

Mathematical Creative Thinking Process Analysis Based On Student Learning Style

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Abstract

The creative thinking process of students needs to be developed to generate new ideas when solving mathematical problems. One of the causes of students' difficulties in developing a creative thinking process is different learning styles because differences can affect the student's understanding. This study aims to describe the creative thinking process of students in solving mathematical problems based on learning styles. The subjects of this study are 3 students of MTsN 1 Makassar, each representing one subject: visual, auditory, and kinesthetic learning styles. The study results showed that at the preparation stage, subjects with visual, auditory, and kinesthetic learning styles could carry out the creative thinking process well, as shown by expressing essential ideas from the questions. At the incubation stage, subjects with visual, auditory, and kinesthetic learning styles can develop ideas for solving problems by writing step by step. In the illumination stage, the subject's visual, auditory, and kinesthetic learning styles allow them to express their ideas verbally well. At the verification stage, the visual learning style has not been verified compared to other alternative solutions; auditory and kinesthetic always re-check the answers, re-verify the work results, and compare with other alternative solutions. Thus, auditory and kinesthetic subjects can produce creative thinking processes in solving mathematical problems based on indicators developed by Wallas. In contrast, visual subjects cannot produce creative thinking processes in solving mathematical problems based on indicators developed by Wallas.

Keywords: Creative Thinking Process, Learning Style, Mathematics Problems



INTRODUCTION

The purpose and function of Education according to the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System is to develop abilities and form a dignified national character and civilization to educate the life of the nation, aiming to develop the potential of students to become human beings who believe in and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become a responsible democratic citizen (Putri, 2019).

Learning at school will significantly help students to achieve their educational goals. By learning, students will experience a behavioral process due to correction to their environment. The environment referred to in this case includes humans, plants, or other objects that make students acquire new or pre-existing knowledge. Mathematics is one of the subjects that play an essential role in Education (Ningsih et al., 2020). Through mathematics, students are prepared to face changes in circumstances based on logical, critical, rational, honest, careful thinking, and mathematical mindset (Saputri et al., 2016). In addition, mathematics can also describe problems in daily life in a mathematical model so that it can get faster and simpler solutions (Sulistiyawati et al., 2018).

In general, we can see students' creativity in Indonesia in the results of research conducted by Martin Prosperity, namely *the Global Creativity Index* (GCI), which states that Indonesia is ranked 115th out of 139 countries with an index of 0.202 (Florida, 2015). This result is lower than that of other Southeast Asian countries on the list, such as Thailand, Vietnam, Singapore, and Malaysia. In addition, the results of an international mathematics assessment test for 15-year-old students, namely the *Programme for International Student Assessment* (PISA) test in 2022 issued by the *Organization for Economic Co-operation and Development* (OECD), show that Indonesia has risen 5 positions compared to PISA 2018. Indonesian Mathematics has an average score of 366, ranked 70, below Thailand, ranked 58th, Malaysia 54th, and Singapore first. This shows the need to improve the creative thinking skills of students, especially their mathematical thinking skills.

Creativity is the competence a person possesses to make combinations as a result of his new creativity and has social meaning; not everything that is produced must be new, but a combination. By combining the parts that have existed before, a new combination will be obtained (Munandar, 2012). The Career Center of the Maine Department of Labor USA argues that one of the skills needed in the world of work is the ability to think creatively (Mursidik, Samsiyah, & Rudyanto, 2015). However, it is not only the field of work that requires creative thinking but also the field of Education, especially in mathematics education, because creative thinking is the goal



of learning mathematics. (Anggoro, 2015).

Creative thinking is important in producing ideas that can be applied to solving world problems (Maftukhah et al., 2017). Mathematical creative thinking combines logical and divergent thinking based on intuition but still in consciousness (Nugroho et al., 2013). Creative thinking combines logical and divergent thinking processes (A. P. Sari & Ikhsan, 2017). Logical thinking is more emphasized in students' ability to conclude by the rules of logic, which can be proven with correct conclusions based on previous knowledge according to what is known (Siswono, 2018). Meanwhile, divergent thinking emphasizes the ability of students to find various alternative answers to a problem (Jagom, 2015). The mathematical creative thinking process is used in solving problems by developing a structured mindset by referring to the logical, didactic nature of the area of knowledge and adapting connections to mathematical content (Febriani & Ratu, 2018). Students' creative thinking process accurately represents how creativity emerges in solving problems (Oktaviani, Sisworo, & Hidayanto, 2018).

Wallas revealed that creative thinking is the stages a person goes through when thinking creatively. The guidelines developed by Wallas are one of the most commonly used theories to determine the creative thinking process (T. Y. E. Siswono, 2004). Based on Wallas' theory, creative thinking includes *preparation*, *incubation*, *illumination*, and *verification* (Uloli & Prastowo, 2016).

Based on the results of the preliminary study also show that some students can solve correctly by paying attention and perception to the problem and doing the stages of thinking about the concept of substitution in solving the problem, and can be seen in Figure 1

$$\begin{aligned}
 x + 3y &= 15 & \Rightarrow x &= 15 - 3y \\
 3x + 6y &= 30 \\
 3(15 - 3y) + 6y &= 30 \\
 45 - 9y + 6y &= 30 \\
 45 - 3y &= 30 \\
 -3y &= 30 - 45 \\
 -3y &= -15 \\
 y &= 5 \\
 x + 3(5) &= 15 \\
 x + 15 &= 15 \\
 x &= 0
 \end{aligned}$$

Student 2

$$\begin{aligned}
 \text{Dik: } x + 3y &= 15 \\
 x + 3y &= 15 \\
 3x + 6y &= 30 & \Rightarrow x + 3y &= 10 \\
 \text{Bila } x \text{ di } y & \\
 \text{Penyelesaian: } & \\
 x + 3y &= 10 \\
 x &= 10 - 3y \\
 x + 3y &= 15 \\
 (10 - 3y) + 3y &= 15 \\
 10 + y &= 15 \\
 y &= 15 - 10 \\
 y &= 5 \\
 x + 3y &= 15 \\
 x + 3(5) &= 15 \\
 x + 15 &= 15 \\
 x &= 0
 \end{aligned}$$

Student

These facts raise several questions, including: (1) What is in the student's minds when students identify and solve problems? Moreover, (2) What is the pattern of students' creative thinking process in solving problems based on their learning style? These questions lead to exploring the pattern of the creative thinking process based on the student's learning style preferences if given questions in the form of story questions.

Based on this, the ability of each individual to think creatively is undoubtedly different. Students' creativity when solving math problems and achieving success can be influenced by the learning style factors that students themselves have (Rohmah, Rochaminah, & Idris, 2017). It is not only students' creativity in solving a problem; learning style also has an important role in students' mathematical creative thinking process and improves student achievement (Geradus & Bire, 2014). Several factors affect students' mathematical creative thinking process in solving problems, including internal and external factors (Richard et al., 2014). In line with this, Afifudin et al. (2017) said that students learn according to their learning style, and each learning style affects the thinking process and learning outcomes. Each student has a different way of thinking when solving problems; their learning style allegedly influences this.

Gunawan believes that in carrying out activities of thinking, processing, and understanding information, students have a preferred way, which is what learning style means (Amir, 2015). Students who learn using a more dominant learning style will get better results when compared to students who learn in a way that is not in line with their learning style. (A. K. Sari, 2014) explained that students' learning styles are essential characteristics inherent in students related to absorbing, processing, and conveying information. (Wilyono, Liliyasi, Setiawan, & Paulus, 2012) A person's learning style is absorbing, organizing, and managing the information received. In addition, (Karim, 2014) said that learning style is a way for students to absorb, manage, and process information or lesson materials in their studies.

METHOD

The type of research used is descriptive research using a qualitative approach that aims to describe and reveal data that produces an overview of the student's creative thinking process based on the student's style through problem-solving. The creative thinking process is revealed through the students' work in solving the problem of a two-variable linear equation system, which is observed through written work and strengthened by interviews.

