Improving Students' Creative Thinking Skills Through The Wallas Method In Learning Mathematics In Elementary School

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Abstract. Creative thinking skills are one of the abilities that students must have and develop in learning mathematics to face the challenges of the 21st century. This literature review will discuss the development of student's creative thinking skills with the Wallas method to improve students' creative thinking skills to face the challenges of the 21st century. The Wallas method has four stages: planning, incubation, illumination, and verification. The Wallas method can improve creative thinking skills even though the time to complete each stage of the Wallas method cannot be predicted. Thus, the Wallas method can improve creative thinking skills because it has structured stages so that students find ideas more quickly because they know where to start to solve the problems they face. Although the Wallas model does not provide concrete guidelines on the duration of each stage, it can be overcome by familiarizing students with the Wallas method. Students can quickly find data related to the problem at hand, students can quickly find ideas to solve the problems they face, and students can test the ideas they have obtained

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INTRODUCTION

In the current era of globalization, society and countries are starting to demand people who are not only intelligent but also creative and full of initiative to create new ideas, discoveries, and new technologies that are no less competitive than developed countries. To achieve this, it is necessary to foster creative attitudes, thoughts and behavior from an early age, so that in the future students will not only be consumers of knowledge, but create new knowledge, not only be job seekers, but be able to create new jobs (entrepreneurship).how important it is to develop creativity in the education system, this is emphasized in Law Number 20 of 2003 concerning the National Education System explaining that learning activities are the process of interaction of students with educators and learning resources in a learning environment which aims to develop the potential of students so that they become human beings who believe and are devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and are democratic and responsible citizens, according to the SISDIKNAS Law No. 20 of 2003 chapter III article 4, as follows: "Education is carried out by providing an example, building will, and developing students' creativity in the learning process. Based on educational objectives, it appears that student learning is not just about teaching knowledge. There is also the development of students' abilities, namely the ability to think creatively. The importance of teaching and training mathematical thinking skills from an early age so that students can solve problems, read, and perform well in science (Yuliyanto et al., 2021). Individuals who are allowed to think creatively will be able to face challenges; conversely, individuals who are not allowed to think creatively will become frustrated and dissatisfied (Andiyana et al., 2018a).

The ability to think creatively is also very much needed in learning mathematics. In mathematics subjects, much material can enable students to have critical and creative thinking skills. Therefore, critical and creative teachers must stimulate students' creative thinking abilities. However, so far, teachers in mathematics learning have placed more emphasis on mastering basic mathematical concepts using a deductive approach. It makes students tend to memorize mathematical formulas in a less meaningful way. As a result, they are less able to shape students' attitudes and skills in critical and creative thinking (Rochmad, 2013).

Meanwhile, according to Siswono et al. (2013), currently, teachers are used to giving questions that only have a single answer or method, resulting in students only being able to solve them in a way that the teacher has exemplified. However, problems with a single method or answer do not encourage students to think creatively. Meanwhile, according to Mursidik et al. (2015), basic skills in mathematics learning are usually formed through convergent activities. These activities generally tend to be mathematical exercises that are algorithmic, mechanistic, and routine in nature. However, creative thinking competencies are divergent and require activities to investigate mathematical problems from various perspectives. Through investigations, students can optimize their knowledge to solve various problems. Nevertheless, mathematics learning carried out by teachers, especially for elementary school students, is still dominated by training activities to achieve mathematical basics skills alone. In order to develop elementary school students' creative thinking abilities, the solution that needs to be done is to provide learning that can help students think creatively, one of which is by using the Wallas learning method.

