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Students Creative Thinking Profile as a High Order Thinking in the Improvement of Mathematics Learning

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Abstract: Creative thinking is the highest level of the kind of high order thinking. In observations at the schools in Indonesia, teachers overly equate all levels of achievement of students' creative thinking to obtain higher order thinking skill improvements in mathematics learning. This condition results in an imbalance in learning practices. Therefore, this research fills the gap of this imbalance by describing the student's creative thinking profile as a high order thinking skill in the improvement of mathematics learning. These results can contribute knowledge to educators to manage teaching strategies that can improve mathematics learning which refers to high order thinking skill for all levels of their creative thinking. This research is qualitative descriptive research. The subject were junior high school students in Malang, Indonesia. Data collection methods are tests, observations, and interviews. Data analysis is conducted by reducing data, present data, and conclusions. These research results are descriptions of student's creative thinking profiles as a high order thinking in mathematics learning improvement, namely students have problems planning problem solving; students take a break to make plans; identify the essence of the problem, provide original ideas, provide alternative problem-solving plans, combine previous ideas with problem questions; operate and implement their plans by creating various original solutions.

Keywords: *Creative thinking, high order thinking, junior high school, mathematics learning.*

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Introduction

High order thinking is the basic for someone to solve all of the problems. Staples and Truxaw (2012) shows that the practice of "high order thinking" mathematically of students can be used to solving a variety of mathematical problems. Pier et al. (2019) observe gestures and speech of students; and mention that students use high order thinking skills to complete mathematical tasks. High order thinking is a type of thinking that involves problem-solving, critical thinking, reflective, logical and creative thinking (Brookhart, 2010). Vijayaratnam (2012) states that high order thinking needs to be possessed and developed by students to generate original ideas in solving all problems.

Ramos et al. (2013) states that higher order thinkers can analyze, interpret, reason out, synthesize and evaluate information that is received, transmits or change that information totally into idea with context new or different. On the other hands, the various countries include this ability of high order thinking into the agenda of science education to discover new and original facts in solving various problems (Fensham & Bellocchi, 2013; King et al., 1998). The above opinion shows that the high order thinking skill is a basic component in education to produce new ideas/facts in solving the problems.

Singh et al. (2018) also viewed that high order thinking skills can construct new knowledge in problem-solving. Anderson et al. (2001) states that high order thinking is needed in the learning process that leads to the process of developing new knowledge. This is also in accordance with the opinion Brown and Coles (2012), Nguyễn and Nguyễn (2017), and Subanji (2015), the high order thinking skills helpful for students to apply previous knowledge and produce new and original solutions. In other words, high order thinking skills are very effective for students to produce new and original solution in each problem solving (Vijayaratnam, 2012). Therefore, the students must have a high order thinking skills to think productively in producing original solutions.

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The characteristics of the student who is said to have high order thinking skills namely the person has the skills to think about various of existing perspectives, make inferences, is able to build new and original ideas out of context and synthesize information (Brookhart, 2010). In the process of solving the problem by using the skills of a high order thinking, a person does not perform a systematic procedure for solving a mathematical problem with finite steps, tends to be complex, rarely produce solutions of choice (multiple choice), but produce various of original solution (ie, the solution is more than one/multiple) based on self-regulation (Resnick, 1987). Glassner and Schwarz (2007) states that a person's skills to produce an original solution is called the skills to creative thinking. Kralik et al. (2016) states that high order thinking that focuses on creative thinking can overcome challenges about complex problem-solving. Therefore, high order thinking skills based on creative thinking can produce benefits for persons in solving of a complex problem, so that persons with high order thinking skills that focus on creative thinking can solve problems by producing original solutions.

Krulik et al. (2003) states that creative thinking is the type of thinking with the highest level in "high order thinking" by producing a variety of new and original solutions. The individuals who have creative thinking skills tend to build new ideas and produce a variety of original solutions (Ritter & Mostert, 2017). King et al. (1998) explained that creative thinkers in high order thinking always use the basic principle of "new situation", original, select information that is relevant in the problem, connect that information with previous knowledge experience and form new information. The above statement shows that creative thinking is an important aspect of " high order thinking" so further research needs to be done about the description of high order thinking profiles based on the students' creative thinking in solving questions from open-ended problems.

