

Research Article

Analysis of Creative Thinking Skill in Solving Mathematical Problems Viewed from the Types of Personality

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Abstract.

Creative thinking skills are part of the student's thinking process in solving math problems. Each student has a different thought process according to their personality, so needed suitable learning model for each type of integration. One of the personality type that can be used to review students creative thinking skills is the Keirsey personality type. The purpose of this research is to obtain a description of student personality types based on Keirsey personality test results and creative thinking skills of students in solving mathematical problems on personality types Guardian, Artisan, Rational, and Idealist. The research subjects were students of class X MIPA 1 in one of the senior high schools in Bandung by purposive sampling. This research is descriptive-qualitative research. The results showed that subjects with Guardian personality types became the majority in the class and students with Idealist personality types became the minority. Then based on the results of the analysis, students with Guardian personality types meet indicators of fluency, novelty, and elaboration; Artisans meet indicators of fluency and novelty; Idealists meet indicators of fluency and novelty; and Rational meet all indicators of creative thinking skills, namely fluency, flexibility, novelty and elaboration. By knowing the student's personality type, it is expected to be a reference in teaching methods in order to improve student creative thinking skills.

Keywords: creative thinking skill, solving mathematical problems, types of personality.

1. INTRODUCTION

Mathematics is an exact science that demands understanding and provisions of practice [1]. In addition, mathematics is also one of the branches of science that must be studied at every level of education, ranging from elementary school to high school. In an ever-evolving life one not only has enough mathematical abilities but the most important thing is how to use mathematical skills in everyday life [2]. Therefore, learning mathematics is important because there are many things that can be applied in everyday life.

In all subject, the ability to think creatively is very important to develop [3]. In addition to being important for mathematics learning, creative thinking skills are also necessary for everyday life. Individuals who are able to survive in the information and globalization

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era are individuals who have critical, logical, systematic, and creative abilities [4]. This is in line with Government Regulation No. 17 of 2010 in the 2013 Curriculum on Education Management and Implementation which states that building a foundation for the development of students' potential to become knowledgeable, capable, critical, creative, and innovative human beings is the goal of the implementation of primary and secondary education [5].

Based on the government regulation, it can be known that one of the goals of the implementation of education is to encourage the potential of students to become creative human beings. Therefore, creative thinking skills are an important part of honing in mathematics learning. In mathematics, the disposition or orientation of mathematics is used as a view in creative thinking, including discovery and problem solving [6]. While creativity or creative thinking is a type of thinking that leads to insights, approaches, perspectives, and ways that are all new to understand, and understand various things [7]. From the statement it can be concluded that creative thinking skills are a person's thought process to get new ideas in solving problems. Munandar divides creative thinking skills into four indicators, namely fluency, flexibility, novelty, and elaboration [8].

Guilford argues creativity or creative thinking as the ability to see various possible solutions to a problem, is a form of thinking that until now still lacks attention in education [9]. Based on the results of research by GCI (Global Creativity Index) in 2015 Indonesia ranked 115th out of 139 countries studied with global creativity index points of 0.202 [10]. From the results of the research shows that the creativity index of the Indonesian state is still low, this can be seen in terms of order and global creativity index that uses a range between zero to one. The cause of the low global creativity index is due to students' low creative thinking ability, this is indicated by students' inability to get various alternative solutions when solving the mathematics problems presented [11]. Thereby it can be concluded based on these results that the creative thinking skills of Indonesian students' mathematics are low. Therefore, teachers are expected to pay special attention to thinking skills, especially creative thinking skills.

Creative thinking skills are part of the student's thinking process. Based on the fact, that each individual has a diverse thought process. So that students' creative thinking skills can vary, because the thought process and personality of each individual are also different. Because the creative thinking process depends heavily on the way students learn and respond to a math problem [12]. Differences in the thought process can be understood by the approach of personality classification [13]. After knowing the differences in student personality, it is expected to be a reference in teaching methods in

order to improve students' creative thinking skills and students become more concerned by teachers.

