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Analyzing Students' Creative Thinking Skills Based on Rational and Guardian Personality Types

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ABSTRACT

Differences in personality types significantly influence individuals' ways of thinking, which in turn affect the problem-solving strategies they employ in mathematics. This study aims to analyze students' Creative Thinking Ability (CTAL) in solving mathematical problems based on rational and guardian personality types. A descriptive qualitative approach was employed, involving four tenth-grade students from SMA Negeri 2 Enrekang, consisting of two students with rational personality types and two with guardian personality types. The research instruments included a creative thinking ability test, the Keirsey personality test questionnaire, and interview guidelines. Data validity was ensured through source triangulation, while data analysis was carried out using data reduction, data display, and conclusion drawing. The findings revealed that students with rational personality types demonstrated higher levels of creative thinking ability, averaging at CTAL level 3, as they were able to meet the indicators of fluency and flexibility in solving problems. However, both personality types did not show evidence of originality. Students with guardian personality types generally performed at CTAL level 1, as they typically relied on a single method of problem-solving, except in problem number 2 where they were able to reach CTAL level 3. This study was limited to rational and guardian personality types, and therefore cannot be generalized to other personality types. Future research is recommended to include artisan and idealist personality types to provide a more comprehensive understanding in line with David Keirsey's theory.

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Introduction

The national education goals of Indonesia, as stated in Law of the Republic of Indonesia No. 20 of 2003 concerning the National Education System, are to develop students' potential to become individuals who are faithful and devoted to God Almighty, possess noble character, are healthy, knowledgeable, capable, creative, independent, and responsible democratic citizens (Sofyan, 2022). To achieve these goals, it is necessary to improve the quality of learning as a medium for students to attain their educational objectives. Mathematics, as one of the core subjects, aims to develop logical, analytical, critical, systematic, and creative thinking skills for problem solving (Pasaribu, 2021). Therefore, mathematics instruction should be designed in a way that promotes students' creative thinking abilities (Suriyani, 2017). Creative thinking is essential in mathematics learning, as it enables students to solve problems more effectively. According to Siswono, creative thinking is indispensable in mathematics learning because mathematics is a complex body of knowledge; students possess the potential to think creatively, they can produce original solutions when solving mathematical problems, teachers can observe students' authentic contributions and remarkable ideas, and students can experience the process of discovering something original, requiring deep and critical thinking, persistence, and resilience, such as in constructing proofs and discovering theorems (Agustiana, 2022).

In the current era, one of the main challenges in mathematics education is the low level of students' creative thinking skills. The education system tends to emphasize memorization and procedural understanding rather than exploration and challenging problem solving. Exercises are generally routine and follow clear solution patterns, which prevents students from developing alternative solutions or new approaches to problem solving. Consequently, their creative thinking skills remain underdeveloped. A student can be considered to possess creative thinking skills when they meet certain indicators. According to Silver (1997), creative thinking in mathematics is characterized by three aspects: fluency, flexibility, and novelty. Fluency refers to the ability to solve problems using multiple interpretations, methods, or solutions. Flexibility refers to the ability to approach a problem in different ways and to discuss various solution strategies. Novelty refers to examining solutions through diverse methods and generating entirely new approaches. Since students have different backgrounds and abilities, their cognitive processes also vary. Levels of Creative Thinking Ability (CTAL) are categorized into CTAL 4 (Highly Creative), CTAL 3 (Creative), CTAL 2 (Moderately Creative), CTAL 1 (Less Creative), and CTAL 0 (Not Creative) (Siswono, 2007). Students are categorized as Highly Creative if they meet fluency, flexibility, and novelty indicators, or both flexibility and novelty; Creative if they meet fluency and novelty or fluency and flexibility; Moderately Creative if they meet flexibility or novelty; Less Creative if they meet only fluency; and Not Creative if they meet none of the indicators (Ardiansyah et al., 2015).

However, students' mathematical creative thinking remains relatively low in classroom practices. Students are often unable to solve non-routine problems, relying heavily on teacher-taught methods rather than exploring creative solutions. The 2022 PISA results reported by the Ministry of Education, Culture, Research, and Technology of Indonesia (Kemdikbudristek, 2023) show that Indonesian students scored poorly in creative thinking, with only 31% achieving the basic proficiency level (Level 3). With an average score of 19 out of 60 points, Indonesian students performed significantly below the OECD average score of 33 in creative thinking, underperforming relative to their performance in mathematics and reading. This highlights the urgent need to strengthen students' creative thinking skills, particularly in mathematics. In practice, however, classrooms often provide limited opportunities for students to develop such skills. Many teachers prioritize computational ability over creativity, treating the latter as less important in learning (Anastasyia, 2024). This hinders the growth of students' creative potential in mathematical problem solving. Teachers should, therefore, occasionally

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provide open-ended problems to stimulate creative thinking (Sari et al., 2020). Students' creative thinking skills can be further enhanced when learning is connected to real-life situations. One mathematical topic that strongly involves contextual problem solving is the Three-Variable Linear Equation System (Sistem Persamaan Linear Tiga Variabel/SPLTV).

