The analysis of algebra creative thinking skill based on strong mathematical habit of mind

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Abstract. This research aimed to describe the student’s creative thinking skill of two variables on linear equations system viewed from the strong mathematical habit of mind. The indicators of creative thinking skill include fluency, flexibility, and novelty. This research was a qualitative descriptive study. The subjects of this research were 7 students of IX A class at SMP N 4 Playen Gunungkidul. The data collection methods were a questionnaire, test, and interview to discover the students who had strong mathematical habit of mind. The research instruments had been validated by using triangulation method. The result showed that there were 2 students (28.58%) conformed with fluency indicator (it was categorized as less creative), there was 1 student (14.28%) conformed with flexibility indicator (it was categorized as adequate creative), and there were 4 students (57.14%) namely 3 students conformed with fluency and flexibility indicator and 1 student conformed with the indicators of fluency and novelty (it was categorized as creative). The analysis showed that the students who had strong mathematical habit of mind still there in the students who had less creative. There was no students who had strong mathematical habit of mind in the students who had very creative thinking skill. This was caused by the difficulty of students in turning contextual questions into mathematical sentences and lack of confidence in using various ways to solve the problems. The students tended to use some procedural steps in solving the problems. Therefore it was necessary to emphasize a good understanding of algebra concept and the practice of varying questions so that the students were not mistaken in using algebraic concepts and had no difficulty in solving non-routine algebraic questions.

1. Introduction
Mathematics has an important role in the development of science and it is always used in daily activities. Besides, mathematics is very important to learn, mathematics is considered as a basic of other sciences. We know that mathematics is often associated with the calculations and number. This is a crucial situation because we certainly involve mathematics in our daily lives. To be able to have a good mathematical skill, it requires to have a good understanding of algebraic concepts. It is always related to the nature of operations and structure that it is used to solve the problems [1]. The importance of understanding algebraic concepts needs to be emphasized to the students because the students do not have any experiences to know the algebraic concepts in using and connecting some various concepts to solve the problems using mathematical skill. To be able to have a good concept, divergent thinking is really needed by the students [2]. Divergent mathematics thinking is a thinking that used in various skills to combine the various concepts and mathematical ideas in solving open-ended problems. Therefore, creative thinking skills are needed in learning mathematics. The students’ creative thinking skills are needed to solve some problems that require seriously and deep thinking skill related to solve open ended mathematical problems with non-routine types of problems [3]. The importance of learning oriented to the creative thinking skill, one of them such as to solve the problems from different perspectives. Besides, creative thinking can train the students to find the solutions from various points of view [4].
Creative thinking is one of high-level thinking skills that are used to deal with the industrial revolution 4.0. The skill to think in standard problem solving creatively is proposed by (National Council of Mathematics Teachers) NCMT. One of them is to implement and adjust some various strategies in solving the problems [5]. Mathematical creative thinking produces some products, such as mathematical creativity that produces the novel solutions. It can be given to the problems and it makes the old approaches become the new approaches. In mathematical creativity, the students are required to be able to come up with many ideas in solving the problems, discover many alternative answers from different points of view, be able to make unusual combinations of solutions, and be able to enrich and develop an idea [6]. Mathematical creative thinking skill is used to think in solving problems with a new ways or combining mathematical ideas with other conceptual abilities to expand the students’ mathematical understanding, the more ways that conducted by the students to solve a problem, the more creative someone with an answer note must match the problem referred to [7]. To discover the creative thinking skill of each student in solving mathematical problems, it can be seen from three key components that is assessed in creativity using Torrance Test of Creative Thinking (TTCT) including fluency which refers to the number of ideas that is created in response to an order, flexibility which refers to the change in approach when responding to an order, and novelty which refers to the authenticity of ideas when responding to a command [8].