The research was carried out at MTsN 1 Makassar by assigning grade VIII students as research subjects. The determination of the research subject is based on the fact that grade VIII



students have taken the material of the two-variable linear equation system. The research subjects were three students: one with a visual learning style, one with an auditory learning style, and one with a kinesthetic learning style.

RESULT

The following will present the results of the analysis of the student's creative thinking process based on the student's learning style based on the student's work results, interviews, and observations. The results of this analysis are in the form of descriptions or descriptions of students solving SPLDV questions given by the researcher, which are reviewed from the four stages of Wallas: preparation, incubation, illumination, and verification.

Description of the Creative Thinking Process of Visual Learning Style Students

In the first stage, preparation, the subject looks neat in a dress. When reading the question without making a sound, the subject looks calm even though there is a commotion from other students. The following is a presentation of the subject's written results.

② MIRAL $x = \text{roti keju}$
 $y = \text{roti coklat}$
 Dik: $2x + 4y = \text{Rp } 20.000$
 $x + y = \text{Rp } 10.000$
 Dit: $x + 3y = \dots?$

Figure 2 Work of the Subject of SV Preparation Stage

Based on the written results of the Subject SV, it can be seen that the SubjectSubject can collect information or data and identify problems by writing down what is known by equating cheese bread with chocolate bread with xy . The SubjectSubject also understands what is known, and $2x + 4y = \text{Rp } 30.000$ and $x + y = \text{Rp } 10.000$ can write down what is asked of the problem by writing a mathematical equation. To dig into more in-depth information about the subject's creative thinking process, here is an excerpt of an interview between the researcher (P) and the subject (SV).

P What comes to your mind after reading the question?

SV We were told to find out how much 1 pack of cheese-stuffed bread and 3 packs of chocolate-stuffed bread cost.

P What initial information did you find after reading the question?



SV *From this question, I can find out how much two packs of cheese-stuffed bread cost. The price of four packs of chocolate-stuffed bread is Rp. 30,000, while the price of one pack of cheese-stuffed bread and one pack of chocolate-stuffed bread is Rp. 10,000. So, we are told to find out the price of each.*

Based on the interview excerpt above, the subject can quickly mention what is known and ask questions in his language. This proves that the subject has understood the problem presented, collected relevant data and information, and related it to find a solution to the given problem. Next, the researcher wanted to reveal the subject's prior knowledge by asking questions about the concepts he had in mind when solving the problem. The following are the subjects' answers when interviewed:

P *What mathematical concepts might be used to solve this problem?*

SV *This problem is a concept of a two-variable linear equation system.*

P *Why is this problem included in the two-variable linear equation system?*

SV *Because the two variables are about cheese bread and brown bread*

Based on the interview excerpt above, it can be seen that the SubjectSubject knows that the problem given is the concept of a two-variable linear equation system because there are two variables, so from the Subject'sSubject's answer, it can be concluded that the SubjectSubject has the basics of initial knowledge to explore alternatives to solve the problem in the problem. Furthermore, the subject can also describe the information he has obtained from the problem as the first step to solving the problem by making a mathematical model of all the information, as shown in Figure 2 while scribbling on paper with the pen he is holding.

At the **Incubation stage** At the time of the interview, in answering the question, the subject babbles while doodling on paper with a pen and is not distracted by the commotion; the following will be presented with excerpts of the subject's interview at the incubation stage:

P *Did you immediately come up with an idea for the solution?*

SV *Not*

P *Then what do you think and do?*

SV *I was silent for a while, drank, and reread the question. Thinking about what method I will use, Sir*

P *So what method to use?*

SV *I can use the combined method.*

P *How is it the combined method?*

SV *I use the elimination method first and then the substitution method.*



P What if there is another way besides the gabungani method?

SV I also usually use the substitution method and the elimination method

Based on the interview excerpt above, it can be seen that the SubjectSubject, when thinking of an idea to solve the problem on the problem, does not immediately find the idea of solving the problem and experiences a stalled solution. The subject needs to do some activities such as drinking and being still—the subject searches for information by rereading the question. The SubjectSubject also revealed that the idea used is a combined method. The SubjectSubject understands that the combined method uses two methods: the elimination and substitution methods. The SubjectSubject also mentioned that elimination and substitution methods can solve the problem.

In the **Illumination stage**, the subject is solving problems, finding solutions, and being able to answer problems correctly. The SubjectSubject uses the combined method as shown in the following image:

Peny

$$\begin{array}{rcl} 2x + 4y & = & \text{Rp } 30.000 \quad \times 1 \\ x + y & = & \text{Rp } 10.000 \quad \times 2 \\ \hline 2x + 4y & = & \text{Rp } 30.000 \\ 2x + 2y & = & \text{Rp } 20.000 \\ \hline 2y & = & 10.000 \\ y & = & 5.000 \end{array}$$
 Elimination

$$x + (5.000) = \text{Rp } 10.000$$

$$x = 10.000 - 5.000$$

$$x = \text{Rp } 5.000$$
 Substitus

$$x + 3y = 5.000 + 3(5.000)$$

$$= \text{Rp } 20.000$$

Figure 3 Illumination Stage SV Subject Work

Based on the picture, it can be seen that the SubjectSubject is a good planner, careful by taking the first step, namely by eliminating x in equation (1) $2x + 4y = \text{Rp } 30.000$ and equation (2) to facilitate calculations by multiplying 2 equations (2) to obtain a new equation, namely 2. By applying x in both equations, the SubjectSubject obtained the value of $y = \text{Rp } 5.000$. Then, the SubjectSubject substitutes the value of $y = \text{Rp } 5.000$ to the equation and obtains the value $x = \text{Rp } 5.000$. $x + y = \text{Rp } 10.000$ $x + y = \text{Rp } 10.000$ $x + 2y = \text{Rp } 20.000$ $x + y = \text{Rp } 10.000$ Thus, the SubjectSubject can find out how much 1 pack of cheese bread and 3 packs of chocolate bread cost, namely $x + 3y = 5.000 + 3(5.000) = \text{Rp } 20.000$. The SubjectSubject is also able to explain the steps to be taken by babbling while scribbling something on paper with a pen when interviewed, as in the following interview excerpt:

P How do you solve problems based on the ideas you have chosen?

SV I am going to eliminate x first and then substitute it into the equation

P Describe the steps you chose to complete

SV When I pay attention to the two equations, equation 1 is $2x + 4y = \text{Rp } 30,000$, and equation 2 is $x + y = \text{Rp } 10,000$. First, I elucidate x by multiplying 2 equation 2 to obtain $y = \text{Rp } 5,000$. Then, I substitute equation 2 to get $x = \text{Rp } 5,000$. From this result, I can find out how much 1 pack of cheese bread and 3 packs of chocolate bread cost: $x + 3y = 5,000 + 3(5,000) = \text{Rp } 20,000$.

In the **Verification** stage, the SubjectSubject takes the step of substituting the value to the equation so that the SubjectSubject gets the same value, i.e., as in the following image: $x = \text{Rp } 5.000$, $y = \text{Rp } 5.000$

$$\begin{aligned}
 x &= \text{Rp } 5.000 \\
 y &= \text{Rp } 5.000 \\
 \text{Buktikan: } 2x + 4y &= \text{Rp } 30.000 \\
 2(5.000) + 4(5.000) &= \text{Rp } 30.000 \\
 10.000 + 20.000 &= \text{Rp } 30.000 \\
 \text{Jadi Sudah Benar}
 \end{aligned}$$

Figure 4 Results of the Verification Stage SV Subject Work

When confirmed through the interview, the SubjectSubject is also able to explain the steps in testing the truth well by substituting the values of x and y to the equation by concluding that the result obtained by the SubjectSubject is the same, namely by babbling while doodling something on the paper. The following is an excerpt of the Subject'sSubject's interview on that $2x + 4y = \text{Rp } 30.000$ verification :

Interview

P How do you test the correctness of the solution you have done?

SV I looked again at the similarities and how it works, whether right or wrong, Sir, and it was right.

P Did you find another way to solve this problem: by testing the correctness of the previous solution? If so, what is the method like?