Previous studies have shown that many students struggle to develop creative ideas when solving complex mathematical problems such as SPLTV. For instance, Sukiyanto et al. (2023) reported that, among three students studied in depth, only one fulfilled all three aspects of creative thinking as defined by Silver. Similarly, Triyani & Azhar (2021) found that out of three students interviewed in depth, only one demonstrated all three aspects, and of 22 students who completed the test, 12 were categorized as having low creative thinking ability. Another study by Khairunnisa (2021) revealed that among 31 students, 19.35% were categorized as "very low," 25.81% as "low," 45.16% as "moderate," 6.45% as "high," and only 3.23% as "very high." Collectively, these findings indicate that students' mathematical creative thinking is generally concerning. Most students are in the "moderate" or "low" categories, with very few achieving all three aspects of creative thinking, as highlighted by Silver. This suggests that current mathematics instruction has not been fully effective in fostering creative thinking. Thus, further efforts are needed by teachers to enhance students' creative thinking skills in mathematics. Feist, as cited by Yan, Childs, and Hall, emphasized that creativity depends on a combination of cognitive abilities and personality traits (Putri, 2019).

According to Hasanah (2017), David Keirsey classified human personalities into four types: guardian, artisan, idealist, and rational. Murniasih (2020) noted that guardians and artisans share similarities in concrete communication (fact-focused), while guardians and idealists are alike in cooperative problem solving (based on general procedures). Rationals and idealists share abstract communication styles (idea- and logic-based), while rationals and artisans share utilitarian problem-solving tendencies (solution-oriented without concern for acceptance). There are no similarities between rationals and guardians in either communication or problem solving. Among these four types, guardians and rationals exhibit significant differences in their thinking styles (Hanifa, 2019). Guardians focus on practical, detailed, and structured approaches, whereas rationals emphasize logic, analysis, and systematic reasoning. These differences inevitably influence their creative thinking skills in solving problems. Therefore, comparing the Creative Thinking Abilities Levels (CTAL) of students with rational and guardian personality types in the context of SPLTV is of particular interest.

Method

Type of Research

This study employed a descriptive qualitative design with the purpose of explaining and portraying students' creative thinking abilities based on Silver's indicators of fluency, flexibility, and novelty, as viewed from two personality types defined by Keirsey—rational and guardian. Students' abilities were subsequently classified into Creative Thinking Ability Levels (CTAL) according to Siswono's framework, which consists of five levels ranging from CTAL 0 (Not Creative) to CTAL 4 (Highly Creative). The research involved four students as subjects, comprising two with rational personality types and two with guardian personality types. Three instruments were used to collect data: the Keirsey Temperament Sorter to determine students' personality types, a Creative Thinking Ability Test to assess their creative thinking performance, and interview guidelines to further explore students' knowledge and understanding beyond written responses. Data collection followed a qualitative approach, in which the data were primarily in the form of narratives and verbal descriptions. The data

analysis process involved three stages: data reduction, data display, and conclusion drawing or verification. The focus of the study was to describe students' creative thinking abilities and classify them into CTAL categories, analyzed according to their rational or guardian personality types.

Subjects

This study involved four student subjects, consisting of two with rational personality types and two with guardian personality types. The selection of subjects was based on the results of the Keirsey Temperament Sorter administered to 40 tenth-grade students of SMA Negeri 2 Enrekang, comprising 21 students from class X IPA 3 and 19 students from class X IPA 4. Based on the questionnaire results, students identified as having rational and guardian personality types were then selected to complete the Creative Thinking Ability Test and participate in interviews to analyze their Creative Thinking Ability Levels (CTAL).

Instruments

The primary instrument in this study was the researcher, who played a central role in collecting, interpreting, and validating the data. Supporting instruments included the Keirsey Temperament Sorter (KTS), the Creative Thinking Ability Test, and interview guidelines. The KTS used in this study was adapted from The Keirsey Four Temperaments Sorter (Keirsey, 1998) and translated into Indonesian to facilitate students' comprehension. This questionnaire consisted of items designed to identify students' personality types. The Creative Thinking Ability Test was developed to measure students' mathematical creative thinking in relation to Silver's indicators: fluency, flexibility, and originality. The test items were designed within the context of the Three-Variable Linear Equation System (SPLTV). Each problem was structured to provide opportunities for students to demonstrate multiple solution strategies, apply varied approaches, and generate original ideas. Table 1 presents a description of the test items and their alignment with the indicators of Creative Thinking Ability Levels (CTAL). The interview guidelines served to capture deeper insights into students' reasoning and thought processes that were not fully observable from their written responses. The combination of these instruments ensured a comprehensive assessment of students' creative thinking abilities based on their identified personality types.