Open-ended problems questions are very effective research tools in enriching or expanding of students' knowledge rather than closed-ended problems questions because open questions encourage students to answer various original solutions freely (Arnon & Nirit, 2009). This open-ended problem requires students to understand the problem and also think about how to reach conclusions that lead to new knowledge discoveries (National Council of Teacher Of Mathematics, 2000). Brookhart (2010), and Forthmann et al. (2019) states that open-ended problems can encourage creative thinking of students from the highest level in high order thinking to build original ideas. Therefore, teachers or students need to build new knowledge by applying this open-ended problem. The open-ended problem in this paper is a problem that encourages the person to think of various perspectives of problems and find a variety of new and original solutions.

High order thinking skill in learning needs to be possessed by educators to improve and develop high order thinking of students in each institution of higher learning (Nagappan, 2010). Students need to improve their high order thinking skills to overcome difficulties in generated new ideas and creative (Yee et al., 2012). So, creative thinking plays an important role in mathematics learning which can improve student's high order thinking. Creative thinking is a type of high order thinking with the highest level, because creative thinking is focused on the process of producing various original ideas in solving complex problems (Krulik et al., 2003). This condition encourages educators to provide various of learning strategies that can improve students' high order thinking (King et al., 1998).

However, research Zohar and Dori (2003) states that many teachers do not help the achievement of students' creative thinking that is low to find new and original ideas with their high order thinking skills. This argument shows that the teacher overly equates all levels of the achievement of students' creative thinking (low, medium, high level) in producing original ideas. This condition results in an imbalance in the practice of high order thinking learning from various levels of creative thinking. Therefore, this research fills the gap of this imbalance by exploring and describing the student's creative thinking profile as a High Order Thinking in the mathematics learning improvement.

Methodology

Research Design

This qualitative research is research with a descriptive explorative approach. It is called as a research of descriptive because the researcher conducts an analysis at the descriptive level, namely analyzing and conveying detailed descriptions of the facts experienced by individuals or scenes in a particular process or activity (Creswell, 2015). It is called as explorative descriptive research because this research is only limited by the process of exploring about positive phenomena that exist and taken in exclusion from an experience of a person or group (Poerwandari, 1998). This research aims to describe the student's creative thinking profile as a High Order Thinking in the mathematics learning improvement.

Material

The data of this research are written answers to the answer sheets and argument of student mouth obtained by the use of test instruments from mathematical problem questions about plane figure (geometry) and interviews. The mathematical problem questions in this research are open-ended question that challenges students to produce a variety of original and creative alternative solutions (see Figure 1.a). Data obtained from interviews aims to test data credibility. The process of testing the credibility of qualitative data in this research uses a type of communicative credibility, namely the researchers reconfirm his data-and-analysis to the subject related to their responses when solving problems through interview activities.

Research Subject

The subject of this research consisted of three people. These three people are students from SMP N 08 Malang and SMP N 01 Turen Malang. Subject are chosen with several criteria, namely (1) student of junior high school with ages 13 to 15 years, (2) students have received the plane figure (geometry), (3) students can communicate or convey the results of their thought processes both in writing and verbally in daring communication, (4) students are able to demonstrate their high order thinking skills when solving of mathematical problems by producing a variety of original and creative alternative solutions.

Research Procedure

This research was conducted in several procedures. The first procedure begins with selecting 98 subjects of junior high school with aged 13 to 15 years who can convey their thoughts both in writing and verbally in Daring (e-learning in Zoom Application). The selection of the subject of this research was the result of recommendations from their class teacher. The subject is given a mathematics problem (test) about plane figure according to the schedule given by the class teacher from each school. Based on the solving of the problem, 31 of the 98 subject who demonstrated high order thinking skills based on their creative thinking (students were able to produce a variety of original solutions) were chosen.

Of the 31, 3 students were chosen because the response from these three students represented the response of 31 students in the process of plane figure (geometry) problem solving. The first subject (S1) represented three students with a level of creative thinking "high", the second subject (S2) represented eleven students with a level of creative thinking "moderate", and the third subject (S3) represented seventeen students with a level of creative thinking "low". The profile of high order thinking in this research is based on the level of students' creative thinking. Lince (2016), and Shriki (2013) states that creative thinking is the skills of students to produce new and original solutions. Therefore, the profile of high order thinking of students is based on how students produce original solutions. The characteristics of the research subject are shown in Table 1.