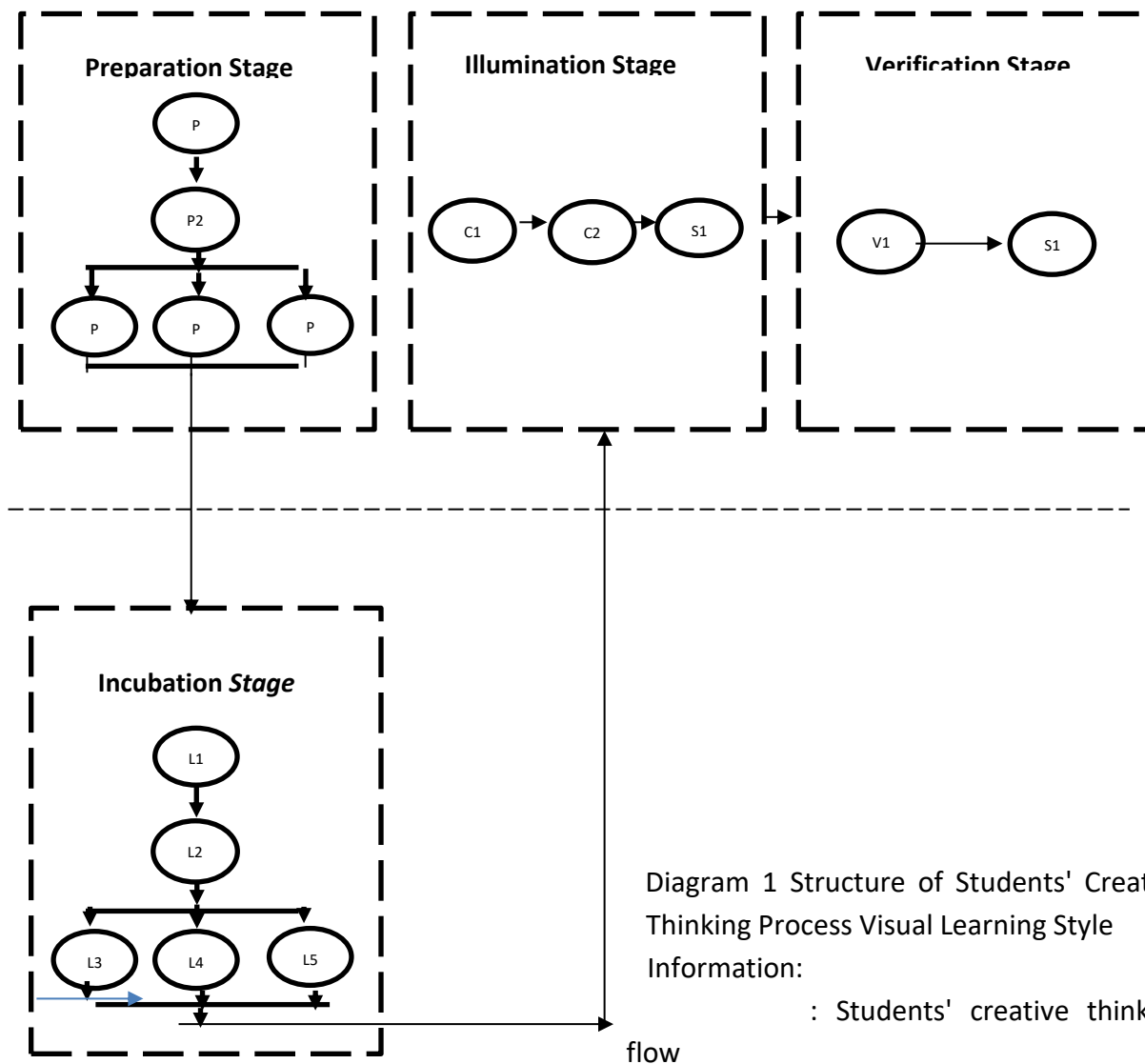
SV For example, I take the equation one $2x + 4y = \text{Rp } 30,000$ and then I substituted the values of X and Y . $2(5,000) + 4(5,000) = 30,000$, and the result was the same, so the answer I got was correct.

Based on the above analysis, it can be concluded that SV subjects with visual learning styles at the subject verification stage re-examine the stages of answers to ensure the correctness of the answers they have obtained. The subject can also test the problem-solving idea worked on in the



problem by substituting the x and y values for known equations. However, the subject cannot be compared with other alternative solutions.

Diagram 1 presents the following creative thinking process of students with a visual learning style based on Wallas's stages.



Code	Information
P1	Reading Questions
P2	Identify the question information provided
P3	Creating a known equation 1

P4	Making equation 2 known
P5	Creating the equation asked
I1	Reading Questions Back
I2	Knowing that the problem is SPLDV
I3	Combined solution ideas/ideas
I4	Substitution settlement ideas/ideas
I5	Ideas/ideas for the elimination solution
C1	Applying ideas to solve problems with combined methods
C2	Strategize the steps to complete the combined method
S1	Get a solution
V1	Checking the solution that has been worked on

Description of Creative Thinking Process of Auditory Learning Style Students

In the first stage, preparation, the SubjectSubject looks neat. When reading the question, the SubjectSubject moves his lips and pronounces it. He also looks disturbed by the commotion from other students. To dig into more in-depth information about the subject's creative thinking process, here is an excerpt from an interview between the researcher (P) and the subject (SA).

P *What comes to your mind after reading the question?*

SA *Sir, in that question, how much did it cost to buy one pack of cheese-stuffed bread and three packs of chocolate-stuffed bread?*

P *What initial information did you find after reading the question?*

SA *From this question, I can find out how much two packs of cheese-stuffed bread cost. The price of four packs of chocolate-stuffed bread is Rp. 30,000, while the price of one pack of cheese-stuffed bread and one pack of chocolate-stuffed bread is Rp. 10,000. So, we are told to find out the price of each.*

I wrote down what is known by equating cheese sandwiches with xy and chocolate sandwiches with xy . So because it was known earlier that $2x + 4y = \text{Rp } 30.000$ $x + y = \text{Rp } 10.000$, what was asked of the question can be written $x + 3y = \dots$?

P *Why don't you write down what you know and what you ask?*

SA *Lazy, Sir, the important thing is that I know.*

Based on the interview results, the subject felt too lazy to write but was able to explain things well. The subject collected information or data and identified the problem by explaining what was known by comparing cheese bread with chocolate bread and xy . The SubjectSubject



also understands what is known, and $2x + 4y = Rp\ 30.000$ $x + y = Rp\ 10.000$ can write down what is asked from the problem by writing in the form of a mathematical equation, namely $x + 3y = \dots$? Next, the researcher wants to reveal the subject's prior knowledge before solving the problem with questions about the concepts he thinks about when solving the problem. The following are the subjects' answers when interviewed:

P *What mathematical concepts might be used to solve this problem?*

SA1 *Sir, this problem includes the two-variable linear equation system.*

P *Why is this problem included in the two-variable linear equation system?*

SA1 *Yes, because there are variables of cheese bread and brown bread*

Based on the interview excerpt above, it can be seen that the SubjectSubject knows that the problem given is the concept of a two-variable linear equation system because there are two variables, so from the Subject'sSubject's answer, it can be concluded that the SubjectSubject already has the basics of initial knowledge to explore alternatives to solve the problem in the problem.

At the **Incubation stage**, At the time of the interview, answering questions the SubjectSubject speaking well and clearly in a loud voice, the following will be presented excerpts of the Subject'sSubject's interview:

P *Did you immediately come up with an idea for the solution?*

SA1 *No, it is necessary to recall the ways I have learned*

P *What do you do?*

SA1 *I had time to sing, talk to friends, then reread the question, Sir*

P *How many times have you read the question*

SA1 *Twice*

P *How long does it usually take to solve a problem like this?*

SA1 *5 minutes like just now*

P *So what method to use?*

SA1 *I can use the elimination method*

P *That is my plan, which is to eliminate x. After it is done, I will eliminate y*

SA1 *Can what it looks like be explained?*

P *I will equalize the numbers on x of the two equations, eliminating y.*

P *What if there is another way besides the elimination method?*



SA1 You can also use the substitution method and the combined method

Based on the interview excerpt above, it can be seen that the SubjectSubject, when thinking of an idea to solve the problem on the problem, does not immediately find the idea of solving the problem and experiences a stalled solution. The SubjectSubject took 5 minutes to do activities like singing and talking to friends. The subject searched for information by rereading the question with a rather loud voice. The SubjectSubject also revealed that the idea to be used is the elimination method. The SubjectSubject understands that the elimination method removes one of the variables in the equation. The SubjectSubject also mentioned that combined and substitution methods can solve the problem.