Table 1. Description of Creative Thinking Ability Test Items

Item	Problem Description	CTAL Indicators
Item 1	Mr. Ali has a capital of Rp. 3,060,000 to purchase children's clothing for resale. He spends his money on shirts, pants, and t-shirts. The capital is sufficient to buy 5 dozen shirts, 4 dozen pants, and 6 dozen t-shirts. He then sells them with a profit of Rp. 6,000 per shirt, Rp. 7,000 per pair of pants, and Rp. 5,000 per t-shirt. From selling 4 dozen shirts, 2 dozen pants, and 3 dozen t-shirts, he earns Rp. 2,472,000. If the purchase price of pants is Rp. 5,000 higher than that of t-shirts, determine the purchase price of each item.	**Fluency**: Ability to interpret relationships among variables and given information. **Flexibility**: Ability to apply multiple approaches in modeling and solving the SPLTV. **Originality**: Ability to devise new/unique strategies to solve the problem in context.
Item 2	A tourist site has three parking lots. The first lot holds x vehicles, the second lot holds y vehicles, and the third lot holds z vehicles. The total vehicles in the first and second lots is 110. The number of vehicles in the first lot is 22 fewer than in the third lot. If one-sixth of the vehicles in the third lot leave, the numbers of vehicles in the second and	**Fluency**: Ability to interpret relationships among variables and given information. **Flexibility**: Ability to apply multiple approaches in modeling and solving the SPLTV. **Originality**: Ability to devise new/unique strategies to solve the problem in context.

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	third lots become equal. Determine: (1) the SPLTV representing the problem, and (2) the total number of vehicles initially parked.	
Item 3	A lens factory operates three machines: A, B, and C. If all three operate, they produce 5,700 lenses in one week. If only machines A and B operate, they produce 3,400 lenses per week. If only machines A and C operate, they produce 4,200 lenses per week. Determine the number of lenses produced by each machine in one week.	**Fluency**: Ability to interpret relationships among variables and given information. **Flexibility**: Ability to apply multiple approaches in modeling and solving the SPLTV. **Originality**: Ability to devise new/unique strategies to solve the problem in context.

Procedures

The data collection procedure consisted of several stages. First, the Keirsey Temperament Sorter questionnaire was administered to 40 tenth-grade students from classes X IPA 3 and X IPA 4 at SMA Negeri 2 Enrekang. The questionnaire results were used to classify students into four personality types according to Keirsey: guardian, artisan, rational, and idealist. Among these, ten students were identified with the two personality types of interest, four rational and six guardian. From this group, two students from each personality type were selected as research subjects, based on recommendations from the mathematics teacher regarding their ability to articulate their thinking, which facilitated the data collection during interviews. The selected students then completed the Creative Thinking Ability Test. The results of this test were analyzed to classify students into Creative Thinking Ability Levels (CTAL): CTAL 0 (Not Creative), CTAL 1 (Less Creative), CTAL 2 (Moderately Creative), CTAL 3 (Creative), and CTAL 4 (Highly Creative). Following the test, interviews were conducted to explore students' reasoning and understanding in greater depth. The classification of CTAL was based on the characteristics outlined in Table 2.

Table 2. Classification of Creative Thinking Ability Levels (CTAL)

CTAL	Creative Thinking Characteristics	Fluency	Flexibility	Originality
CTAL 4 (Highly Creative)	Meets all three indicators, or at least	√	√	√
	flexibility and originality	–	√	√
CTAL 3 (Creative)	Meets fluency and originality, or fluency	√	–	√
	and flexibility	√	√	–
CTAL 2 (Moderately Creative)	Meets flexibility only, or originality only	–	√	–
		–	–	√
CTAL 1 (Less Creative)	Meets fluency only	√	–	–
CTAL 0 (Not Creative)	Does not meet any indicator	–	–	–

Analysis

The data in this study were analyzed through several stages. First, data reduction was carried out by selecting and organizing information relevant to the research objectives. Next, the data were presented based on the results of students' written tests and interviews. The presentation of data was structured according to the indicators of creative thinking ability, which served as the basis for determining students' Creative Thinking Ability Levels (CTAL) for each personality type examined, namely rational and guardian. The data were primarily presented in narrative form to describe the research findings. To ensure the validity of the data, source triangulation was employed. All data collected from the outset were further examined

and verified by comparing students' written work with their interview responses in order to obtain more accurate information and draw conclusions.

Results

Data collection was conducted after determining the students who met the criteria as research subjects. A total of four students were selected, consisting of two students representing each of the personality types under investigation, namely rational and guardian. The Creative Thinking Ability Level (CTAL) of each subject for every test item is presented in Table 3.

Table 3. Creative Thinking Ability Levels (CTAL) of the Subjects

Student Code	Personality Type	CTAL – Item 1	CTAL – Item 2	CTAL – Item 3
AAA	Rational	CTAL 3	CTAL 3	CTAL 3
FAS	Guardian	CTAL 1	CTAL 3	CTAL 1
MAL	Guardian	CTAL 1	CTAL 3	CTAL 1
NNS	Rational	CTAL 3	CTAL 3	CTAL 1

In this study, the researcher did not employ a score-based assessment system to analyze students' creative thinking abilities. This decision was based on the perspective that creative thinking cannot be adequately measured by numerical scores alone, but rather through the achievement of specific indicators (fluency, flexibility, and originality). The research also emphasized the processes undertaken by students in solving the given problems. The selected student subjects were subsequently interviewed to gain deeper insights into their creative thinking abilities in addressing the test items.