Creative thinking skill is considered as one of keys success in the modern competitive environment. Creative thinking skill is emphasized by learning programs. But in the fact, the students only accept learning mathematics procedural learning without getting learning that encourages the students’ creative thinking skill [9]. Creative thinking is always associated with two factors, namely cognitive factors and non-cognitive factors in solving the problems [10]. The non-cognitive factor is the students’ attitude in responding when faced with a problem. Both of them have a positive relationship between attitude and cognitive factors in mathematics learning [11]. The good attitude is very necessary in learning mathematics, one of them which are to create an independent and creative person. The students can respond and find the solutions from any complex problem well. Specifically, this is related to the students’ thinking such as considering several ways to represent mathematical ideas, linking ideas, making generalizations, and understanding mathematics in a structured way [12]. To be able to do this act, it requires a high position and intelligent behavior or it can called by habit of mind. Habit of mind is used to encourage the students to solve problems [13]. Habit of mind has two dimensions, namely describing the ways of thinking and doing habits that reflect to the behavior of thinking in solving the problems [14]. Besides habit of mind, it is very important to solve mathematical problems because it is one of the mathematical powers and one of abilities to think mathematically at a higher level [15]. The habit of mind influences the higher order thinking skill. If someone has good habit of mind, they must have a high disposition and intelligent behavior. This is because habit of mind is the highest levels of learning outcomes that is compared to the content, thinking skill, and cognitive skills [16].

Basically, every human being has habit of mind as an ability to control himself for responding the intelligent behavior which includes self-regulation, critical thinking, and creative thinking. It had been agreed by several researchers in psychology [17]. Besides, habit of mind is a habit that used in implementing the integrated mathematical steps in problem-based learning to improve the students’ creative thinking skill [18]. The results of other researchers showed that the students’ creative thinking skill was influenced by mathematical habit of mind in problem-based learning strategies. Then it was suggested in further research that some research is needed on the effect of mathematical habit of mind with problem-based learning strategies. It can improve the students’ creative thinking skill. It was also mentioned in a research that the results of mathematical habit of mind integration in learning model could affect the students’ mathematical creative thinking skill [19]. Besides good mathematical skills are also not only from strong habit of mind, but also from habit of mind at a weak, sufficient, and strong levels. This problem appears in the teaching mathematics make the researchers want to know why the habits of mathematical thinking at strong levels have the same mathematical thinking on the habit of mind at weak levels and quite specifically on their creative thinking skill.
2. Method
This study was a descriptive qualitative research. This research was conducted at SMP Negeri 4 Playen Gunungkidul in class IX A. The total of subject was 7 students that was categorized based on the students’ strong habit of mind. Data collection technique used was creative thinking test that was adjusted for some indicators. In-depth semi-structured interviews and questionnaires were prepared to discover each student habit of mind at strong level. The test that was given to the students was essay questions with a total of 3 algebraic questions on material system of two-variable linear equation system material. The researcher also gave questionnaire that consists of 50 items that had been developed by researchers and adjusted to each indicator of thinking habits, There were 16 indicators of thinking habit. Habit of mind indicators included never giving up, regulating conscience, empathy for opinions of others, thinking flexible and metacognitive, trying to work carefully, asking effectively, using old experiences for new experiences, thinking clearly, utilizing sensory devices to process data, innovate, enthusiasm in responding, dare to face risk, ridiculing, interdependent thinking, and continuous learning [16]. The test questions were validated by two UNS lecturers and one from Sarjanawiyata Tamansiswa University lecturer, while the questionnaire items were validated by two UNS Psychology lecturers. To find out the validity of test and interview data, the researchers used triangulation method by comparing test results and interviews with the same data sources.

The questionnaire was used by researchers to choose the students with strong mathematical habit of mind. The result would grouped into selected group as the research subject. Questionnaire consisted of positive and negative sentences and had four alternative answers, namely highly agree, agree, disagree, and highly disagree. For scoring each positive and negative statement in a row that was 4, 3, 2, 1 score. From the scores that were obtained then it would be converted into some grades and classified into five habit of mind levels, here the researchers only took the subject to the students with strong habit of mind. Based on the questionnaires distribution results in IX A class that consist of 25 students, it was obtained that there were 7 students had strong habit of mind, besides, there were 12 students included in the sufficient level and there were 8 students included in the weak level.

The results of students’ analysis in solving problems had been adjusted to the indicators of creative thinking skill. It described the students’ creative thinking skill based on strong mathematical habit of mind. Indicators of creative thinking skill consist of three aspects, including fluency (the students can solve problems using a variety of answers), flexibility (the students can solve problems using a variety of ways), and novelty (the students can solve problems in different ways than are commonly used)[8]. The ability level to think creatively in mathematics by Siswono was formulated as in the following table [20]:

| Level                          | Characteristics                                      |
|-------------------------------|------------------------------------------------------|
| Level 4 (Very Creative)       | The students are able to demonstrate fluency, flexibility, and novelty |
| Level 3 (Creative)            | The students are able to demonstrate fluency and novelty or fluency and flexibility |
| Level 2 (Adequate Creative)   | The students are able to demonstrate novelty or flexibility |
| Level 1 (Less Creative)       | The students are able to demonstrate fluency |
| Level 0 (Not Creative)        | The students are not able to show three aspects of creative thinking indicators |