Table 1. The characteristics of the research subject

Subject Initials	The number of students who represent the creative characteristics	Subject Characteristics	Creative thinking Level
S1	12	Students are able to solve problems and make more than four new and original solutions.	High
S2	16	Students are able to solve problems and make 3-4 new and original solutions.	Moderate
S3	13	Students are able to solve problems and make 2 new and original solutions, according to the request in the problem.	Low

Based on Table 1, the three subjects were interviewed regarding the reasons for each response that described high order thinking profiles based on their level of creative thinking when solving of the problems. This interview activity aims to test the credibility of the data. This data is then analyzed. Students' mathematics learning practice is carried out online (Zoom meeting application). Mathematics learning practice will provide an overview of the students creative thinking profile as higher order thinking in improving mathematics learning. Documentation of students' mathematics learning practices describing creative thinking profiles is shown in Figure 1.

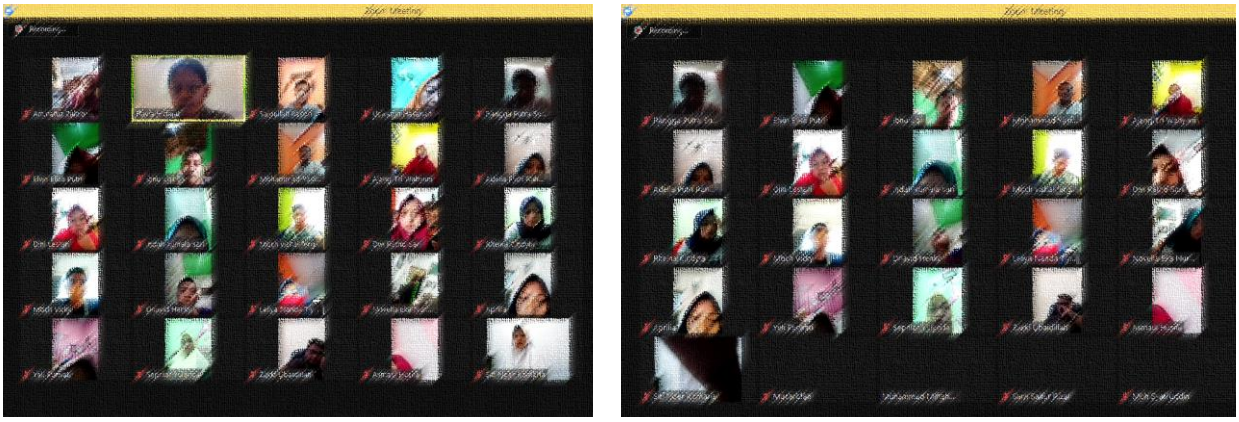

Figure 1. Student's mathematics learning activities

Figure 1 shows mathematics learning activities through the zoom application. Each student must turn on the camera and show his face during mathematics learning. Students must respond to learning mathematics to find out the profile of students' higher order thinking.

Method of collecting data

Data collection was conducted by several methods, namely test, observations and interviews. Tests are conducted to identify students' responses in solving of the problems. Test validity is proven by content validity through expert judgment by calculating the Aiken index (Gregory, 2015). The expert judgment in this study were three lecturers of mathematics education. The results show 0.83 with high validity criteria. The reliability of the test is proven by testing on students on a small scale. the reliability coefficient with Cronbanch Alpha is 0.7983 < 0.6. At the solving of the test, the researcher observes the expressions, behaviors, and motion of the students with direct observation and indirect observations (observations indirect with videos and voice recorders). The implementation of the test and observation aims to determine the subject with a high order thinking profile based on the level of creative thinking when solving of mathematical problems. The subjects were interviewed regarding their responses when solving of mathematical problems (tests). Interviewing to test the credibility of data obtained from tests and observations related to descriptions of high order thinking profiles based on the level of creative thinking of the subject. Data from tests, observations, and interviews were analyzed in the next stage.

Data analysis

Data with good credibility is used to describe the profile of high order thinking students based on their level of creative thinking in solving of mathematical problems. The implementation of data analysis in this research consists of three stages, namely (1) reducing data by selecting important parts needed and eliminating unnecessary or unimportant parts; (2) presenting data by processing, grouping and interpreting data that has been reduced into seven stages that describe the profile of high order thinking students based on the level of creative thinking when solving of the mathematical problems; (3) making conclusions. The reliability of analyzing technique in this study uses member checking techniques (Creswell, 2015), namely, the data is showed to the subject so that the subject checks the accuracy and resonance of the data based on his experience.