Creative Thinking Ability Level of Rational Students

CTAL of Subject AAA

In solving Problems 1, 2, and 3, subject AAA, who has a rational personality type, demonstrated the indicators of fluency and flexibility, but did not exhibit originality in any of the three problems. The subject was able to identify facts and relevant information by explicitly stating what was known and what was being asked, and provided more than one relevant idea for solving the problems. For instance, in Problem 1, AAA began by assigning variables x, y, and z to represent the purchase prices of the three items, and subsequently constructed the corresponding mathematical model, as illustrated in Figure 1.

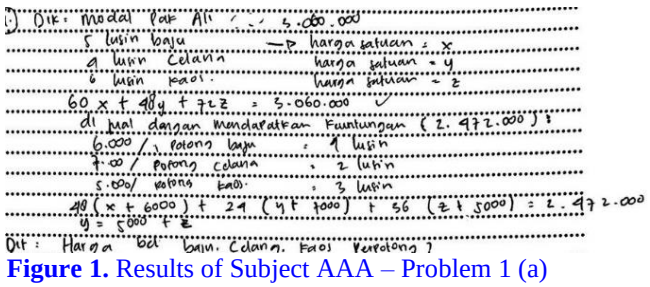

Figure 1. Results of Subject AAA – Problem 1 (a)

In addition, subject AAA utilized the information regarding the profit from each shirt, pair of pants, and t-shirt by incorporating it into the system of equations constructed from the assigned purchase prices. The subject also simplified the equations before performing further operations, which indicates a structured and systematic approach to problem solving. Furthermore, AAA applied two different solution methods (substitution and elimination) to solve the problem, thereby reinforcing the indicator of flexibility. The use of multiple strategies

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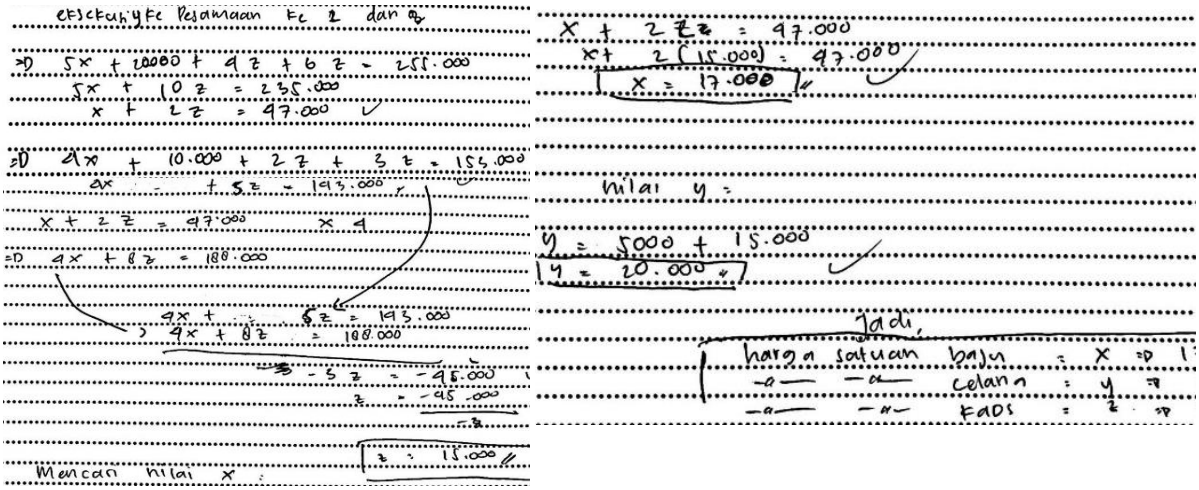
not only validated the accuracy of the solution but also reflected the student's ability to approach the problem from more than one perspective. The solution process is illustrated in Figure 2.

Figure 2. Results of Subject AAA – Problem 1 (b)



The analysis of subject AAA's responses indicates that the student consistently demonstrated fluency and flexibility across Problems 1, 2, and 3, but did not display originality. In the written test for Problem 1, AAA systematically identified the facts and information provided, assigned variables (x, y, and z) for the purchase prices, and translated the problem context into a system of linear equations. The subject also incorporated profit information into the equations and simplified them prior to further operations. To solve the problem, AAA applied two different strategies (substitution and elimination) thereby confirming the presence of flexibility. This was further supported by the interview transcript:

P *Which strategy do you find most suitable for solving the problem?*
SAAA *I prefer the substitution method by substituting the value of* y *into equations (1) and (2). To make the calculation easier, I divided equations (1) and (2) by 12 before substitution. After obtaining the results, I eliminated variable* x *to determine the value of* z*, and then substituted* z *to find the values of* x *and* y.