3. Result and Discussion
3.1 Result
To measure the skill to think creatively, the researchers gave written tests of 3 essay questions that were adjusted to each indicator of creative thinking skill. This test was given to the students based on mathematical habit of mind, because not all the students with strong habit of mind had good creative thinking skill too. Strong habit of mind was obtained from filling out the mathematical habit of mind
questionnaire that had been given by the researchers. The results of questionnaire showed that 7 students had strong mathematical habit of mind. Then, the students were given creative thinking tests and in-depth interviews to find out the extent of students' creative thinking skill. The following results were obtained from the research:

Table 2. The results of students’ creative thinking skill levels based on strong mathematical habit of mind

| No | Students’ Initials | Indicators | The Level of Mathematical Creative Thinking Skill | Percentages |
|----|--------------------|------------|---------------------------------------------------|-------------|
|    |                    | Fluency    | Flexibility | Novelty |                                      |             |
| 1  | AM                 | √          |            |         | Less Creative                          | 28.58%      |
| 2  | AS                 | √          |            |         | Less Creative                          |             |
| 3  | MS                 |            | √          |         | Adequate Creative                      | 14.28%      |
| 4  | DS                 | √          | √          |         | Creative                               |             |
| 5  | AK                 | √          | √          |         | Creative                               |             |
| 6  | ASH                | √          |            | √       | Creative                               | 57.14%      |
| 7  | VN                 | √          |            |         | Creative                               |             |

Figure 1. The graphic of the students’ creative thinking skill levels results based on strong mathematical habit of mind

Based on the results in Table 2, it showed that not all of students with strong mathematical habit of mind had good creativity. From the table, it was found that the students still had less creativity (28.58%), because they were only able to work on 1 problem that related to the fluency indicator and 14.28% students are only able to solve the problems related to the flexibility indicator (it could be categorized as adequate creative). For the students who can meet the novelty indicator was one student and it could be categorized as creative. From the test results on the novelty indicator, students can complete when using the substitution method and the perimeter concept of the triangle well. However, most problems experienced by students in solving novelty indicators were due to the difficulties in using appropriate methods and lack of student confidence in trying to use known values to be combined with understanding other mathematical concepts.

3.1.1 Mathematical Creative Thinking Skill Test Questions
1. (Indicator: Fluency).
Determine the solutions set of equations system from $x + 2y = 2$ and $2x + 4y = 8$ for $x, y \in R$, Don’t forget to give the conclusions! (Provide more than one way to find the answers!)

2. (Indicator: Flexibility)
If we have two numbers, three numbers of the first number plus five in the second number, as the result are $-9$, then seven numbers of the second numbers plus five in the first numbers are $-19$, and three numbers of the second numbers equals four numbers in the first number plus 41. What is the value of the two numbers? (Provide more than one way to find answers!)

3. (Indicator: Novelty)
It is known that two right triangles with area ratio of the first and second triangles are 2: 1. If the height of the first triangle is equal to the base length minus 1, then the sum of the base length and height is 7 cm and the sides of incline and the circumference are 5 cm and 12 cm. How many area of the second triangle? (Provide more than one way to find answers!).

3.1.2 The Analysis of The First Subject’s Answers

The First Subject Interview Transcript

T : “What was the information that had you obtained from the questions number 3?”
S1 : “I was looking for the set of solutions, sir, so I was looking for $x$ and $y$ values of two equations then made a conclusion from that form of algebra.”

T : “How did you solve the problem?”
S1 : “By using substitution and graphic method Sir.”
T : “Why in substitution method, you could assume that the result did not have a solution? Try to explain it!”
S1 : “In substitution method, the value of $x$ is $2y - 2 = 0$, then the value of $x$ was substituted into the same equation, it gets $2; 2 = 0$. Then in graph method, the lines were not intersected because there was only one line drawn. Because the values of $x$ and $y$ were 0 and the graphic did not intersect, so the equation had no solution.”

T : “Could $2y - 2$ be counted?”
S1 : “Yes, sir, you could deduct it, for example $2y - 2$ was equal to $0y$ or equal to 0.”
T : “Was there another way to do it?”
S1 : “With elimination and combination methods, sir, but I was still confused about how to do it, sir.”
T : “Why did not you do numbers 2 and 3?”
S1: “I was confused, sir, I was changing the story problem into a mathematical sentence. And in question number 2, I was confused because there were 3 equations with 2 variables. In question number 3, I was confused which method that I must choose to do it.”