In the **Illumination stage**, the SubjectSubject, in solving the problem, can find a solution and can answer the problem correctly using the elimination method, as shown in the following figure:

Handwritten work showing the elimination method:

$$\begin{array}{rcl} \text{eliminasi } x: & & \\ 1. & 2x + 4y = 30.000 & \times 1 \\ & 1x + 1y = 10.000 & \times 2 \\ \hline & 2x + 4y = 30.000 & \\ & 2x + 2y = 20.000 & - \\ \hline & 2y = 10.000 & \\ & y = \frac{10.000}{2} & \\ & y = 5.000 & \end{array}$$

$$\begin{array}{rcl} \text{eliminasi } y: & & \\ & 2x + 4y = 30.000 & \times 1 \\ & 1x + 1y = 10.000 & \times 4 \\ \hline & 2x + 4y = 30.000 & \\ & 4x + 4y = 40.000 & - \\ \hline & -2x = -10.000 & \\ & x = \frac{-10.000}{-2} & \\ & x = 5.000 & \end{array}$$

Below the equations, the student calculates the total cost:

$$1x + 3y = 5.000 + 3(5.000) = 5.000 + 15.000 = 20.000$$

Handwritten conclusion: $\Rightarrow$ Jadi 1 bungkus roti isi keju dan 3 bungkus roti isi coklat = 20.000

Figure 4 Results of SA Subject *Illumination Stage*

Based on the picture, it can be seen that the SubjectSubject takes the first step, namely by eliminating x in equation (1) $2x + 4y = \text{Rp } 30.000$ and equation (2) to facilitate the calculation by multiplying 2 equations (2) to obtain a new equation, namely 2. By applying x in both equations, the SubjectSubject obtained the value of $y = \text{Rp } 5.000$. Then the SubjectSubject performs $x + y = \text{Rp } 10.000$ $x + y = \text{Rp } 10.000$ $x + 2y = \text{Rp } 20.000$ the elimination of y on equation (1) $2x + 4y = \text{Rp } 30.000$ and equation (2) to facilitate the calculation by multiplying 4 equations (2) to obtain a new equation, namely 4. By imagining y in both equations, the SubjectSubject gets a value of $x = \text{Rp } 5.000$. $x + y = \text{Rp } 10.000$ $x + y = \text{Rp } 10.000$ $x + 4y = \text{Rp } 40.000$ Thus, the SubjectSubject can find out how much 1 pack of cheese bread and 3 packs of chocolate bread cost, namely $x + 3y = 5.000 + 3(5.000) = \text{Rp } 20.000$. The SubjectSubject is also able to explain the steps

that will be carried out well and clearly with a pen when interviewed, as in the following interview excerpt:

P How do you solve problems based on the ideas you have chosen?

SA I eliminate x first, then eliminate y

P Try to explain the steps to complete it that you chose

SA When I pay attention to the two equations, equation 1 is $2x + 4y = \text{Rp } 30,000$, and equation 2 is $x + y = \text{Rp } 10,000$. First, I elucidate x by multiplying 2 equation 2 to obtain $y = \text{Rp } 5,000$. then I

From this result, I can find out how much 1 pack of cheese bread and 3 packs of chocolate bread cost: $x + 3y = 5,000 + 3(5,000) = \text{Rp } 20,000$.

The SubjectSubject takes a step in the verification stage by resolving the problem using the combined method. First, the SubjectSubject uses the method of elimination x so that the value of $y = 5,000$ is obtained and then substitutes the value to the equation to the equation, from the value of y and x the subject substitutes to the equation in question, i.e., so that the SubjectSubject gets the same value, as shown in the following figure: $y = 5.000x + y = 10.000x + 3y = \dots ? 20.000$

$$\begin{array}{rcl} 2x + 4y & = & 30.000 \quad | \times 1 \\ x + y & = & 10.000 \quad | \times 2 \\ \hline 2x + 4y & = & 30.000 \\ - (2x + 2y = 20.000) & & \\ \hline 2y & = & 10.000 \\ y & = & \frac{10.000}{2} \\ y & = & 5.000 \end{array}$$

$$\begin{array}{rcl} x + y & = & 10.000 \\ x + 5.000 & = & 10.000 \\ x & = & 10.000 - 5.000 \\ x & = & 5.000 \end{array}$$

$$x + 3y = 5.000 + 3(5.000) \Rightarrow \text{Jadi tetap sama} = 5.000 + 15.000 = 20.000$$

Figure 6 SA Subject Results Verification Stage

When confirmed through an interview, the subject can also smoothly explain the steps for testing the truth by choosing a combined method. The following is an excerpt of the subject's interview on that *verification* :

Table 4.28 Results of SA1 Subject Interviews at the *Verification Stage*

P How do you test the correctness of the settlement you have done?

SA Earlier, I checked how I worked, Sir, and it is correct.



P Did you find another way to solve this problem: by testing the correctness of the previous solution? If so, what is the method like?

SA I will choose another method, which is the combined method. First, I will eliminate x from the equations $2x + 4y = 30,000$ and $x + y = 10,000$. So, I get the value of $y = 5.000$. Then, I substitute $x + y = 10,000$ and get the value of $x = 5.000$ as well. Then, I substitute the values from x and y to the equation $x + 3y$. $5,000 + 3(5,000) = 20,000$. The result is the same, so the answer I got is correct.

Based on the above analysis, it can be concluded that SA subjects with auditory learning styles at the subject verification stage re-examine the stages of answers to ensure the correctness of the answers they have obtained. Subjects can also test the problem-solving ideas worked on in the problem using a combined method. The following creative thinking process of students with an