In research conducted by Pangestu & Yunianta (2019), they examined the creative thinking processes of students with extroverted and introverted personality types based on the Wallas stages, with research subjects namely two introverted students and two extroverted students in class VIII of SMP Negeri 3 Salatiga with high mathematical abilities. Meanwhile, research from Febriani & Ratu (2018) examined the profile of students' creative thinking in solving open-ended problems based on Wallas theory, with the subjects of this research being three students with high, medium, and low abilities at Pangudi Luhur Middle School, Salatiga, who were determined using purposive sampling. Based on research that has been conducted, this research will examine increasing elementary school students' creative thinking abilities through the Wallas learning method. The research conducted by Siswono (2004) entitled "Identification of Students' Creative Thinking Processes in Mathematical Problem Posing Guided by the Wallas Model and Creative Problem Solving (CPS)" aims to provide an overview of student creativity in class I of SMP (in this case SMP Negeri 4 and SMP Negeri 26 Surabaya) in posing problems guided by the Wallas model and Creative Problem Solving (CPS), students' creative thinking processes when posing mathematical problems, and the level of student's creative thinking in posing mathematical problems. The weakness of the Wallas method is the uncertainty of time. The Wallas model does not provide definite instructions about how long each stage should last, in line with research conducted by Hendriyati et al. (2017), which states that some students go through it by thinking about how to solve it while writing quickly. Nevertheless, some students go through this stage with a long process of contemplation to get ideas for solving problems, and Savic (2016) says that the incubation stage tends to be challenging to do because, at that stage, students will temporarily detach themselves from a problem and think about it in nature. Unconscious. Even though they have read the questions many times, the subject finds it difficult to find ideas for solving them.

The creative thinking process developed by Wallas is one of the theories most commonly used to understand the creative thinking process, which includes four stages: preparation, incubation, and illumination (Munandar, 2002). Based on the description above, this research aims to identify whether the Wallas method can improve creative thinking abilities in elementary school students.

LITERATURE REVIEW

METODE WALLAS

The creative thinking process developed by (1926) is one of the theories most commonly used to understand the creative thinking process, which includes four stages: preparation, incubation, illumination, and verification. Wallas' creative process method can be found in various disciplines, from art science to writing (Vetere III & Vetere, 2022). The Wallas model is categorized as a psychodynamic approach in Sternberg's six approaches to creativity (Savic, 2016). Freiman and Sriraman (in Savic, 2016) state, "The psychodynamic approach to studying creativity is based on the idea that creativity arises from the tension between conscious reality and unconscious drives." A dynamic interaction between consciousness and the subconscious/unconscious is called "psychodynamics." So, from the description above, it can be

concluded that the Wallas method is categorized as a psychodynamic approach, where an idea can emerge between the subconscious, and the Wallas method can be found in various scientific disciplines.

In the preparation stage, students prepare themselves to solve problems by collecting relevant data from previous experiences and new knowledge and asking other people to solve them. In the incubation stage, students seem to escape from the problem temporarily. However, "incubate" it in the pre-conscious. At the illumination stage, where inspiration arises, ideas initiate and follow the emergence of inspiration and new ideas. The final stage is the stage where someone tests and checks the problem solution against reality (Sari et al., 2017)

MATHEMATICAL CREATIVE THINKING

This creative thinking is the basis for responding to the responses received in finding solutions to their problems. Remember that the problems faced cannot necessarily be solved using previously existing methods but require new combinations in the form of attitudes, ideas, and thought products so that the problems can be resolved (Fitriarosah, 2016). Meanwhile, according to Siswono (2016), creative thinking generates or produces new ideas. Creative thinking involves intensive production that fulfills novelty so that someone can be said to be creative by producing something that is already known. Thus, creative thinking is a process that can help students solve problems in new ways that are different from existing methods and help students discover new things or ideas that they generate. This aligns with the SISDIKNAS Law No. 20 of 2003, chapter III, article 4: "Education is carried out by providing examples, building will, and developing students' creativity in the learning process. In developing students' mathematical creative thinking abilities, it is necessary to harmonize the creativity of the elements of mathematical Education, especially teachers, who are required to be able to animate and stimulate students to think creatively (Faturohman & Afriansyah, 2020). According to Yuliyanto et al. (2021), creative mathematical thinking is students' ability to find solutions to various problems regarding answers, strategy, novelty, and explaining in detail through logical processes and previously acquired knowledge.

Meanwhile, according to Andiyana et al. (2018), mathematical creative thinking is the ability to think, which aims to create or find new ideas that are different, unusual, and original and bring definite and precise results. It can be concluded that creative mathematical thinking is students' ability to come up with new ideas to solve problems they are facing through a logical process. Based on the description above, it can be concluded that it is essential for every elementary school student to have creative thinking in the teaching and learning process. Through creative thinking, students can understand the subject matter they are studying and produce something new that was previously known. In this way, creative thinking will prevent students from stopping learning so that they become active learners.