T: “Are you sure about the answer that you are working on?”
S1: “Yes, I am sure sir.”

Based on the results of tests and interviews, it could be concluded that the first subject could solve creative thinking skill tests related to the fluency indicators by using substitution and graphs methods. The students who could solve only one fluency indicator problem were 2 students and it could be categorized as less creative. The information obtained from the interview that the first subject was confused in completing using elimination method. The first subject also did not solve the problems related to the indicators of flexibility and novelty, on the questions that related to the indicators of flexibility, he was confused in using the combination of three equations to find the values of $x$ and $y$. While on the questions related to novelty indicators, the first subject had difficulty in using the right way to find the values of $x$ and $y$, he lacked of confident to implement the known values that be combined with the understanding of mathematical concepts that he knew in finding the values of $x$ and $y$.

3.1.3 The Analysis of the Second Subjects’ Answers

![Figure 3. The result of the second Subject](image)

The Second Subject Interview Transcript

T: “What was the information that had you obtained from the questions number 2?”
S2: “I was looking for $x$ and $y$ values from the story problems sir.”

T: “How did you solve the problem?”
S2: “From the story problems then I made into a mathematical model, obtained 3 equations. Then we looked for the values of $x$ and $y$ with substitution and elimination.”

T: “Why were the values of $x$ and $y$ in the substitution and elimination methods different?”
S2: “Because in the substitution method I used the third and second equations, whereas in the elimination method I used the first and second equations.”

T: “In the substitution method, there were two numbers, one of them contain variables, be able to calculate or subtract count operations?”
S2: “Yes, Sir, all you have to do is calculate the coefficient.”
T: “What is your opinion if the equation that was used was different, it would produce different values of \( x \) and \( y \)? Why don't you use some combination of these three equations to find the values of \( x \) and \( y \)? Is there any other ways besides what you are working on?”

S2: “Yes sir, from the results of my work, it was combining several different equations that would get different values of \( x \) and \( y \). I performed the calculation operation based on the equation sir, the substitution method was carried out by involving the third equation because the form was easy to do using the substitution operation and the other two equations, I did with the elimination method.”

From the results of tests and interviews, it could be concluded that in solving the questions that were oriented to creative thinking skill, the second subject could only solve problems related to the indicators of flexibility with more than one way of solving, namely by using substitute and elimination methods. There was 1 student who could complete this stage and it was categorized as adequate creative. From the results of tests and in-depth interviews, the information was obtained that the second subject understood the given questions and then build the requested mathematical model. The second subject did not solve the problem related to the fluency and novelty indicators. That was because the second subject did not understand the purpose of the solutions types in the two-variable linear equation system and lacks confidence in choosing various appropriate ways to find the values of \( x \) and \( y \) respectively.

3.2. Discussion

Based on the results of tests and interviews with students who had strong habit of mind, it could be concluded that the students could solve the test questions with more than one method of completion that in the students who had strong habit of mind did not get the students who were not creative, but also not found in the students with very creative categories. Most students understood the purpose of the questions that was asked by the researchers and could change the story questions into mathematical sentences that would be solved.

On the first subject, the student could only complete the question that related to the indicators of fluency. The student who had difficulty in working on the problems with flexibility indicators because they saw there were three equations, while the usual problem was only had two equations to find the values of \( x \) and \( y \). The first subject was also unable to solve the problem with the novelty indicator because he had difficulty using the right method because many of the questions were known. This student was included in the category of less creative, although he could write the conclusions correctly but there was an error in understanding the concept of algebra. This is in accordance with previous research which explains that 40% habits of mind affect the mathematical ability of students, this needs improvement and development starting in terms of students’ understanding, knowledge and skills holistically [13]. From the results of the first subject work, it obtained several errors, namely the algebraic arithmetic operations. The students assumed that two numbers, one of them which contains variables, could be an addition or subtraction operation, in addition two equal numbers if divided by the result were zero. In addition, the students also consider in algebraic operations, if the value of \( x \) and \( y \) was zero then it could called by the operation having no solution, then in the graph, because there was only one line that did not intersect, it was also considered to have no solution. So the students concluded that in problem one, it did not have a solution. As a result, this was correct that the conclusion had no solution, but an error occurred in the students’ understanding algebraic concepts. The values of \( x \) and \( y \) that were equal to zero should not had no solution, but it was called by a single settlement and a graph that did not have a solution if the graphic were parallel. The graphic drawing of the student's work result, it did not intersect, but there was an error in algebraic arithmetic operations, the graph should be crossed by a parallel line.