Based on the results of a preliminary study conducted by researchers at SMAN 1 Rancaekek related to creative thinking skills, it was found that of the 36 students who took the creative thinking skills test, there was only one student who answered correctly all test questions, as many as 24 students obtained below-average scores with a percentage of 66.67% and as many as 12 students scored above average with a percentage of 33.33% so that it can be concluded that thinking skills Creative students are still relatively low. Most students experience problems with indicators of flexibility, novelty, and elaboration in finding alternative answers, because students only memorize formulas so that when given questions that have different concepts tend to be confused in solving problems. This is reinforced by the results of an interview to one of the mathematics teachers where in mathematics learning the creative thinking skills that students have in solving math problems are still not visible, because the value of skills is equated with the value of knowledge later in the learning method given by the teacher to the student is a lecture method where the learning is centered on the teacher. Therefore, saturation arises in students during the mathematics learning process caused by each student having a different thought process so that the style in learning is also different. Then the need for knowledge about student personality types in order to use learning methods that are appropriate for each student with diverse personality types.

As for some previous research that tried to see the relationship between differences in students' thinking processes and differences in behavior, including in research Putri & Haerudin [14] which concluded that differences in personality characteristics have their own advantages and disadvantages in mathematical cognitive abilities. Research on the creative thinking process has been conducted by Aziz, Kusmayadi, & Sujadi [3] which obtained different results in each personality type. From these studies it can be indirectly concluded that there is an influence between personality type and student cognitive, which also affects creative thinking skills.

In the book *Please Understand Me II* by a Psychologist, David Keirse, classifies personality types into four. These personality types are Artisan, Guardian, Rational, and Idealist. This classification stems from the way a person gets his energy (extrovert or introvert), the way a person obtains information (sensing or intuitive) the way a person makes decisions (thinking or feeling) and the way a person observes and assesses (judging or perceiving) [13]. In the world of education, each student has a variety of personality types, so the thoughts they have are different. It also affects the way students learn.

Mathematical creative thinking skills are related to Keirsey's personality type. In the Keirsey personality type, there are various personality types that are classified into four types, namely guardian, artisan, idealist, and rational. Each personality type has a different way of thinking so that it produces different creative thinking skills. As explained by Jung [10] the way a person receives, processes, and provides information to others varies from one another because it is influenced by his personality. So that it is in line with the indicators of creative thinking compiled by Mahmudi [16] namely fluency, flexibility, novelty, and elaboration. Each such indicator is characterized by the ability to provide many solutions, diverse, unique, and concise in accordance with mathematical procedures when giving answers, or certain mathematical situations but have the same end result.

Based on these backgrounds, it has been known that creative thinking skills are influenced by personality types. And each personality type has a different tendency to think creatively when solving problems. Knowing the creative thinking skills of each personality type is expected to help teachers in deciding the right learning model for each personality type that students have in order to hone students' creative thinking skills for the better. So that researchers are interested in conducting research on Students' Creative Thinking Skills in Solving Mathematical Problems reviewed from Keirsey Personality.

2. RESEARCH METHOD

The type of research is qualitative research using descriptive methods with the aim of describing the results of student creative thinking skills tests and interviews reviewed from Keirsey's personality. The instruments used in this study were personality classification questionnaires, creative thinking skills tests, and interviews. For the subjects used are two students of each personality type based on the results of the Keirsey personality type classification questionnaire and the subject taken based on the direction of the teacher taking into account the average grades of mathematics, the ability to communicate both verbally and in writing, and the activeness when learning mathematics.

The questionnaire used has 16 questions sourced from the book *Please Understand Me II* by a psychologist named David Keirsey. While the creative thinking skills test instrument used there are three question points with the following question indicators.

Data collection techniques in this study used personality type classification questionnaires, creative thinking skills tests, and interviews. In this study, questionnaires were used to classify students' personality types into four types, namely Guardian, Artisan,

TABLE 1: Creative thinking skill.