According to Williams (1979), creative thinking skills have four indicators, namely, the ability to think fluently (fluency), the ability to think flexibly (flexibility), the ability to think original (originality), and the ability to think in detail (elaboration). According to Yuliyanto et al. (2021), indicators that show the success of students' mathematical creative thinking abilities are determined based on four indicators, namely fluency in producing various mathematical problem-solving solutions, flexibility in producing varied mathematical problem-solving strategies, authenticity in describing the mathematical problem-solving process, and elaboration, namely the skill of describing mathematical problem-solving in detail. Meanwhile, according to Munandar (2016), creative thinking indicators include five indicators, namely: (1) Fluency thinking, when students achieve this indicator, they can find ideas for answers to solve problems; (2) Flexible thinking, when students achieve this indicator they can provide varied solutions (from all angles); (3) Original thinking, when this indicator is achieved, students can produce unique answers (using their language or words that are easy to understand); and (4) Elaboration skills, the achievement of this indicator is that students can expand an idea or explain in detail an answer. According to Guilford (Suryana, 2012), there are five indicators of creative thinking, namely: (1) Sensitivity (problem sensitivity), which is the ability to detect, recognize, understand, and respond to a statement, situation, or problem; (2) Fluency, is the ability to generate many ideas; (3) Flexibility,

is the ability to propose various solutions or approaches to problems; (4) Originality, is the ability to generate ideas in original ways, not cliche, and are rarely given by most people; (5) Elaboration, is the ability to add to a situation or problem so that it becomes complete and detail it in detail, which includes tables, graphs, pictures, models and words. Thus it can be concluded that there are four indicators of creative thinking, namely: (1) fluency thinking, which is the student's ability to generate ideas for answers to solve problems; (2) Flexible thinking, which is the student's ability to find answers to problems faced in different ways; (3) Original thinking, is the ability to express a unique answer that few people know; (4) Elaboration, is the student's ability to answer a problem in detail.

MATHEMATICS LEARNING

Mathematics is one of the subjects that play a vital role in Education because it can be seen from the time spent in mathematics lessons at school more than other subjects. Education is implemented at all levels of Education, from elementary school to college (Amir, 2016). Soedjadi (Siswono, 2012) presents several definitions according to experts that mathematics is (1) an exact and systematically organized branch of science, (2) knowledge about numbers and calculations, (3) knowledge about logical reasoning and dealing with numbers, (4) knowledge of quantitative facts and problems about space and shape, (5) knowledge of logical structures, and (6) knowledge of strict rules. Views on the meaning of mathematics are more influenced by the fields of study of mathematicians whose expertise is related, such as logic, geometry, analysis, or applied. According to Ruseffendi (Bahrudin et al., 2019), Mathematics is the science of organized structures. Mathematics discusses facts and relationships -relationships, as well as discussing space and form. James and James (in Ramdani, 2006) say that mathematics is the science of logic regarding shapes, arrangements, quantities, and concepts that are related to each other in large numbers, divided into three fields: algebra, analysis, and geometry. Anitra (2021) said that learning mathematics is one of the mandatory lessons in elementary schools. In mathematics subjects, there are subject materials that are related to each other, and also as subjects that are related to other subjects in elementary school. This shows that mathematics is not just about learning how to count but can also be applied to other subjects. Thus, it can be interpreted that mathematics is a subject that has a vital role because mathematics contains much learning that can be compared with other subjects.

FLAT BUILDING

In this literature review, the mathematical material discussed is flat shapes. A flat shape is a two-dimensional shape with only length and width limited by straight or curved lines. Flat shapes are said to depict something genuine so that the material discussed cannot be separated from symbols (Rohman et al., 2018). Meanwhile, (Winata et al., 2016) flat shapes are made (painted) on a flat surface. A flat shape with three sides is called a triangle; four sides are called a quadrilateral, five are called a pentagon, six are called a hexagon, and so on. According to Simbolon and Sapri (2022), students have difficulty answering flat-shape questions because of their difficulty in using mathematical concepts. Students ignore perimeter and area units and do not include these units, and there are still students who use perimeter units as area units. This error is said to be a mistake of fact. Because, in essence, students do not understand how to read units correctly. Thus, flat shapes are shapes made or painted on a flat surface. Flat shapes only have two dimensions, namely length and width, which are limited by straight or curved lines, and student errors, namely reading errors, where students have difficulty understanding the concept of flat shapes. Meanwhile, according to Elisah (Bahrudin et al., 2019), students' errors in completing flat shapes are reading errors, errors in understanding the problem, transformation errors, processing ability errors, and errors in writing the final answer.