On the second subject, the students could solve the problems related to the indicator of flexibility, but the students still work using procedural technique without doing some variations (varying ways) in finding \( x \) and \( y \) values of three equations provided. The second subject did not solve the problems related to fluency and novelty indicators. On the question that related to fluency indicators, the
students experience confusion because in finding the value of each variable the values of x and y were equal to zero, the second subject felt unsure of the calculation that had been done so he or she did not write it on the answer sheet. The second subject also did not understand the meaning of a single settlement, did not have a solution or had many solutions. The second subject only knew the values of x and y and did not understand about the meaning of x and y when drawn using the graphic method. Besides that, on the novelty indicator of second subject, it was also difficult to find the right way to discover the values of x and y, the second subject had difficulty in doing arithmetic operations using algebraic manipulation. Based on the results of the second subject test, it found some errors of the students in solving these problems. From the results of tests and in-depth interviews obtained information that the second subject could understand the questions given then build the requested mathematical model, but errors occur in the process of solving the questions. In solving the problem, the second subject considered that two numbers, one of which contains variables, it could be done by calculating addition or subtraction operations. Then in solving the problem, the second subject tended to look for the easiest form of equation to do in arithmetic operations with substitution or elimination method. In the third equation, the second subject tended to assume that the equation was used specifically for the substitution method and other two equations for the method of elimination. Besides that, he was hesitant in completing using the graph method because it contained 3 equations and students did not try to solve it by using graph method. The second subject also did not try to pair three existing equations into multiple pairs of linear equations systems to find x and y values respectively. This was because of the problem that given to the students was different from the sample questions in the mathematics textbook. These problems were in line with the research which explained that relying on mathematical textbooks would have an impact on the lack of opportunities for students to think creatively [21]. In addition, the second subject considered that the values of x and y in the substitution and elimination methods could have different values because they were obtained from different pairs of equations.

Based on the problems that occur, it could be concluded that there were some problems and errors in solving creative thinking problems even though the students who had strong habit of mind, this occurred in the process of solving problems namely in-depth understanding of algebraic concepts and the lack of students in practice solving problems non routine which focus on the ability to think creatively, so that when learning about a story problem (contextual) the students had difficulty and lack of confidence in turning these questions into mathematical sentences to work on. This is consistent with research which explains that not all students who have strong thinking skills will also have strong mathematical creative thinking abilities [22]. The low ability of students to think creatively mathematically was also caused by the lack of giving varied questions which was giving many opportunities for students to think creatively [23]. This becomes something that needed to be improved from the understanding of the students' algebraic concepts because it was very important in learning further complex material. It was feared that the longer students would use the wrong concept understanding to be used in solving other problems. In addition, the provision of exercises for non-routine questions was needed to be given periodically so that the students had confidence and a lot of experiences in solving non-routine problems so that when encountering varying questions, the students had no difficulty in completing or changing the story questions (contextual) into mathematical sentences to be completed.

4. Conclusion
Based on the results of the tests and interviews that had been conducted, it could be concluded that not all students who had strong habit of mind had good creativity in solving creative thinking skills test questions. From the subject, 7 students had high habit of mind, 2 students (28.58%) were able to complete the fluency indicator (it could be categorized as less creative), 1 student (14.28%) was able to complete one indicator of flexibility (it could be categorized as adequate creative), and 4 students (57.14%), with 3 students were able to complete indicators of fluency and flexibility and 1 student was able to complete the indicators of fluency and novelty (it could be categorized as creative). The low
ability of students to think creatively in students who had strong habit of mind was due to the deep understanding of algebraic concepts in arithmetic operations and the lack of students in practice in solving non-routine questions regularly. This results in errors of algebraic concepts on an ongoing basis when studying further mathematical concepts, lack of confidence in using various ways to solve problems, and difficulties in turning story problems (contextual questions) into mathematical sentences. Therefore it needed to be an improvement in understanding the basic concepts of algebra in arithmetic operations, providing in-depth material, and practicing on non-routine questions regularly so that students had experience in solving various problems and had various ways to solve these problems. Besides that in the next research it is expected to be able to explore various other information which has not been carried out in-depth assessment of students' problems in solving problems related to mathematical creative thinking skill.