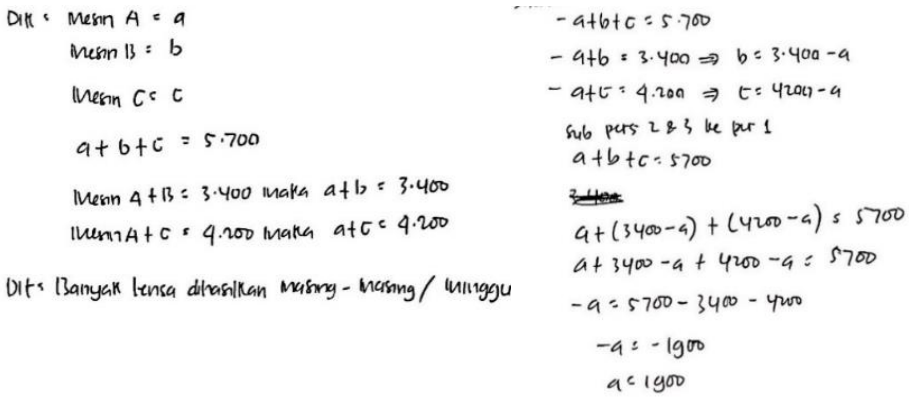
Similar reasoning patterns were observed in Problems 2 and 3, where AAA first identified key facts and information, formulated equations, and then solved them using both elimination and substitution methods. These processes demonstrate AAA's ability to provide more than one relevant idea (fluency) and apply more than one problem-solving method (flexibility). However, no evidence of originality was found, as the strategies remained within conventional approaches and did not involve innovative or uncommon methods. Accordingly, based on both written responses and interview data, subject AAA's creative thinking ability can be classified at CTAL 3 (Creative) across all three problems.

CTAL of Subject NSS

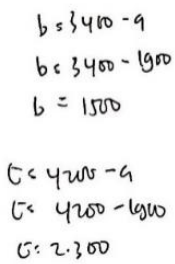
In solving Problems 1 and 2, subject NNS, who has a rational personality type, demonstrated the indicators of fluency and flexibility, but did not exhibit originality. The student was able to construct mathematical models from the information provided in the problems, identify the unknowns, and generate more than one relevant idea for solving the tasks. This process illustrates NNS's ability to interpret given data and approach the problem

through multiple strategies. An example of this modeling process is shown in Figure 3. For Problem 3, however, NNS displayed only the indicator of fluency. The subject successfully formulated a mathematical model and identified the key components of the problem but relied on a single solution method. No evidence of flexibility or originality was observed, as the student did not attempt alternative approaches or propose unconventional strategies. Based on these findings, subject NNS's performance can be classified as CTAL 3 (Creative) for Problems 1 and 2, where fluency and flexibility were achieved, and CTAL 1 (Less Creative) for Problem 3, where only fluency was evident.

Figure 3. Results of Subject NSS – Problem 3 (a)



In Problem 3, subject NNS initially represented the three machines as variables *a*, *b*, and *c*. From the problem statement, the subject constructed three equations: (1) $a + b + c = 5{,}700$ when all three machines operated; (2) $a + b = 3{,}400$ when only machines A and B operated; and (3) $a + c = 4{,}200$ when only machines A and C operated. In the written solution, NNS



transformed equations (2) and (3) into $b = 3{,}400 - a$ and $c = 4{,}200 - a$, and substituted these into equation (1) to directly obtain the value of *a*. Subsequently, the subject determined the values of *b* and *c* using the substitution method, as illustrated in Figure 4. This solution process demonstrates the indicator of fluency, as the subject was able to extract the essential information, model the relationships mathematically, and apply substitution effectively to reach the solution. Furthermore, the student displayed flexibility by combining direct substitutions with transformations of the equations, indicating a willingness to approach the problem from more than one angle. However, no evidence of originality was observed, as the strategies employed remained within conventional algebraic procedures. Accordingly, subject NNS's performance on Problem 3 can be classified at CTAL 3 (Creative), since both fluency and flexibility were present, although originality was absent.

Figure 4. Results of Subject NSS – Problem 3 (b)

This approach is consistent with the following interview excerpt:

P *Why did you choose substitution as your method?*

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SNSS *Because I think it is the fastest. I substituted equations (2) and (3) into equation (1) to obtain* a = 1,900. *Similarly, to find* b *and* c, *I substituted the value of* a *and obtained* b = 1,500 *and* c = 2,300.

Based on the written test and interview results, subject NNS in Problem 3 demonstrated the indicator of fluency by providing more than one relevant idea to solve the problem. However, the subject did not show flexibility, as only one solution method was used, nor originality, since the written responses did not reveal unique or unconventional approaches. Therefore, it can be concluded that in solving Problems 1 and 2, the subject was at Creative Thinking Ability Level (CTAL) 3, while in Problem 3, subject NNS remained at CTAL 1.