Results

First Subject (S1)

The first subject (S1) shows a creative thinking profile with a level of "high" through a series of his responses in solving the problems. The series of responses is shown from questions and statements students about the information in the problem question, because he feels strange or there is something wrong with the problem. The subject experiences difficulties/problems in understanding the new problem questions before he writes the solution on the answer sheet.

S1 : Miss, what does this question mean?

P : Why do you say that?

S1 : I never knew this plane figure (plane figure in problem question).

P : How do you not know this plane figure? Is there something wrong?

S1 : I'm confused ...

P : Why?

S1 : I don't know what formula will be used to determine the area of this plane figure.

P : Have you not been taught about the area of the plane figure?

S1 : Already miss, but ... (S1 are quiet for a moment)

S1 : In this question, it is known that the length of the side BC is 8 cm, the length of the side AF = CG is 5 cm, the length of the side DE = EF = DG is 6 cm.

P : Then, what will you do next?

S1 : Hmmm ... (Students are silent for a moment)

S1 take a few breaks 1-2 minutes to determine the next step of problem-solving. Futhermore, S1 spontaneously give new ideas with a statement directly and verbally.

S1 : Oh yeah ... this plane figure can be cut into the simpler plane figure.

P : What do you mean?

Students then explain their statements in writing and verbally.

S1 : (1) I will cut this main plane figure into a few plane figure pieces; (2) first, I cut this main plane figure into two shapes, namely the trapezoid-ABCG and the square-FEDG; (3) I add the point-H to the line segment BC that is parallel with point-F; and then; (4) I divide this main plane figure into a trapezoid-ABHF and rectangle-EHCD; (5) I divide this main plane figure into trapezoid-ABHF, rectangle-HCGF, and square-FEDG; (6) I add the points-I to the line segment of the BC that is parallel with the point-K, where the point-K is the midpoint from the line segment of DE and then (7) I divide this main plane figure into a parallelogram-ABIF, trapezoid-ICGF, and square-FEDG; (8) I divide this main plane figure into a triangle-BCG, triangle-ABG, and square-FEDG; (9) I add point-J to the line segment AF that is parallel with the point B; and (10) I divide this main plane figure into triangles-ABJ, rectangles-BCGJ, and squares-FEDG; (11) I divide this main plane figure into a trapezoid-ABHF, triangle-HCF, and trapezoid-FEDC; (12) I divide this main plane figure into parallelogram ABIF, trapezoid-EFIK, and rectangle-KDCI.

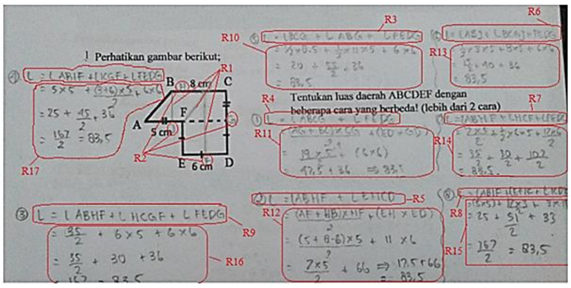

Figure 2a. The Result of The First Subject' Work

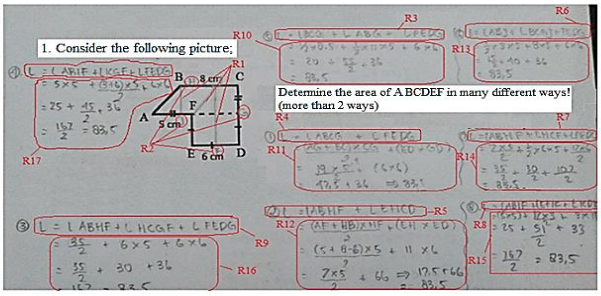

Figure 2b. Translate of The Result of The First Subject' Work

Figure 2 (a-i) shows that students use the formulas from the area of triangle, square, rectangle, trapezoid and parallelogram to determine the area of each piece of the plane figure. In addition, students also substitute the numbers (information in the problem question) into the formulas to determine the area of the main plane figure (questions) in different ways. In Figure 2 (j-k), students implement of the addition and multiplication operations in the use of the formula of the area of the plane figure to determine the area of the main plane figure (question). At the end of the problem solving, the student re-checks the results of his work before he collects the assignment.

Based on the results of the students' work in Figure 2, the first subject was able to use the concepts of triangle, square, rectangle, trapezoid, and parallelogram in determining eight different ways for the answer solution. The first subject was able to use a concept that was not thought of by classmates, namely the concept of parallelogram in finding a variety of answer solutions.