HIGHER-ORDER THINKING SKILLS

Poerwanti and Budiharto (2020) define High Order Thinking (HOTS) as using the mind more broadly to find new challenges. This high-level thinking ability requires a person to apply new or previous knowledge and manipulate information to reach possibilities—answers in new

situations. According to (Widiawati and Joyoatmojo, 2018), higher-order thinking skills have several benefits for students. These benefits include being able to think reflectively and creatively, solve problems, think critically, develop a career, excel in learning, develop social skills, be responsible, have self-control, work hard, and make decisions and plans. Meanwhile, according to the opinion of Hong, Vadivelu, Daniel, and Sim (in Widiawati & Joyoatmojo, 2018), HOST has another name, namely metacognitive, which means that individuals know when to take control of their plans, evaluate and monitor their progress, are flexible, adaptable, and can address problems in various contexts. Thus, higher-order thinking skills are an ability that a person has to take control of his plans, evaluate and monitor progress, be flexible and adaptable, and overcome problems in various contexts. Higher-order thinking skills can be achieved through activities that do not involve memorizing or applying material.

DISCUSSION

The creative thinking process in the Wallas method is used to determine the creative thinking process in students. There are four phases in the Wallas method approach. In the first phase of preparation, students prepare by collecting relevant data from previous experiences and new knowledge and interacting with other people to get solutions. The second incubation phase involves students removing themselves from the problem for a moment but still allowing ideas to develop subconsciously. At the illumination stage, there is a peak of inspiration and the emergence of new ideas that initiate and follow that inspiration. The final phase involves testing and checking the problem-solving against reality. In line with the words of Sari et al. (2017), in the preparation stage, students prepare themselves to solve problems by collecting relevant data from previous experiences and new knowledge and asking other people to solve them. In the incubation stage, students seem to escape from the problem temporarily. However, "incubate" it in the pre-conscious. At the illumination stage, where inspiration arises, ideas initiate and follow the emergence of inspiration and new ideas. In the final stage, someone tests and checks the problem solution against reality.

Fitriarosah, (2016) believes that creative thinking is the basis for responding to the responses received in finding solutions to their problems. Remember that the problems faced cannot necessarily be solved using previously existing methods but require new combinations of attitudes, ideas, or thought products to resolve the problems. According to Munandar (2016), creative thinking indicators include five indicators, namely: (1) Fluency thinking, achieving this indicator, students can find ideas for answers to solve problems; (2) Flexible thinking, when students achieve this indicator, they can provide varied solutions (from all angles); (3) Original thinking, when this indicator is achieved, students can produce unique answers (using their language or words that are easy to understand); And (4) Elaboration skills, when this indicator is achieved, students can expand an idea or explain in detail an answer. In line with the Wallas method, which is related to the ability to think creatively due to structured stages, the Wallas method provides a clear structure in describing the creative process, starting from searching for data (preparation), thinking about existing problems (incubation), after that students get new ideas to solve the problem (illumination) and in the final stage students will test their new ideas to solve existing problems (verification).

According to (Widiawati and Joyoatmojo, 2,018), higher-order thinking skills have several benefits for students. These benefits include being able to think reflectively and creatively, solve problems, think critically, develop a career, excel in learning, develop social skills, be responsible, have self-control, work hard, and make decisions and plans. Mashitoh et al. (2019) said that students are used to thinking instantly and depending on the help of others. Creative thinking abilities can be improved if students are accustomed to carrying out each stage of creative thinking. In line with that, students can get used to using the Wallas method, students can quickly find data related to the problems they face, students can quickly find ideas to solve the problems they face, and students can test the ideas they have obtained to see whether they can be used. Be a solution to a problem or vice versa so that students come back again looking for the right ideas for a solution to the problem they are facing. Thus, the Wallas method can also help students develop HOST (higher-order thinking skills)