Creative Thinking Ability Level of Guardian Students

CTAL of Subject MAL

In solving Problem 2, subject MAL, who has a guardian personality type, demonstrated the indicators of fluency and flexibility, but did not exhibit originality. The subject was able to identify the key information from the problem, transform it into a mathematical model, and apply more than one strategy to solve it. However, in Problems 1 and 3, MAL showed only the indicator of fluency. The subject successfully extracted information from the problem and converted it into mathematical equations, but relied on a single solution method without attempting alternative strategies. As a result, the indicators of flexibility and originality were not evident. For instance, in Problem 1, MAL proposed several initial ideas for approaching the problem before constructing the final mathematical model, as illustrated in Figure 5. Based on these findings, subject MAL can be classified at CTAL 3 (Creative) for Problem 2, where fluency and flexibility were present, and at CTAL 1 (Less Creative) for Problems 1 and 3, where only fluency was evident.

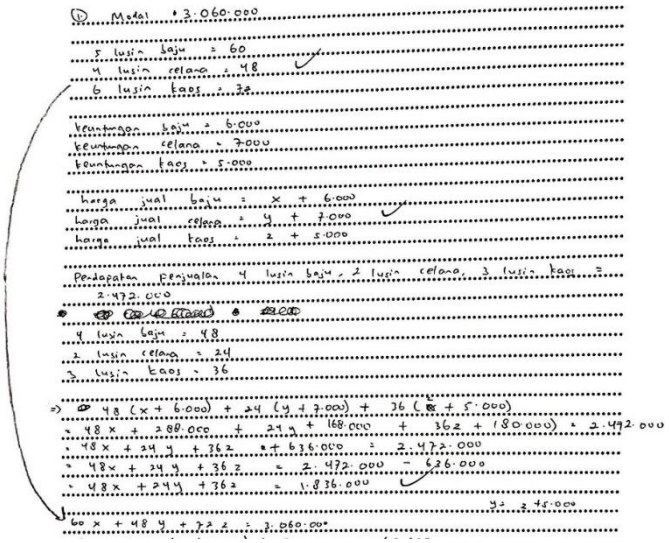
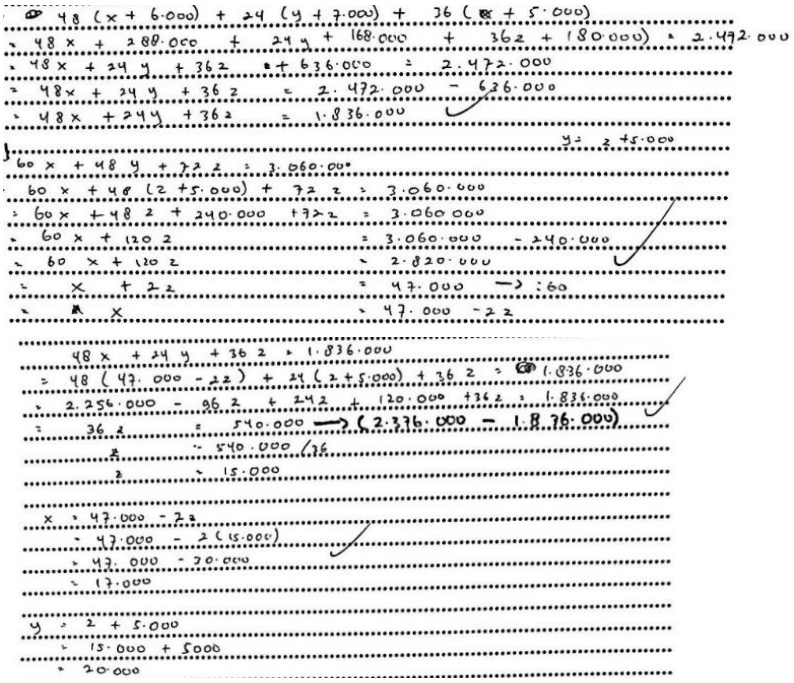


Figure 5. Results of Subject MAL – Problem 1 (a)

The subject multiplied the number of clothing items purchased by Mr. Ali (5 dozen shirts, 4 dozen pants, and 6 dozen t-shirts) by 12 to calculate the total purchase price, resulting in the equation 60x + 48y + 72z = 3,060,000, as indicated by the arrow in the student's written response. The subject then formulated the selling price equations for each item by incorporating the profit margins: x + 6,000 for shirts, y + 7,000 for pants, and z + 5,000 for t-shirts. Using the information about the sales revenue from 4 dozen shirts, 2 dozen pants, and 3 dozen t-shirts,

the subject constructed the revenue equation 48x + 24y + 36z = 1,836,000. Additionally, the subject utilized the information that the purchase price of pants was Rp. 5,000 higher than that of t-shirts, producing the equation y = z + 5,000. However, in solving the problem, the subject was observed to rely on only one method (the substitution method) as shown in Figure 6.

Figure 6. Results of Subject MAL – Problem 1 (b)



From the written test, it was evident that subject MAL relied on only one method (the substitution method) to solve the problems. This was also confirmed in the following excerpt from the interview transcript:

P *Why did you choose substitution as your method?*
SNSS *Because I think it is the fastest. I substituted equations (2) and (3) into equation (1) to obtain* a = 1,900. *Similarly, to find* b *and* c, *I substituted the value of* a *and obtained* b = 1,500 *and* c = 2,300.