Second Subject (S2)

S2 shows a creative thinking profile with a level of "moderate" through a series of his responses in solving the problems. In these case, S2 first met with the problem. The problem experienced by S2 is shown by his behavior which often reads the problem repeatedly and subject ask a lot of questions.

S2 : Miss, what is this plane figure (plane figure in problem question)?

P : Why?

S2 : I have not been taught and introduced to this plane figure in class

P : Have you not been taught about the concept of plane figure (geometry)?

S2 : Already Miss, but I only taught square, rectangle, triangle, trapezoid. I do not know this plane figure and I cannot determine what formula is right for determining the area of this plane figure.

P : How do you not know this plane figure? Is the question wrong?

The conversation stops for about 5-10 minutes because S2 read the questions repeatedly.

P : What do you find or know about the information in this problem question?

S2 : There is an ABCDEF build, where the length of the side AF = CG = 5 cm, the length of the side DE = EF = DG = 6 cm, and the length of the side BC = 8 cm.

P : What will you do next?

In Figure 3, S2 draw or make a dividing line that cuts the main plane figure (question) into several pieces of plane figure, namely students cut the main plane figure (problem question) into two shapes, namely (1) trapezoid-ABCG and square-FEDG; (2) trapezoid-ABIF (Add point-I to line segment BC that is parallel to point F) and rectangle-ICDE; (3) trapezoid-ABKG (Adding point-K to line segment BC that is parallel to point K, where point-K is the midpoint of line segment DE), triangle-CGK, and square-FEDG.

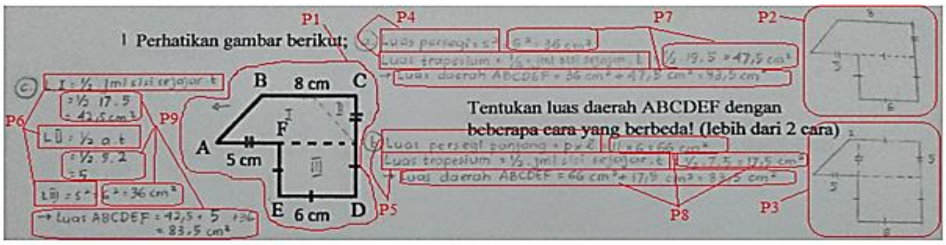

Figure 3a. The Result of The Second Subject' Work

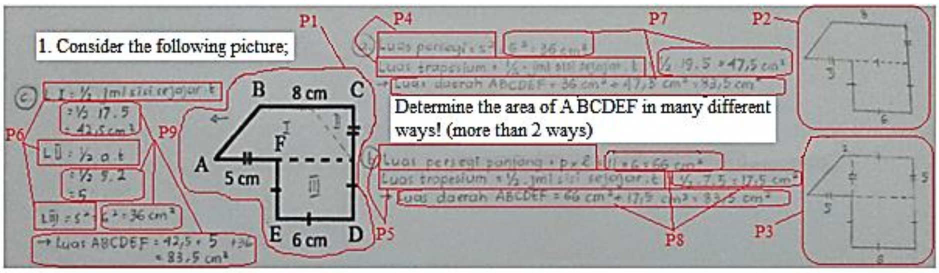

Figure 3b. Translate of The Result of The Second Subject' Work

Figure 3 (a-i) shows that S2 use the concepts from triangle, square, rectangle, and trapezoid area to determine the area of the main plane figure (questions). Students apply the formula from the four of plane figure area to determine the answer solution in three different ways. In Figure 3 (j-k), students substitute the numbers (information in the question) into the formulas and the implement of the addition and multiplication operations in the use of the formula from the plane figure pieces area to determine the area of the main plane figure (question).

Third Subject (S3)

S3 shows a creative thinking profile with a level of "low" in solving the problems. The problem of S3 is not much different from S1 and S2, namely students contemplating (mind-wandering) for some time while reading the questions repeatedly.

S3 : I don't know this plane figure (problem question). How can I determine the area of this plane figure?

P : Why do you say that?

S3 : I have never been taught to this plane figure.

P : Have you not been taught about the concept of plane figure (geometry)?

S3 : Already Miss, but I have never been introduced to this plane figure (question).

P : What information did you find in the problem?

S3 : the length of the side BC = 8 cm, the length of the side DE = EF = DG = 6 cm, and the length of the side AF = CG = 5 cm.