Type	Indicators
Fluency	Skills in answering questions with relevant answers
Flexibility	Skills in answering questions with a variety of answers based on information obtained from the problem and applying concepts in different ways
Novelty	Skills to provide answers that are new, unique, and more than before
Elaboration	Skills in enriching and detailing answers in detail of ideas become more interesting

Rational, and Idealist. For the test of creative thinking skills in the form of a description problem with equation material and equality of absolute value and interview guidelines that aim to find out more about the answers given by students based on the results of the student’s creative thinking skills test.

At the data analysis stage researchers used a personality type classification table for questionnaires and analysis of Miles and Huberman models for test instruments and interviews. Miles and Huberman models are divided into three activities, namely Data Reduction, Data Display, and Conclusion Drawing.

3. RESULTS AND DISCUSSION

3.1. Student Personality Type based on Keirsey Personality Test Results

Based on the results of Keirsey’s personality type classification presented in Table 2, Keirsey’s accumulated personality type classification was obtained from 25 students in class X MIPA 1. The data from the accumulated classification of Keirsey personality types class X MIPA 1 SMAN 1 Rancaekek is presented in the table as follows.

TABLE 2: Keirsey’s personality type classification.

Personality Types	Numerous	Persentase
Guardian	9	36
Artisan	8	32
Idealist	3	12
Rational	5	20
Total	25	100

From the table there are students with guardian personality type nine students or 36%. Furthermore, the artisan personality type there are eight students or 32%. Then the idealist personality type there are three students or by 12%. And the rational personality

type is five students or 20%. Thereby it can be concluded that students with guardian personality types become the dominance of the class.

Based on the data obtained from the questionnaire for the classification of Keirsey's personality type and the results of consultations with subject teachers, students who were the subject of the study were obtained as stated in table below.

TABLE 3: Result of Keirsey's personality type classification.

Student Code	Personality Types	Subject Code
S-4	Guardian	GU1
S-18	Guardian	GU2
S-14	Artisan	AR1
S-19	Artisan	AR2
S-3	Idealist	ID1
S-15	Idealist	ID2
S-22	Rational	RA1
S-25	Rational	RA2

3.2. Creative Thinking Skills Students with Artisan, Guardian, Rational, And Idealist Personality Types in Solving Math Problems

The presentation of the results of the analysis of students' creative thinking skills in solving mathematical problems is reviewed from the personality of Guardian, Artisan, Idealist, and Rational to get different results on each personality type. For the results of the Guardian personality type obtained GU1 and GU2 subjects are able to mention the information provided in the question, solve the problem to get the conclusion of the answer, and able to explain the answer smoothly, but GU2 subjects are accustomed to directly solve the problem so often forget to write the information known from the question. This is relevant to Keirsey [17] stating that the Guardian is a concrete communicator who likes to speak and write empirically and specifically. Based on this, the Guardian subject is able to meet the indicators of fluency, which can provide relevant and correct answers. Then on the flexibility indicator, both subjects know other ways to solve a given math problem, but do not write it down and choose an easier way and have been conveyed by the teacher in the class to solve the problem. This is in line with Keirsey's thinking that the guardian personality type is also known as Sensory Judging (SJs), which is the type that is consistent and pays attention to small things in doing work to avoid mistakes [10]. In addition, according to Dewiyani the guardian personality type does not need any other way to ascertain the truth of the results that have been

given, simply by repeating all the work he has done [14]. So the guardian subject prefers the usual way taught by teachers to reduce the risk of errors in the answer.

For the novelty indicator, both guardian subjects are able to create new ideas based on the problems given and the answers given by both subjects are the result of their own thoughts. And for elaboration indicators, GU1 and GU2 subjects are able to solve mathematical problems in a detailed, detailed, and in accordance with mathematical procedures, but GU2 subjects do not write them because they are not familiar and directly in the completion process. Basically, the guardian personality type prefers regular learning and solving problems with regular procedures [10].