Based on the written test and interview, subject MAL in Problem 1 demonstrated the indicator of fluency by providing more than one relevant idea to approach the problem. However, no evidence of flexibility was observed, since only one method was applied, and no indication of originality was found, as the solution did not involve unique or unconventional strategies. A similar pattern was observed in Problem 3, where MAL again showed fluency but not flexibility or originality. In contrast, in Problem 2, MAL successfully demonstrated both fluency and flexibility, though originality was still absent. The subject was able to extract the given information, construct a mathematical model, and employ more than one strategy in solving the problem. Accordingly, it can be concluded that in solving Problems 1 and 3, subject MAL was classified at CTAL 1 (Less Creative), while in Problem 2, MAL reached CTAL 3 (Creative).

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CTAL of Subject FAS

Similar to subject MAL, subject FAS, who has a guardian personality type, demonstrated the indicators of fluency and flexibility in Problem 2 but did not show evidence of originality. In this problem, the subject was able to extract the relevant information, construct a mathematical model, and apply more than one strategy to solve the task. In contrast, in Problems 1 and 3, FAS displayed only the indicator of fluency. The subject successfully identified the information from the problem statement, translated it into mathematical equations, and provided more than one relevant idea for solving the task. However, the student relied on a single method of solution, which meant that flexibility was not evident. Furthermore, no indication of originality was observed, as the approaches remained within standard procedures. For example, in Problem 1, FAS proposed several initial ideas before finalizing the mathematical model, as illustrated in Figure 7. Based on these findings, subject FAS can be classified at CTAL 3 (Creative) for Problem 2, where fluency and flexibility were demonstrated, and at CTAL 1 (Less Creative) for Problems 1 and 3, where only fluency was achieved.

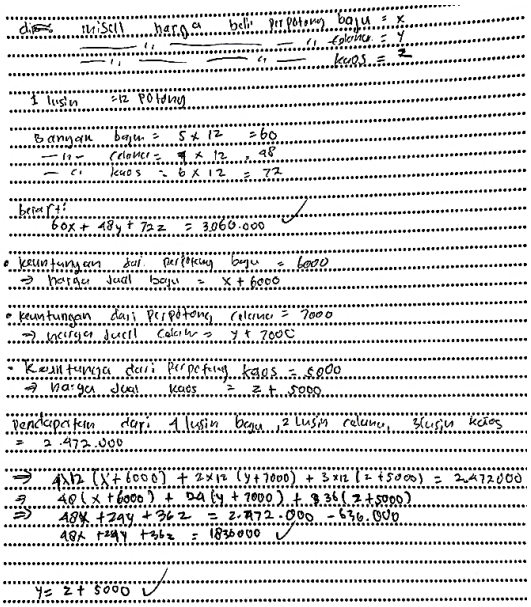

Figure 7. Results of Subject FAS – Problem 1 (a)

In the written test, subject FAS was able to provide more than one relevant idea for solving the problem. The subject assigned variables x, y, and z to represent the purchase prices of each item and constructed a corresponding mathematical model. Next, FAS formulated the selling price equations based on the profit per unit (x + 6,000 for shirts, y + 7,000 for pants, and z + 5,000 for t-shirts) and, using the sales revenue of Rp. 2,472,000, developed the equation 48x + 24y + 36z = 1,836,000. In addition, the subject made use of the information that the purchase price of pants was Rp. 5,000 higher than that of t-shirts, producing the equation y = z + 5,000. However, it was evident from the test results that FAS relied on only one method, the substitution method, to solve the problem, as shown in Figure 8 and confirmed in the following excerpt from the interview transcript:

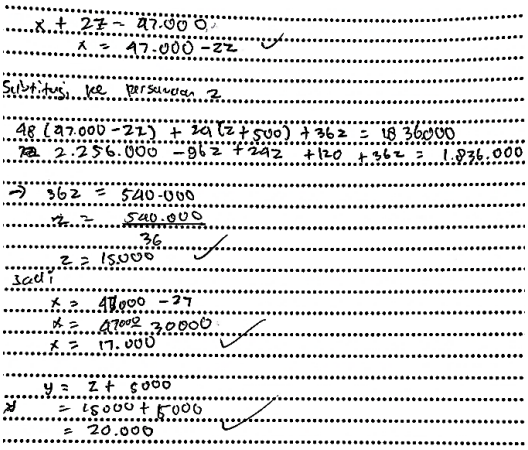

Figure 8. Results of Subject FAS – Problem 1 (b)

Based on the written test and interview, FAS in Problem 1 fulfilled the indicator of fluency by generating more than one relevant idea but did not show flexibility, since only one solution method was employed. Likewise, no evidence of originality was found, as the solutions followed standard procedures. A similar pattern was observed in Problem 3, where the subject again demonstrated fluency without flexibility or originality. In contrast, in Problem 2, FAS achieved both fluency and flexibility, though originality remained absent. The subject was able to identify the relevant information, construct equations, and apply more than one method in the solution process. Therefore, subject FAS can be classified at CTAL 1 (Less Creative) for Problems 1 and 3, and at CTAL 3 (Creative) for Problem 2.