P : Then, what will you do next?

S3 : hmmm ... (Students are silent for a moment)

The conversation stopped again about 1-2 minutes, students spontaneously gave his arguments verbally.

S3 : ohhhh ... I know ..., this main plane figure (problem) can be cut.

P : What does " can be cut " mean?

Students then explain their statements in writing and verbally.

S3 : I will cut this plane figure into a few planes figure pieces, namely (1) trapezoid-ABCG and square-EFDG; (2) trapezoid-AFOB (Adding point-O to the line segment BC that is parallel to point F) and rectangle-EDCO.

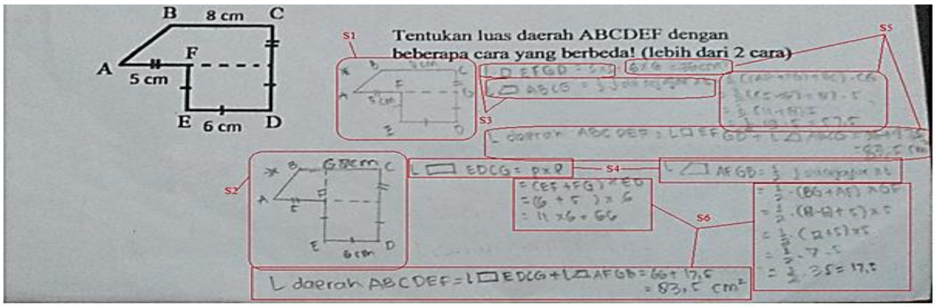

Figure 4a. The Result of The Third Subject' Work

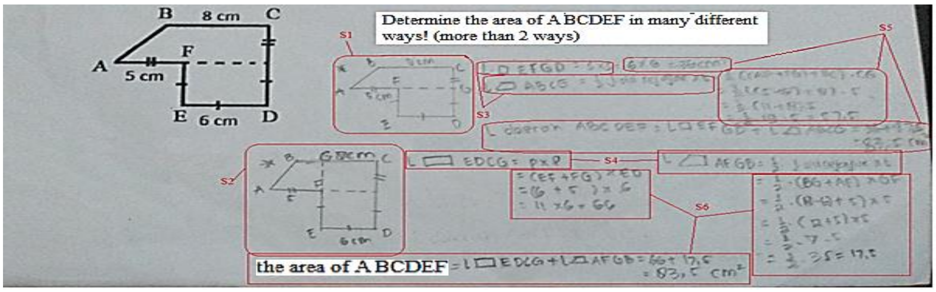

Figure 4b. Translate of The Result of Third Subject' Work

Figure 4 (a-i) shows that students only use the concepts from the area of square, rectangular, and trapezoidal to determine the area of the main plane figure (questions). In addition, S3 also apply the formula from the three of plane figure area to find the answer solution in two different ways. In Figure 4 (j-k), S3 substitute the numbers (information in the problem question) into the formulas and the implement of the addition operations and multiplication operations to determine the area of the main plane figure (question).

Discussion

In this research result, three of subject experience problems when solving of the plane figure problems in e-learning practice. The problem of S1, S2, and S3 are not much different, students are unfamiliar with solving non-routine problems, so subject are motivated to ask more questions to identify the problem. This is consistent with the opinion Attridge and Inglis (2015), and Ricks (2011) that problems can motivate someone to reflect and identify problems. Based on the results of interviews with subject, S1, S2, and S3 experiencing high confusion related to the understanding of the essence of the questions and uncertainties to determine the problem-solving plan, so students make a delay or take a few breaks to decide on the plan in solving this problem. This is in accordance with the opinion of Nestadt et al. (2016) that the feeling from high uncertainty or confusion can cause delays for determining decisions in planning the next problem solution. However, high confusion and curiosity can help students in planning and solving a mathematical problem (Leo et al., 2019). Comparison of the students who represent each of creative thinking characteristics in this research is shown in Figure 5.