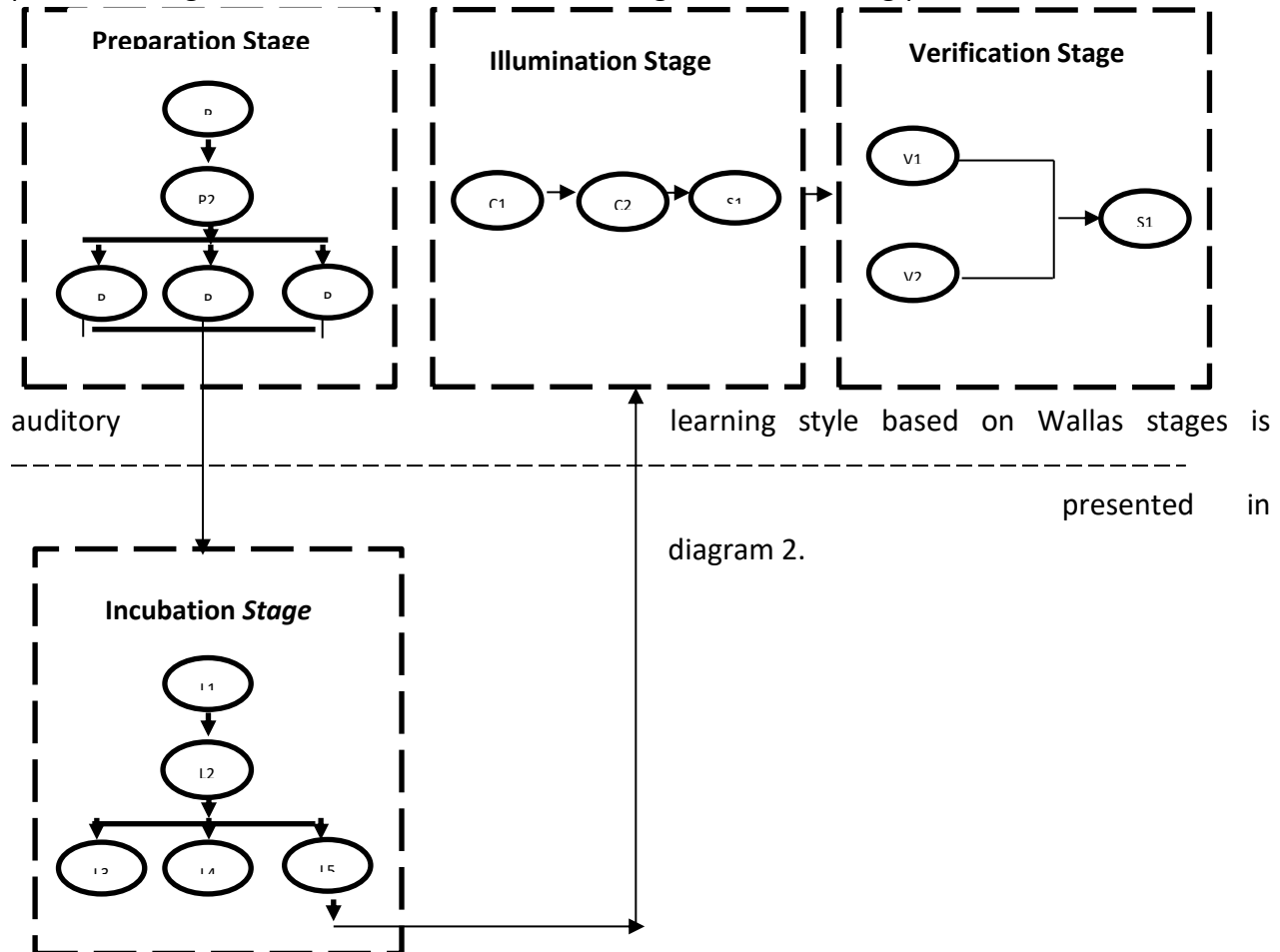


Diagram 2 Structure of Students' Creative Thinking Process Auditory Learning Style

Information:

—: Students' creative thinking flow

Code	Information
P1	Reading Questions
P2	Identify the question information provided
P3	Creating a known equation 1
P4	Making equation 2 known
P5	Creating the equation asked
I1	Reading Questions Back
I2	Knowing that the problem is SPLDV
I3	Combined solution ideas/ideas
I4	Substitution settlement ideas/ideas
I5	Ideas/ideas for the elimination solution
C1	Applying ideas to solve problems with elimination methods
C2	Strategizing steps to solve elimination methods
S1	Get a solution
V1	Checking the solution that has been worked on
V2	Resolve alternative solutions with a combined method

Description of Creative Thinking Process of Kinesthetic Learning Style Students

In the **preparation stage**, the subject uses his finger to guide him when reading, but he cannot sit still. The following is a presentation of the written results of the SubjectSubject.

$$\begin{array}{l}
 1. \text{ Dik} = 2X + 4Y = 30.000 \\
 \quad \quad X + Y = 10.000 \\
 \text{Dit} = X + 3Y = ?
 \end{array}
 \quad \left| \begin{array}{l}
 \text{Roti keju} = X \\
 \text{Roti coklat} = Y
 \end{array} \right.$$

Figure 7 Results of SK Subject Preparation Stage

Based on the written results of the subject SK1, it can be seen that the SubjectSubject can collect information or data and identify problems by writing down what is known by equating cheese-stuffed bread with chocolate-stuffed bread with XY . The SubjectSubject also understands



what is known, and $2X + 4Y = 30.000$ $X + Y = 10.000$ can write down what is asked of the problem in a mathematical equation. To dig into more in-depth information about the subject's creative thinking process, here is an excerpt of an interview between the researcher (P) and the subject (SK). $X + 3Y = \dots$?

P *What comes to your mind after reading the question?*

SK *In this question, you will find out how much one pack of cheese-stuffed bread and three packs of chocolate-stuffed bread cost.*

P *What initial information did you find after reading the question?*

SK *From this question, I know how much 2 packs of cheese stuffed bread and the price of 4 packs of chocolate stuffed bread is Rp. 30,000, while the price of 1 pack of cheese-stuffed bread and 1 pack of chocolate-stuffed bread is Rp. 10,000. So we are told to find out the price of each. I wrote down what is known by equating cheese sandwiches with chocolate sandwiches with xy . So because it was known earlier and $2x + 4y = 30.000$ $x + y = 10.000$, what is asked from the question can be written $x + 3y = \dots$?*

Based on the results of the interview of SK subjects, it can be seen that the subjects use a lot of body signals, such as hands and eyes, and respond to physical attention. The SubjectSubject can slowly mention what is known and ask about the question. This proves that the subject has understood the problem and can collect information or data on the question to solve the problem contained in the question. Next, the researcher wanted to reveal the subject's prior knowledge by asking questions about the concepts he had in mind when solving the problem. Here are the subjects' answers when interviewed

P *What mathematical concepts might be used to solve this problem?*

SK1 *Pak two-variable linear equation system*

P *Why is this problem included in the two-variable linear equation system?*

SK1 *Because in two variables, namely cheese bread and chocolate bread*

Based on the interview excerpt above, it can be seen that the SubjectSubject knows that the problem given is the concept of a two-variable linear equation system because there are two variables, so from the Subject'sSubject's answer, it can be concluded that the SubjectSubject has the basics of initial knowledge to explore alternatives to solve the problem in the problem. Furthermore, the subject can also describe the information he has obtained from the problem as the first step to solving the problem by making a mathematical model from all the information, as shown in Figure 7.



At the **Incubation stage**, During the interview, answering the Subject'sSubject's questions by speaking slowly and moving his hands and eyebrows, the following will be presented with excerpts of the Subject'sSubject's interview:

P *Did you immediately come up with an idea for the solution?*

SK *No Brother*

P *Then what do you think and do?*

SK *I stood up, walked, and sat down again, Sir, remembering what I had learned, Sir*

P *How many times have you read the question*

SK *Twice*

P *Why do you use your finger as a pointer when reading the question?*

SK *No, Sir, I quickly understood that I was like that, Sir*

P *How long does it usually take to find a solution to this problem?*

SK *3 minutes like just now*

P *So what method to use?*

SK *Pak combined method*

P *How is it the combined method?*

SK *I am going to equalize the numbers on x of the two equations. So, I get a value y and then substitute it to one of Sir's equations.*

P *What if there is another way besides the combined method?*

SK *You can also use the substitution method only and the elimination method only.*

Based on the interview excerpt above, it can be seen that the SubjectSubject, when thinking of an idea to solve the problem on the problem, does not immediately find the idea of solving the problem and experiences a stalled solution. The SubjectSubject took 3 minutes doing several activities such as standing up, walking, and sitting back—the SubjectSubject searched for information by rereading the question using his finger as a clue. The SubjectSubject also revealed that the idea used is a combined method. The SubjectSubject understands that the combined method uses two methods: the elimination and substitution methods. The SubjectSubject also mentioned that elimination and substitution methods can solve the problem.