Subject AR1 and AR2 with Artisan personality types on the fluency indicator can mention the known information in the question to get the conclusion of the answer, but in one of the artisan subjects did not write it and gave irrelevant answers because they did not understand the material tested. This is natural for subjects with artisan personality types, because artisan subjects are very quick in making decisions without thinking [18]. Then for the indicator of flexibility, both artisan subjects are less able to write other ways to solve a given mathematical problem because both are confused and lack understanding of the material.

In the novelty indicators of AR1 and AR2 subjects can provide new ideas based on the problems given and the answers given are the result of their own thoughts. Then on the elaboration indicator of the subject AR1 can provide answers in detail, spoken, and in accordance with mathematical procedures, while AR2 subjects cannot give detailed answers because they do not understand the material. This is natural because according to Keirse and Bates artisan personality types prefer applied science that requires techniques to be practiced such as art, not science related to long counts [11].

Subjects with Idealist personality types on the fluency indicator can both mention known information from the problem, but the subject ID2 is not able to solve the problem with the relevant answer, then when asked to explain the results of the answer, the subject feels confused and cannot explain it because it has not mastered the material. This is in line with the findings Layyina that the idealist subject is lacking in determining the steps of workmanship [12]. Then for the flexibility indicator, both idealist subjects only provide solutions in one way and do not think of other ways of solving.

In the novelty indicator, the subjects of ID1 and ID2 can give new ideas based on the problems given but the results are not perfect and the answers given are the result of their own thoughts even though the idealist subject doesn't understand the meaning of the problem but can understand by thinking. This kind of thing may happen to idealist

personality types, because according to Myers, the idealist type is someone who has intuitive feelings with high sensitivity [14]. And for elaboration indicators, both idealist subjects can provide answers in detail, organised, and in accordance with mathematical procedures, but the results given are errors and not yet precise. This is in line with the discovery Anjani, M, & Kamid that idealist subjects have not been able to do calculations precisely [2].

Subjects with Rational personality types, namely RA1 and RA2, on the fluency indicator are able to explain the information provided in the question and provide relevant and correct answers, but in the subject RA1 do not write it on the answer because they are accustomed to not writing it and directly on the completion of the answer. Then on the flexibility indicator, the subject of RA1 is able to provide two different ways of solving with the right answer and still has other forms of inequality in solving the given problem. This is in line with Keirsey's statement that rational personality type is someone who has high analytical skills and prefers science, problem solving, and logical thinking [11]. While the subject of RA2 only provides one way of completion and the answer is less relevant to what is requested from the question. The subject of RA2 thought the answer given was the same as what was asked of the question, so RA2 was less thorough in understanding what was asked of the question. Basically, humans have all four types of Keirsey personality, but they have a tendency to at least one personality type [10]. After the researchers examined more about RA2, the subjects had idealist personality type tendencies. But the second tendency is the artisan personality type, where everything is done tends to be hasty so less thorough, researchers suspect when the subject of RA2 solves the problem with indicators of flexibility, he tends to be artisan type.

In the novelty indicator, both rational subjects are able to give new ideas based on the given questions and the results of answers based on their own thoughts. For elaboration indicators, RA1 subjects can provide answers in detail, spoken, and according to mathematical procedures but do not write them because they are accustomed directly to completion. While RA2 subjects tend to be Artisan types also when solving problems with detailed indicators, because of the haste so that they are less thorough when reading questions, as a result there are errors in answering questions, but RA2 subjects are able to provide answers in detail, and in accordance with mathematical procedures.

4. CONCLUSION

Based on the results of the discussion, it was obtained that students with guardian personality types became the majority, while students with Idealist personality types

became a minority in the class. Then for students with the Guardian personality type can meet the indicators of fluency, novelty and elaboration, but do not meet the indicator of flexibility. Then in students with Artisan personality types can meet indicators of fluency and novelty, while indicators that are less fulfilling are indicators of flexibility and elaboration. Then in students with Idealist personality types are able to meet indicators of fluency and novelty, but do not meet the indicators of flexibility and elaboration. And finally, students with Rational personality types can meet all indicators of creative thinking skills, namely fluency, flexibility, novelty and elaboration.

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