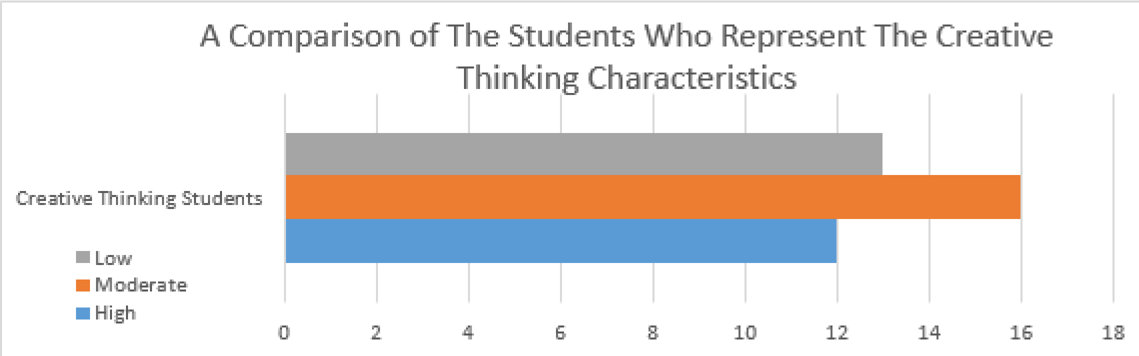

Figure 5. A comparison of the students who represent the creative thinking characteristics

A second stage from the creative thinking profile showed that three of students take a few breaks to think problem-solving plan. At this stage, S1 requires a faster time than S2 and S3 to reflect and understand the purpose of the problem. The process of "take a few breaks" is often called the incubation process (Sitorus & Masrayati, 2016). Leung and Lin (2018) states that the incubation process is a problem-solving process that refers to the discovery of new knowledge from one's personal perspective. Therefore, the process of "take a few breaks" is needed by someone in thinking about a plan to solve the problem and plan to find a new solution. At this stage, someone is not active in solving of the problems, but they reflect on problems, think constantly, and work to find new and original ideas (Gabora, 2002). Gu et al. (2019), and Lin and Wu (2016) said that the use of "time" is very necessary to bring up creative thinking of students so that students spend a lot of time for exchanging ideas and stimulating new ideas and right.

Third stage showed that students identify the essence of the problem. At this stage, the problems of the subject have not been resolved, so S1, S2, S3 make various efforts to find problem-solving solutions. This is in accordance with the opinion (Cavicchi, 2018), that someone can make any effort to overcome the problem that is confusing him. The effort of the S1 is to try to identify the problem by mentioning or detailing the information on the question so that S1 know more deeply the essence from the problem and can determine the problem-solving plan. This is in accordance with opinion’s (Dostál, 2015), someone needs to identify, prepare and define problem questions to determine information is needed in solving the problem. At this stage, S2 and S3 require intervention from researcher. The Various of intervention programs can provide many insights in optimizing problem-solving practices (Visscher et al., 2018). S2 and S3 are guided by researchers to re-examine things that are known or found in the problem so that students are guided to understand the problem and determine the steps to solve the problem. This is in accordance with the opinion Brunstein and King (2018), and Keevers and Treleaven (2011), that the intervention of other people can help someone in identifying problems and developing solutions appropriately.

The fourth stage showed that students form original ideas. At this stage, S1, S2, and S3 mention spontaneously and verbal that the main plane figure can be cut into several well-known plane figure shapes, so the subject formed a new idea suddenly based on the basic concepts of the plane figure that they have known. This is in accordance with the opinion of Thomas and Jung (2015), namely the formation of new ideas that appear suddenly is always based on the facts that exist. The original ideas of S1, S2, and S3 are not much different, namely, they use the basic concept of the plane figure that they have known for forming original plane figures. The formation of original ideas suddenly can lead students to the right solution. This is in accordance with the opinion (Solso et al., 2008), namely the formation of new and original ideas suddenly can be a bright path for students to lead to solving the right problem. Gillier et al. (2018) states that the formation of original ideas is a sign that someone has succeeded in understanding the problem, producing an original and appropriate solution. This condition provides the next research question, namely how to form new ideas that lead to solutions that are less precise or wrong? What is the classification of the formation of new ideas based on the acquisition or finding an original solution?

At the next stage, students mentioned alternative of problem-solving plans. This fifth stage includes the activity of drawing or making a dividing line that cuts the main plane-figure (question) into several pieces of the plane-figure known by students. This is in accordance with the opinion of Attridge and Inglis (2015), and Zehavi and Mann (2005) namely the process of reflection from previous learning experiences in high order thinking is very useful for solving problems. Based on the results of the brief interviews and student's work in Figure 2 (1-10), S1 uses his experience of the concepts of triangles, squares, rectangles, trapezoidal and parallelogram to plan solutions of problem. The plan solutions used to determine area of the main plane figure (question). In Figure 3 (1-10), S2 uses four concepts of triangle, square, rectangle, and trapezoid to plan problem solving. In figure 4 (1-10), S3 only uses three of the concepts of square, rectangular, and trapezoidal to plan problem solving. At this stage, the experience of the S1 is more and varied than the experience of the S2 and S3, so the level of high order thinking from S1 is higher than S2 and S3. In addition, S2 has a higher level than S3. This is consistent with arguments of Gu et al. (2019), and Henriksen et al. (2017), that if students have more experience, the level of students' creative thinking is higher to produce original solutions.