In the **Illumination stage**, the subject, in solving the problem, can find a solution and answer the problem correctly. The SubjectSubject uses the combined method as shown in the following image:



Handwritten mathematical work showing the solution of a system of linear equations:

$$\begin{aligned} \text{jwb: } & 2x + 4y = 30.000 \quad | \quad 1 \\ & x + y = 10.000 \quad | \quad 2 \\ & \hline & 2x + 4y = 30.000 \\ & 2x + 2y = 20.000 \\ & \hline & 2y = 10.000 \\ & y = \frac{10.000}{2} \\ & y = 5.000 \end{aligned}$$

Substitution and verification steps:

$$\begin{aligned} 2x + 4(5.000) &= 30.000 \\ 2x + 20.000 &= 30.000 \\ 2x &= 30.000 - 20.000 \\ 2x &= 10.000 \\ x &= \frac{10.000}{2} \\ x &= 5.000 \end{aligned}$$

Verification:

$$\begin{aligned} x + 3y &= \\ 5.000 + 3(5.000) &= \\ 5.000 + 15.000 &= \\ 20.000 & \end{aligned}$$

Final result circled: $x + 3y = 20.000$

Figure 8 Results of the Subject of the Illumination Stage SK

Based on the picture, it can be seen that the SubjectSubject takes a step by eliminating x in equation (1) $2x + 4y = 30.000$ and equation (2) to facilitate the calculation by multiplying 2 equations (2) to obtain a new equation, namely 2. The SubjectSubject obtained a value of $y = 5,000$ by applying x in both equations. Then the Subject substitutes $x + y = 10.000$ to equation (1) $2x + 4y = 30.000$ to $2x$. The SubjectSubject obtains a value of $x = 5,000$. Thus, the SubjectSubject can find out how much 1 pack of cheese bread and 3 packs of chocolate bread cost, namely $x + 3y = 5,000 + 3(5,000) = \text{Rp } 20,000$. The SubjectSubject is also able to explain the steps to be taken slowly and using physical attention, as in the following interview excerpt:

P How do you solve problems based on the ideas you have chosen?

SK I am going to eliminate x first and then substitute it into the equation

P Try to explain the steps to complete it that you chose

SK When I pay attention to the two equations, equation 1 is $2x + 4y = \text{Rp } 30,000$, and equation 2 is $x + y = \text{Rp } 10,000$. First, I eliminate x by multiplying 2 equation 2 to obtain $y = \text{Rp } 5,000$. Then, I substitute equation 2 to get $x = \text{Rp } 5,000$. From this result, I can find out how much 1 pack of cheese bread and 3 packs of chocolate bread cost: $x + 3y = 5,000 + 3(5,000) = \text{Rp } 20,000$.

At the Verification level, the SubjectSubject takes steps by subtracting equation (1) $2x + 4y = 30.000$ and equation (2) $x + y = 10.000$; the result is $x + 3y = 20.000$, as shown in the following figure:

$$\begin{array}{r}
 2x + 4y = 30.000 \\
 x + y = 10.000 \quad - \\
 \hline
 x + 3y = 20.000 \\
 \text{Jadi Sama halnya } 20.000
 \end{array}$$

Figure 7 Results of Subject Decree Question Number 1 Verification Stage

At the time of confirmation through the interview, the SubjectSubject is also able to explain the steps in testing the truth well by subtracting the equation (1) $2x + 4y = 30,000$ and the equation (2) $x + y = 10,000$ by concluding that the result obtained by the SubjectSubject is the same as the one asked in the question, namely $x + 3y = 20,000$ is the same as the result obtained by elimination. The following is an excerpt of the subject's interview on that *verification* :

P How do you test the correctness of the solution you have done?

SK I checked how I worked, Sir, whether it was and was correct, Sir

P Did you find another way to solve this problem: by testing the correctness of the previous solution? If so, what is the method like?

SK By subtracting equation (1) $2x + 4y = 30,000$ and equation (2) $x + y = 10,000$, Sir, the result is the same as asked in the question, which is $x + 3y = 20,000$
So the result is the same, so the answer I got is correct, Sir.

Based on the above analysis, it can be concluded that SK subjects with kinesthetic learning styles at the verification stage of the SubjectSubject re-examine the stages of the answers to ensure the correctness of their obtained answers. The SubjectSubject can also test the problem-solving ideas worked on on the problem by subtracting the two equations.



Diagram 2 presents the creative thinking process of students with a kinesthetic learning style based on Wallas's stages.

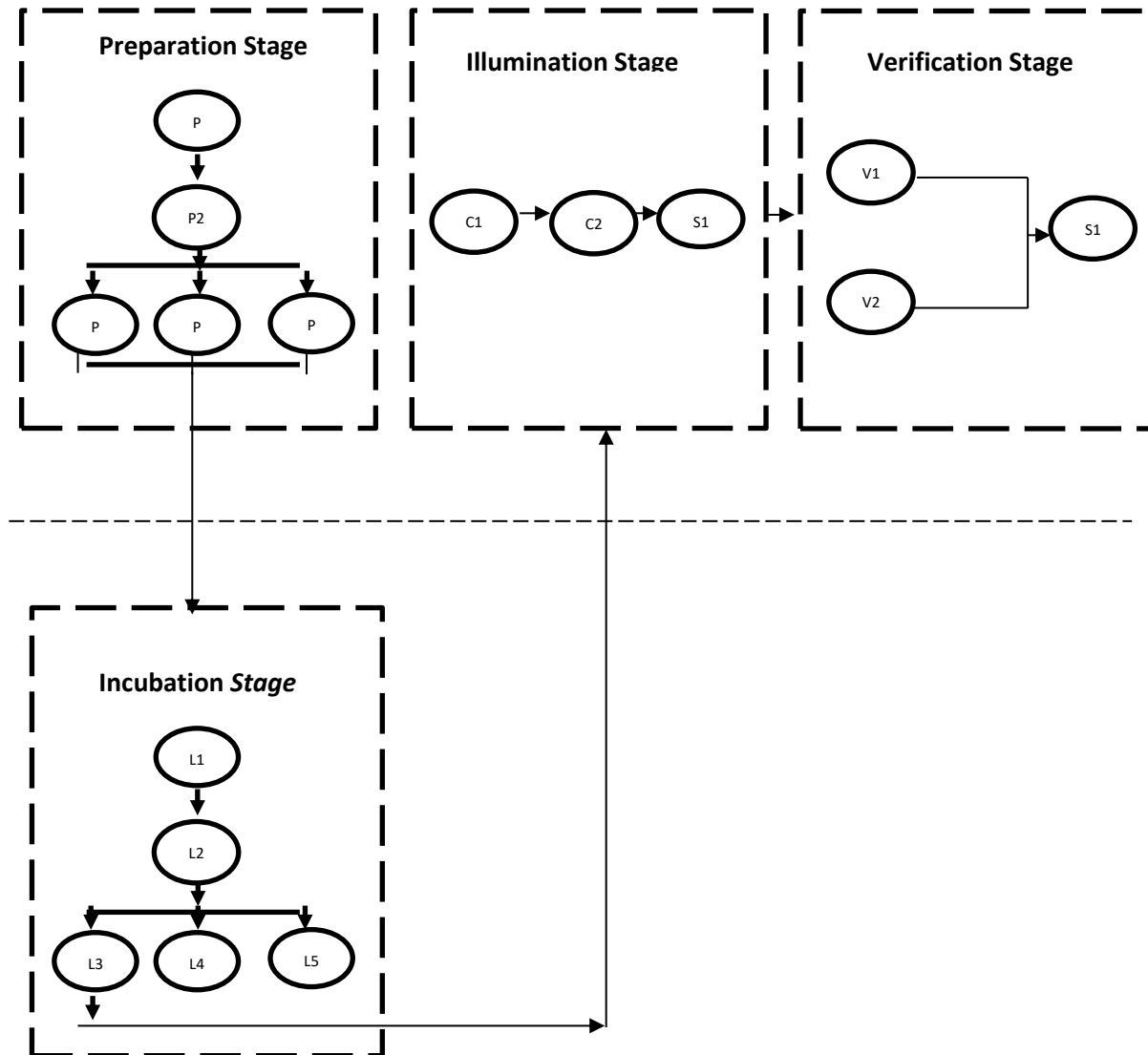


Diagram 3 Structure of Creative Thinking Process of Kinesthetic Learning Style Students Information:

—: Students' creative thinking flow

Code	Information
P1	Reading Questions
P2	Identify the question information provided
P3	Creating a known equation 1
P4	Making equation 2 known
P5	Creating the equation asked
I1	Reading Questions Back
I2	Knowing that the problem is SPLDV
I3	Combined solution ideas/ideas
I4	Substitution settlement ideas/ideas
I5	Ideas/ideas for the elimination solution
C1	Applying ideas to solve problems with combined methods
C2	Strategize the steps to complete the combined method
S1	Get a solution
V1	Checking the solution that has been worked on
V2	Solve other alternative solutions by subtracting known equations

This study found 3 mathematical creative thinking processes based on students' learning styles: mathematical creative thinking processes with visual learning styles, mathematical creative thinking processes with auditory learning styles, and mathematical creative thinking processes with kinesthetic learning styles. Creative thinking combines logical and divergent thinking processes (A. P. Sari & Ikhsan, 2017). Logical thinking is more emphasized in students' ability to conclude by the rules of logic, which can be proven with correct conclusions based on previous knowledge according to what is known (Siswono, 2018). Meanwhile, divergent thinking emphasizes the ability of students to find various alternative answers to a problem (Jagom, 2015). The mathematical creative thinking process is used in solving problems by developing a structured mindset by referring to the logical, didactic nature of the area of knowledge and adapting connections to mathematical content (Febriani & Ratu, 2018). Students' creative thinking process accurately represents how creativity emerges in solving problems (Oktaviani, Sisworo, & Hidayanto, 2018). The creative thinking process of students is an accurate picture of how students' mathematical creativity occurs. Savic (2016) suggests using Wallas's four creative thinking stages to discover this.