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References

[1] Sahebjamei S and Mokhles H M 2012 Educational designing based on assignment-process approach and investigation of its role on reduction learning disabilities of student having mathematics disorder Procedia-Sosial Behav. Sci. 46 790-4
[2] Tabach M and Friedlander A 2016 Algebraic Procedures and Creative Thinking ZDM (July)
[3] Chiu M S 2009 Approaches to the Teaching of Creative and Non-Creative Mathematical Problems International Journal of Science and Mathematics Education 7 55-59
[4] M Mursalin, Nuraini N L S, Purnomo H, Damayanti N W, Kristanti D, Rohim A, Widyaastuti R, et al 2018 The development of algebra teaching materials to foster students’ creative thinking skills in higher education IOP Conf. Series: Journal of Physics:Conf. Series 1088 (2018)012101
[5] NCTM 2000 Principles and Standards for Schools Mathematics, American:Library of Congress Cataloguing in Publication
[6] Aizikovitsh 2014 The Extent of Mathematical Creativity and Aesthetics in Solving Problems among Students Attending the Mathematically Talent Youth Program Creative Education 5 228-241
[7] Schoevers M, Leseman P P M, Slot E M, Bakker A, Keijzer R, Kroesbergen E H 2019 Promoting’s creative thinking in Primary School Mathematics:A Case Study Thinking Skills and Creativity 31 323-334
[8] Silver E A 1997 Fostering Creativity Through Instruction Rich in Mathematical Problem Solving and Thinking in Problem Posing ZDM 29(3)
[9] Bada & Olusegun S 2015 Constructivism Learning Theory: A Paradigm for Teaching and Learning IOSR Journal of Research & Method in Education 5 66
[10] Chen-yao Kao 2016 Analogy’s Straddling of Analytical and Creative Thinking and Relationships to Big Five Factors of Personality. Taiwan: Department of Special Education National University of Taiwan
[11] Miliyawati 2014 Urgensi Strategi Disposition Habits of Mind Matematis Infinity Journal 3(2) 174-188
[12] Handayani A D, Herman T, Fatimah S, Setyowidodo I and Katminigisih Y 2018 Inqury based learning a student centered learning to develop mathematical habits of mind IOP Conf. Series: Journal of Physics:Conf. Series 1013 012115
[13] Dwirahayu G, Kustiawati D and Bidari I 2017 Corresponding habits of mind and mathematical ability IOP Conf. Series: Journal of Physics:Conf. Series 895 012013
[14] Yavuzsoy Kose N and Tanisli D 2014 Primary School Teacher Candidates Geometric Habits of
Mind Educ. Sci. Theory Pract 14(3)1220-120
[15] Li X 2013 Conceptualizing and Cultivating Mathematical Practices in School Classroom Journal of Mathematics Education 6(1) 60-73
[16] Costa A L 2000 In A L Costa (Ed) Developing minds A resource book for teaching thinking Alexandria Habits of Mind VA: ASCD 80-83
[17] Gloria et al 2018 Costa-Callick’s Habits of Mind in Practical Activities of Students as Biology’s Teacher Candidates Center for Science Education 10(1) 16-21
[18] Andriani, Yulianti K, Ferdias P, and Fatonah, S 2017 The effect of mathematical habits of mind learning strategy based on problem toward students’ mathematical creative thinking disposition III(9) 689–696
[19] Mellawati, Sudirman, St B Waluya and Rochmad 2019 Creative thinking ability on the integrating mathematical habits of mind in missouri mathematics project learning IOP Conf. Series: Journal of Physics:Conf. Series 1315 012083
[20] Tohir M, Abidin Z, Dafik and Hobri 2018 Student creative thinking skills in solving two dimensional arithmetic series through research-based learning IOP Conf. Series: Journal of Physics:Conf. Series 1008 012072
[21] Harris A 2016 Creativity and education Academic research international London UK: Palgrave macmillan
[22] Putri I W S, Trapsilasizi D, Hobri, Oktavianingtyas E, Safrida L N, and Aini 2019 Creative thinking skill with adversity quotient based on lesson study for learning community IOP Conf. Series: Journal of Physics:Conf. Series 1211 012110
[23] Van Z M and Van den Heuvel-Panhuizen M 2018 Opportunity to learn problem solving in Dutch primary school mathematics textbooks ZDM – Mathematics Education 50 827–838