The Sixth stage showed that students synthesize of ideas from previous experiences with problems questions. In Figure 2 (a-j), S1 reflects and uses his experience about the formula of the triangles, squares, rectangles, trapezoidal, parallelogram area; and then synthesize this experience on the plan that he made in the fifth stage. In Figure 3 (a-j), S2 synthesizes his experience (triangle, square, rectangle and trapezoid area) with her plan. Figure 4 (a-j) shows that S3 synthesizes of square, rectangle, and trapezoid area on her plan. Based on three of these subjects, it can be concluded that the subject synthesizes the experience that they have with the problem to find original solutions. This is in accordance with the opinion Amrin et al. (2018), Rodgers (2002), Subanji (2013), namely the process of synthesizing the series of ideas from previous experiences can build new ideas to finding the original solution. Attridge and Inglis (2015) also states that students need to compose, rearrange, formulate activities, model the results of previous reflections to plan the formation of new concepts.

The last stage in this research is the operation and implementation of a problem solution plan. This is consistent with the opinion Ricks (2011), and Rodgers (2002) that the final stage in solving the problem is shown in the implementation of the problem-solving plan. Djasuli et al. (2017) also argue that students need to test and investigate the truth of the solution. The implementation of the problem-solving plan is shown in the students test results. At this stage, the subject performs three steps, namely (1) subject determines what information will be used to make the problem-solving plan, namely the numbers that show the length of the sides from plane figure; (2) substitute the information obtained (numbers) into the formula of plane figure area; (3) perform operations of addition or multiplication to determine the value of the main plane figure area (question). Three of these stages are shown in the work results of S1, S2, and S3 in Figure 2 (j-k), Figure 3 (j-k), and Figure 4 (j-k).

The responses from S1, S2, and S3 provide different creative thinking profiles in mathematics learning improvement. The creative thinking profile of S1 shows that S1 is able to solve problems and follow the seven stages above by making more than four original solutions. S2 is able to solve problems and follow the seven stages above by making two to four original solutions. Meanwhile, S3 follows the above seven stages but only makes two original solutions that are in accordance with the request in the problem. In this research, the researcher found questions for the next research related to high order thinking, namely "How do your manner change the students creative thinking profile from a level of "low" to "high"?"

Conclusion

The conclusion in this research shows descriptions of student's creative thinking profiles as high order thinking in mathematics learning improvement based on different levels, namely (1) students initially experience problems because students are unfamiliar with non-routine questions, and confused in determining problem-solving plans; (2) students take a few breaks to just think of the plans; (3) students identify the essence of the problem, where subject with levels of creative thinking "moderate" and "low" need interventions to be able to identify problems; (4) students with three of different levels form a new and original idea, (5) students provide alternative of the plans; (6) students with three of different levels synthesize ideas by combining previously owned ideas with problems questions; (7) students operate and implement the problem-solving plan by making more than four of original solutions.

The practical implication of this research is being able to contribute knowledge to educators related to manage teaching strategies that can improve mathematics learning which refers to high order thinking skill for all levels of their creative thinking, notably in online learning activities. This process of managing to teach practices strategies can improve or construct students high order thinking for their different level of creative thinking in each mathematical problem-solving. Therefore, the student's creative thinking profiles as high order thinking skill is very important to discuss in the practice of student's mathematics learning.

Recommendations

Therefore, another question arises for future research development recommendations, namely how is creative thinking profiles of secondary school students (high school) or college students of a variety of different ages. Another recommendation for further research is how is the profile of students' high order thinking in mathematics learning other than geometry topics?

Limitations

This research has explained the student's creative thinking profiles as high order thinking skill in mathematics learning improvement based on different levels of Junior High School students in online learning activities. However, this research also has limitations namely, subject of this research were only junior high school students with aged 13-14 years. In addition, the topic of learning mathematics in this study is limited to the topic of geometry.

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