students is very low moreover with the motivation in development theoretically.

Result of descriptive analysis about student's creative thinking level and the percentage is presented as in Table 4.

**Table 4 Distribution of creative thinking level**

| TBK | Number of student | Percentage |
|---|---|---|
| **4** | 2 | 6.06% |
| **3** | 4 | 12.12% |
| **2** | 17 | 51.52% |
| **1** | 0 | 00.00% |
| **0** | 10 | 30.30% |
| **Total** | 33 | 100% |

Note: TBK : level of creative thinking
Source: analysis result

Students on the TBK-0 (non-creative) indicate there is no eligible the three creative thinking components such as fluency, flexibility, and novelty such as 10 students or 30.30%. This percentage is high enough. Based on the interview, it is due to that the students are indeed satisfied enough by the ability to analyze area with one method. The students on the TBK-1 (less creative) are only eligible with one of the components such as there is no fluency (0.00%). It is almost the same with TBK-0. It is caused by that students are indeed satisfied to have ability to analyze area only with one method. Students on the TBK-2 (moderate creative) indicate that it is only eligible one of the creative thinking components such as flexibility and there are 17 students (51.52%). Based on the interview, it is obtained the result that there are many students who make effort to construct the reading result and their knowledge in analyzing an area. In further analyzing, the students who have TBK-2 are the students who have motivation to develop although the motivation is still needed to be increased again. The students on the TBK-3 (creative) indicate that there is eligible on two creative thinking components such as fluency and flexibility and there are 4 students (12.12%). This percentage is very small because the students' motivation for self-developing is indeed very less due to be supported by the reading book in library is also needed to be added and up-graded. The students on the TBK-4 (very creative) indicate that there is eligible for two creative thinking components such as flexibility and novelty and there are 2 students (2.06%). The main cause that numbers of students who have very creative TBK are not eligible is there is not eligible on the novelty component. However, the novelty component is demanded the reading habits and constructing the knowledge is high enough.

## CONCLUSION

Based on the result of descriptive analysis which is carried out above, it can be concluded as follow:

1. To analyze situation map area by using multiple solution tasks, the method that is not used at once by the students is the method-6 such as perpendicular coordinate method. However, the method that is the most used is the method-2 such as trilateral circuit. The reason of the two methods is affected by the examples that are used by the teacher.
2. The component of creativity that is as the most owned by the students is flexibility component and the less is creativity component of novelty. It is due to the novelty component is indeed as the most difficult component to be learned.
3. Level of creative thinking which is owned by the student is the most included on the enough categories.

## SUGGESTION

Based on the study result, it can be suggested several things that are related to the student creativity in measuring area as follow:

1. It is needed to be more intensively motivated about the importance reading and constructing the knowledge that has been obtained by giving the chance and compulsion to read for the student.
2. It is needed to be given the quiz which can increase the creativity level, sp the quizzes are not only in the forms of multiple choice and the description with one answer.
3. It is needed to add up and to up-grate the available books in the library and the books are also becoming as handbooks for the student.
4. It is given the tasks which support the increasing of creativity such as by making free paper with several sights seeing of discussion.
5. To increase the learning quality by the cooperative learning models of many kinds.

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