1. Mathematical creative thinking process in the style of visual learning

The results of this study show that students who have a visual learning style tend to be more effective in understanding and remembering information through sight; this is in line with the opinions (Papilaya & Huliselan, 2016) and (De Poter & Hernacki, 2015).

In the **preparation stage**, the subject can identify the information in the problem by reading the problem by heart and thinking about making known equations and equations. When creating equations or mathematical models, they use the symbols or reasoning x , y , k , c , m , and s as variables. This is supported by the statement of Lohman et al. (in Diezmann & Watters 2000) that students can present and manipulate information in the form of symbols. According to Wallas, this preparation stage is the initial stage where humans first collect information by learning everything through their lives (Rusli, 2018). In line with this, Fathurrohman (2015) emphasized that information explains how individuals respond to the responses that come from their environment by organizing data, formulating problems, building concepts and problem-solving plans, and using verbal and nonverbal symbols.

The activities in this preparation stage are reading, thinking, writing down known and asked equations, observing pictures, asking questions, and knowing and understanding what is observed. According to **Tapomoy Deb (2006)**, it is a stage where a person is in a learning condition, such as understanding the problems he faces or making sand elevations on something. The SubjectSubject can carry out the *preparation* stages well. This aligns with the opinion of Jagom et al. (2021) that the visual learning style can carry out the *preparation* stages well, as shown by revealing important information from the questions. This is also the opinion of Warr & Neill (2014) that in the first stage of preparation, a person prepares to solve a problem by collecting relevant data and looking for an approach. Based on Savic (2016), understanding the problem is important in the preparation stage.

At the **incubation stage**, the SubjectSubject reads the question silently; the SubjectSubject tends to be silent by paying attention to the information in the question and needs time to find a solution to the problem by remembering the materials taught. Silent expression is a step where students allow their minds to rest and try to develop ideas. This is Cropley and Urban's (2000) opinion that the incubation stage is when students compile the relationship of finishing ideas from the ideas they have received before. Then, thinking and then doing activities such as going to the toilet, eating snacks, resting, opening WA, and rereading the problem, finally realizing that the problem includes a two-variable linear equation system and determining the idea or idea of the solution, namely the method of combination, substitution, and elimination. This aligns with Rusdi



(2018), who states that the *incubation phase* is when the experience, data, and information that are read and observed are consciously thought about and precipitated.

In this phase, all the experiences, data, and information obtained in the previous *preparation stage* are precipitated until inspiration finally arises. This is reinforced by the opinion of Jagom et al. (2021) that the visual learning style can carry out the *incubation* stages shown by developing ideas in solving problems. Steven M et al. (1999) suggested that the influence of this phase is the emergence of the ability to find solutions, among others. The ability to find this solution can occur suddenly, either when facing a problem or shortly after we experience a problem during the incubation period.

In the ***illumination stage***, the subject applies combined methods, substitutions, and eliminations and develops strategies for problem-solving steps. At this stage, the subject plans the solution to be performed. The idea of solving the problem arises after the subject does *incubation*. This agrees with Savic (2016), who believes that the ideas that emerged from the incubation period are illuminated. Based on Siswono & Kurniawati (2004), in the third stage, a person gets problem-solving, followed by the emergence of inspiration and ideas, which start and follow the emergence of new inspiration and ideas.

The ***verification stage*** is the testing phase. The subject can only check the answers he has obtained and cannot compare the answers with other alternative solutions. According to Savic (2016), the verification stage is illumination. Dep Tapomoy (2006) called this phase the examination phase

Based on these findings, the mathematical creative thinking process with a visual learning style of students meets the indicators of the wallas stages, namely *the preparation, incubation, and illumination stages*. In contrast, the *verification stage* is only 1 indicator. This is in line with research (Khasanah et al., 2018). Students with a visual learning style can pass each stage of Wallas' creative thinking well and fulfill 3 stages. This contradicts Ardianik (2019), who said that students with visual learning styles can meet the indicators at the Wallas stage.

2. Auditory learning style mathematical creative thinking process

This study's results show that students with an auditory learning style are more inclined to use hearing, verbal, and information repetition. They often construct understanding by speaking verbally and repeating mathematical concepts. This activity is an important part of the individual's understanding of the problem that is reexpressed verbally and forming a new understanding of the problem (Zazkis et al., 2016). This aligns with the opinion of Unsworth et al. (2013) that



students with auditory learning styles using verbal methods to solve problems are part of the right retrieval strategy to generate their cues to access information in long-term memory.

At the *preparation* stage, based on the results of the work and interview citations, the subject did not write down what he knew and asked in the question, so an interview was conducted to determine his understanding of the question. In this case, the subject can express his understanding of the information in question well. Based on Savic (2016), understanding the problem is important in the preparation stage. This is the opinion of NCTM (2000) that students at the upper secondary level must be able to express their mathematical ideas effectively by explaining to others so that the truth and clarity can be considered logically. In line with the opinion of Warr & Neill (2014), in the first stage of preparation, a person prepares themselves to solve a problem by collecting relevant data and looking for an approach.

The SubjectSubject can explain well and fluently the symbols or reasoning that x , y , M , and S are used as variables, known equations, and equations in question. This is supported by the statement of Lohman et al. (in Diezmann & Watters 2000) that students can present and manipulate information in the form of symbols. According to Wallas, this preparation stage is the initial stage where humans first collect information by learning everything through their lives (Rusli, 2018). This aligns with the opinion of Jagom et al. (2021) that the auditory learning style can carry out the *preparation* stages well, as shown by revealing important information from the questions. Warr & Neill (2014) also believes that in the first stage of preparation, a person prepares to solve a problem by collecting relevant data and looking for an approach. It is also in line with Savic (2016) that understanding the problem is important in the preparation stage.

Activities that fall into this preparatory stage include reading questions by moving your lips and saying them, thinking, explaining known and asked equations, observing pictures, asking questions, and knowing and understanding what is explained. According to Tapomoy Deb (2006), it is a stage where a person is in a learning condition, such as understanding the problems he faces and making observations.

At the *incubation stage*, the subject rereads the problem, thinks about it, then do activities such as singing, talking to friends, listening to songs, rereading the problem, finally realizing that the problem includes a two-variable linear equation system and determining the idea or idea of the solution, namely the elimination method and the combined method. This aligns with (Rusdi, 2018) that the *incubation phase* is a state in which the experience, data, and information that are read and observed are consciously thought about and precipitated.

In this phase, all the experiences, data, and information obtained in the previous



preparation stage are precipitated until inspiration finally arises. This is reinforced by the opinion of Jagom et al. (2021) that the visual learning style can carry out the *incubation* stages shown by developing ideas in solving problems. Steven M et al. (1999) suggested that the influence of this phase is the emergence of the ability to find solutions, among others. The ability to find this solution can occur suddenly, either when facing a problem or shortly after we experience a problem during the incubation period.