Discussion

Based on the results of the Creative Thinking Ability Test, all subjects—both rational and guardian were able to meet the fluency indicator in all three test items. Regarding flexibility, only student AAA (rational) demonstrated this indicator consistently across all problems, while student NNS (rational) fulfilled it in Items 1 and 2. The two guardian-type students (FAS and MAL) were only able to meet the flexibility indicator in Item 2. With respect to originality, none of the subjects demonstrated this indicator across the three problems. These findings indicate clear differences between rational and guardian students in solving mathematical problems, particularly in the context of the Three-Variable Linear Equation System (SPLTV), which in turn affects their Creative Thinking Ability Levels (CTAL).

Rational students tended to be more open to alternative solutions and more exploratory in seeking multiple methods to solve problems. This tendency is consistent with their personality traits: abstract communication styles and utilitarian problem-solving approaches. Such characteristics make them more inclined toward logical reasoning, creative ideas, and innovation rather than adhering strictly to standard procedures or concrete facts. According to Keirsey's personality theory (1998), rational individuals are oriented toward efficiency and optimal outcomes, which predisposes them to adopt unconventional strategies if they prove effective.

In contrast, guardian students appeared more cooperative and rule-oriented, favoring stability and predictability. This limited their willingness to explore new methods, as they relied on familiar and practical approaches. Gregersen et al. (2011) emphasized that individuals with logical and innovation-oriented thinking are more likely to explore unconventional solutions, whereas traditional-oriented personalities prefer proven approaches, a pattern evident in the guardian students' responses. Similarly, Yan et al., as cited in Wijaya et al. (2016), noted that

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although idealist and rational personalities form a smaller proportion of the population, they often demonstrate exceptional originality and higher creative potential.

Guardian students' preference for conventional approaches aligns with findings by Yuwono (2010), which showed that guardians prefer traditional classrooms with orderly procedures. In this study, guardian students consistently employed standard algorithms without attempting multiple strategies, demonstrating realism and reliance on established methods. As Keirsey (1998) also highlighted, guardians are less likely to develop diverse alternatives, focusing instead on accuracy and efficiency. This observation is further supported by Anastasyia (2024), who found that rational students displayed higher levels of flexibility and originality compared to guardians, who prioritized accuracy and procedural efficiency in problem solving.

Taken together, these findings confirm that personality type significantly influences students' thinking patterns, particularly in solving mathematical problems. Rational students tend to employ logical reasoning and remain open to multiple solutions, while guardian students prefer reliable and practical methods. This study strengthens prior research emphasizing that thinking styles are shaped by personality traits, which directly impact problem-solving strategies. Consequently, understanding such differences can provide a basis for developing instructional strategies tailored to students' personalities, thereby fostering the growth of creative thinking in mathematics learning.

Conclusion

Based on the findings and discussion, it can be concluded that students with rational personality types (AAA and NNS) demonstrated higher Creative Thinking Ability Levels (CTAL) compared to those with guardian personalities. Rational students were able to consistently fulfill the indicators of fluency and flexibility across most test items, placing them predominantly at CTAL 3. However, neither rational nor guardian students exhibited the originality indicator in solving the problems, suggesting that their creativity remained limited to conventional methods and ideas. In contrast, students with guardian personalities (MAL and FAS) showed fluency but tended to rely on a single method of problem solving, resulting in classifications mainly at CTAL 1. An exception was observed in Item 2, where both guardian students achieved CTAL 3. These results indicate that personality type influences students' level of creativity in mathematical problem solving, with rational students outperforming guardian students particularly in flexibility. Nevertheless, all subjects still require further development of creative thinking, especially in terms of originality.

This study is limited to two personality types—rational and guardian—thus the findings cannot be generalized to other types. The focus on structured, logical, and rule-based traits also restricted the exploration of more spontaneous or intuitive thinking styles, which may represent the strengths of other personality types such as artisan and idealist. For example, creativity rooted in imagination or emotion-driven decision-making was not sufficiently addressed. Future research is therefore recommended to include a more comprehensive analysis of all four Keirsey personality types in order to gain deeper insights into how different personality characteristics influence students' creative thinking in mathematics. This study contributes to a deeper understanding of how personality traits shape mathematical creative thinking, providing a foundation for the development of more personalized and differentiated instructional strategies. These findings imply that teachers need to design learning activities that accommodate diverse personality-based approaches in order to more effectively foster students' creative thinking abilities. Overall, the results reaffirm the importance of integrating personality considerations into mathematics education to strengthen students' creative potential.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Authors' Contributions

N.A. contributed to understanding the main ideas of the research and collected the necessary data by conducting research and data gathering at SMA Negeri 2 Enrekang. N.A. also played a role in the development of theory and the formulation of the research methodology. A.S. contributed to the organization and analysis of the data as well as to the discussion of the research findings. The total percentage of contributions for the conceptualization, drafting, and revision of this paper is as follows: N.A.: 60% and A.S.: 40%.

Data Availability Statement

The authors declare that the data supporting the findings of this study will be made available by the corresponding author, [N.A.], upon reasonable request.

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