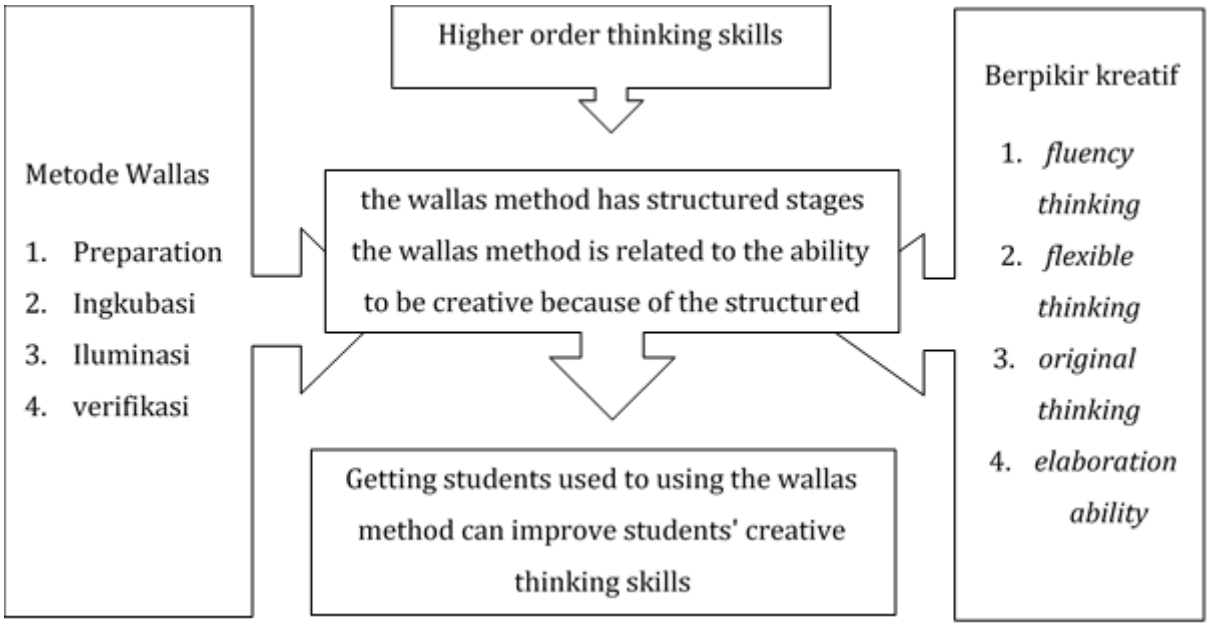

Figure 1. Process of Creative Thinking Skills Development Based on Wallas Method

CONCLUSION

Increasing creative thinking abilities using the Wallas method can help students to develop their creative thinking abilities. The Wallas method has structured stages, so students find ideas more quickly because they know where to start to solve their problems. In the preparation phase, students prepare to solve problems by gathering relevant information from previous experiences and new knowledge while communicating with others to find solutions. In the incubation stage, students seem to detach themselves from the problem momentarily but continue to process it indirectly in the subconscious mind. This is like an "incubation" that occurs at a pre-conscious level. In the illumination stage, where inspiration occurs, new ideas emerge before and after the peak moment of inspiration. In the final stage, creative thinking abilities can be strengthened by familiarizing students with going through each stage of creative thinking.

By recognizing and following the Wallas method, students can quickly collect data related to the problems they face, find ideas to solve them, and test the effectiveness of these ideas as solutions. This process allows students to systematically develop their understanding of problems, find appropriate solutions, and enrich their creativity. Thus, applying the Wallas method can also positively contribute to developing students' higher-order thinking (HOST) abilities. Students' creative thinking processes when they formulate mathematical problems and the level of students' creativity in formulating mathematical problems are the focus of the assessment. One of the weaknesses of the Wallas method is time uncertainty, where the Wallas model does not provide concrete guidance regarding the duration of each stage. In addition, at the incubation stage, difficulties arise because students tend to detach themselves from problems for a moment and let them be processed indirectly in the subconscious.

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