In the ***illumination stage***, the subject applies the elimination method and the combined method, as well as strategizes the problem-solving steps. At this stage, the subject plans the solution to be performed. The idea of solving the problem arises after the subject does *incubation*. This agrees with Savic (2016), who believes that the ideas that emerged from the incubation period are illuminated. Based on Siswono & Kurniawati (2004), in the third stage, a person gets problem-solving, followed by the emergence of inspiration and ideas, which start and follow the emergence of new inspiration and ideas.

The ***verification*** stage is the testing phase. The subject can check the answers he has obtained and compare them with other alternative solutions by combining them. According to Savic (2016), the illumination stage describes the verification stages. Dep Tapomoy (2016) called this phase the examination phase.

Based on these findings, the student's auditory learning style mathematical creative thinking process meets all the indicators of the wallas stage, namely *the preparation, incubation, illumination, and verification stages*. This aligns with Ardianik (2019), saying that students with a visual learning style can meet the indicators at the Wallas stage. However, contrary to research. However, contrary to research (Khasanah et al., 2018), students with an auditory learning style can go through the 3 stages of Wallas' creative thinking process, namely *preparation, incubation, and illumination*, because they cannot re-examine the answers they obtain.

3. Mathematical creative thinking process with kinesthetic learning style

The results of this study show that students have a kinesthetic learning style that prefers to learn by moving, using fingers as a guide when reading, and cannot sit still. They like to shake objects or use physical movements to solve problems. This aligns with the opinion (De Porter & Hernacki, 2015) that kinesthetic students prefer to learn by moving, experimenting with mathematical concepts, shaking objects, or using physical movements to solve problems.

In the ***preparation*** stage, the subject can identify the information in the problem by reading the question using the finger as a clue when reading, thinking to make known equations,



and asking equations and using symbols or reasoning S , M , x , and y as variables when creating equations or mathematical models. This is supported by the statement of Lohman et al. (in Diezmann & Watters 2000) that students can present and manipulate information in the form of symbols. This aligns with the opinion of Jagom et al. (2021) that the kinesthetic learning style can carry out the *preparation* stages well, as shown by revealing important information from the problem. According to Wallas, this preparation stage is the initial stage where humans first collect information by learning everything through their lives (Rusli, 2018). This is also the opinion of Warr & Neill (2014) that in the first stage of preparation, a person prepares to solve a problem by collecting relevant data and looking for an approach. Based on Savic (2016), understanding the problem is important in the preparation stage. The activities that fall into this preparatory stage are reading, thinking, using body cues such as hands and eyes and responding to physical attention, shaking a pen, moving your feet, speaking slowly, writing down known and asked equations, and understanding what is observed. Andriopoulus et al. (2009) stated that things included in the preparation phase are a person's ability to respond and respond to the presence of an issue or problem and ask relevant questions.

At the ***incubation stage***, the subject rereads the problem, then thinks, then performs activities such as standing, walking, sitting back, and going to the toilet to reread the problem, finally realizing that the problem includes a two-variable linear equation system and determining the idea or idea of the solution, namely the combined method and the elimination method. This aligns with (Rusdi, 2018) that the *incubation phase* is a state in which the experience, data, and information that are read and observed are consciously thought about and precipitated.

In this phase, all the experiences, data, and information obtained in the previous *preparation stage* are precipitated until inspiration finally arises. This is reinforced by the opinion of Jagom et al. (2021) that the kinesthetic learning style can carry out the stages of *incubation*, as shown by developing ideas for solving problems. Steven M et al. (1999) suggested that the influence of this phase is the emergence of the ability to find solutions, among others. The ability to find this solution can occur suddenly, either when facing a problem or shortly after we experience a problem during the incubation period. Glover et al. (2013) state that the stage of maturation and processing of ideas is also called idea incubation.

In the ***illumination stage***, the subject applies the elimination method and the combined method, as well as strategizes the problem-solving steps. At this stage, the subject plans the solution to be performed. The idea of solving the problem arises after the subject does *incubation*. This agrees with Savic (2016), who believes that the ideas that emerged from the incubation



period are illuminated. Based on Siswono & Kurniawati (2004), in the third stage, a person gets problem-solving, followed by the emergence of inspiration and ideas, which start and follow the emergence of new inspiration and ideas.

The **verification** is the testing phase. The SubjectSubject can check the answers he obtains and compare the answers with alternative solutions by subtracting the equations for question 1 and question 2 with the substitution method. Based on Savic (2016), the verification stages are described in the illumination stage. Dep Tapomoy (2016) called this phase the examination phase.

Based on these findings, the mathematical creative thinking process with a kinesthetic learning style of students fulfills all the indicators of the wallas stage, namely *the preparation, incubation, illumination, and verification* stages. This aligns with Ardianik (2019), saying that students with a visual learning style can meet the indicators at the Wallas stage. However, contrary to research. However, contrary to research (Khasanah et al., 2018), students with a kinesthetic learning style can go through 2 stages of Wallas' creative thinking process.

CONCLUSION

Based on the results of the research, it was found that 3 creative thinking processes of students were found, namely:

1. Students with a visual learning style tend to focus on visual details by reading repeatedly, reading problems silently, not being disturbed by noise, tidying up and detailing information in an orderly manner, having good long planning, remembering visual explanations, using symbolic representations, and mathematical modeling in the problem-solving process. In the *Preparation* Stage, the subject can collect data and information relevant to the given case and organize data and information by writing down known and asked equations and being able to explain them well. In the *incubation* stage, the subject tends to be silent for a moment, paying attention to the information in the question and taking time to find a solution to the problem by remembering the materials taught. Subject Think of the solution idea for the given problem, i.e., the combined method, substitution, and elimination, then determine the idea of solving the combined method, substitution, and elimination method. Illumination stage of the Subject: Solve the case using the combined method procedure, the elimination method, and substitution, and strategize the analytical completion steps after *incubation*. In the Verification stage, the subject can only check the answers he has obtained and cannot compare the answers with other alternative solutions.



2. Students with auditory learning styles tend to use visual, verbal, and auditory, move their lips and say writing when reading, talk to themselves to process comprehension, remember the teacher's verbal explanations, and like to ask researchers while solving math problems. Subjects often structure understanding by speaking verbally at the *Preparation* Stage of the Subject. Collect data and information relevant to the case given. Organize data and information; do not write down known equations. They are asked because they feel lazy, but they can explain things well. In the *Incubation stage*, the subject detaches himself for a moment by doing activities such as singing, talking to friends, listening to songs, rereading the problem, and finally realizing that the problem includes a two-variable linear equation system and thinking of a solution idea for the given problem, namely the combined method, substitution and elimination as well as the determination of the solution idea, namely the elimination method and the combined method. In the *Illumination* stage, the subject solves cases using elimination method procedures and combined methods and strategizes analytical solution steps. In the *verification stage*, the subject can check the answers he has obtained and compare the answers with other alternative solutions, namely by combined methods.
3. Students with a kinesthetic learning style tend to understand and remember information through visual and motor stimuli, which are reflected in their activities by involving physical movements such as shaking a pen, moving their feet, experimenting and speaking slowly, using fingers as clues, using symbolic representations, and mathematical modeling in the problem-solving process. In the *Preparation* Stage, the subject can collect data and information relevant to the given case, relate data and information by writing down known and asked equations, and be able to explain them well. In the *Incubation stage*, the subject detaches himself for a moment by doing activities such as standing, walking, sitting back, and going to the toilet to reread the problem, finally realizing that the problem includes a two-variable linear equation system and thinking of a solution idea for the given problem, namely the combined method, substitution, and elimination, then determining the solution idea with the combined method and the elimination method. In the *illumination* stage, the subject solves cases using combined method procedures and elimination methods and can strategize resolution steps analytically. In the *verification* stage, the subject can check the answer by testing the results obtained and comparing alternative solutions by reducing them to two known equations and substitution methods.

This research will likely be used to design learning models or strategies that aim to think creatively.



Based on this study, the average subject only provides two solutions, which shows that students are still unfamiliar with *open-ended problems*; it is hoped that teachers occasionally provide learning that uses *open-ended* to stimulate students to think creatively. This study only uses subjects with a single learning unit, so there will likely be research in the following research with visual, auditory, visual kinesthetic, and auditory kinesthetic research subjects.

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