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MULTIPLE INTELLIGENCE AND MATHEMATICAL CREATIVE
THINKING ABILITY OF ELEMENTARY SCHOOL STUDENTS

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ABSTRACT:

One of the uniqueness of students is their intelligence. Intelligence affects students' thinking abilities in following the learning process. This study aimed to analyze the relationship between multiple intelligence and mathematical creative thinking abilities of elementary school students. The population in this study were fourth grade students at SDN Lenteng Agung 01 Pagi, South Jakarta, Indonesia. Based on the simple random sampling technique used, it was obtained 50 students as research samples. Mathematical creative thinking ability was measured using tests while multiple intelligence was measured using questionnaire. The collected data was then tested for correlation using the Pearson product moment correlation test and the simple correlation coefficient significance test (t test). From the results of the analysis using Pearson correlation, it was obtained a correlation coefficient of 0.546. The correlation coefficient obtained was then tested for significance and the value of t count obtained was 4.518 (t count 4.518 > t table 0.346). These results indicated that there was a significant relationship between multiple intelligence and mathematical creative thinking abilities of elementary school students.

INTRODUCTION

Each individual is unique where with its uniqueness, it is what distinguishes it from other individuals. One form of uniqueness of an individual is intelligence. Intelligence is often associated with the success or failure of students in school. So far, most people consider that IQ (Intelligence Quotient) as an important

factor (Widjajanti, 2012). Over time, another intelligence developed, namely EQ (Emotional Quotient) and SQ (Spiritual Quotient). Therefore, it is not surprising that so many intelligence theories put forward by experts. One well-known theory of intelligence is revealed by Howard Gardner. According to Gardner (2013), each individual has at least eight types of intelligence, including linguistic intelligence, mathematical logic, spatial, kinesthetic, musical, interpersonal, intrapersonal, and naturalist. The eight types of intelligence are known as multiple intelligence. It's likely everyone has these eight intelligences. However, the development of the eight intelligences is not the same in every individual (Baş and Ömer, 2010).

Multiple intelligence assumes that each individual has the competence to develop each type of intelligence to a higher level if they get support, enrichment, and teaching. In the realm of education, this theory views each student as having their own uniqueness or strengths, so that if they have weaknesses in one aspect, the teacher should not view the students as stupid. The main task of teachers is to pay attention to the type and level of intelligence of students in their class so that they are able to help their students achieve optimal performance by utilizing the intelligence possessed by each student. Multiple intelligence cannot be ignored in classroom learning. İnan & Erkuş's research (2017) proved that group work based on mathematical worksheets based on multiple intelligence theory can facilitate the learning process of students who have interpersonal social intelligence; besides forms, symbols, graphics, etc. also help students who have visual-spatial intelligence; pronouncing the subject in a clear way with verbal expression makes it easier for students who have verbal-linguistic intelligence.

Intelligence is one of the important factors that students must have so that they can easily participate in learning and have good achievements. However, formal education in Indonesia often emphasizes convergent thinking which only focuses on achieving the most appropriate answer to a problem. Since in elementary school, students are not stimulated to see problems from various points of view and find alternative solutions to a problem. This then leads to the further weakening of students' creative thinking abilities. Gardner (Maharani, 2014) explained that creativity is a complex construct and is most commonly demonstrated through various intelligences, including linguistics, music, mathematics, spatial, kinesthetic, interpersonal, and maybe even intrapersonal. This creativity arises when individuals can think creatively. In creative thinking, a balance between logic and intuition is needed. If an individual has the ability to think creatively, then they can solve their problems in daily life with a variety of possible ways that they can do (Maharani, 2014).

The process of creative thinking also involves several mechanisms such as integrating ideas, generating new ideas, and implementing the ideas (Siswono, 2010). Creative thinking discussed in this study focuses on creative thinking in mathematics. Many students have difficulty when solving mathematical problems because they think the only most appropriate way is the way explained by the teacher. During this time, mathematics learning is carried out only developing language intelligence and mathematical logical intelligence. This kind of learning is actually not appropriate because students will ignore their

uniqueness and strengths. Teachers should be able to provide mathematical experiences that give them the opportunity to be creative (Novita & Mulia, 2016). Good learning is learning that must pay attention, understand, and acknowledge all abilities possessed by students. By appreciating the differences in students' intelligence, it is expected that students' creative thinking abilities will develop well. Based on these problems, researchers examined the relationship between multiple intelligence and mathematical creative thinking abilities of elementary school students

LITERATURE REVIEW

Multiple Intelligences

According to Gardner, Intelligence is observed from one's habits through (1) the habit and solving individual problems and (2) the habit to develop products with cultural values. Gagne stated nine multiple intelligences including (1) linguistic intelligence (*verbal*), i.e., the ability in using word arrangements effectively in oral and written, (2) logical-mathematical intelligence, i.e., the ability in solving mathematical problems through a logical thinking process, (3) spatial intelligence, i.e., the way to observe a visual space properly, (4) musical intelligence, i.e., the ability in developing and expressing music and sound, (5) interpersonal intelligence, i.e., the ability to be sensitive to others' feelings, motivation, and personalities, (6) intrapersonal intelligence, i.e., the ability concerning knowledge about oneself and to act adaptively based on the self-acknowledgement, (7) naturalist intelligence, i.e., the ability to understand and enjoy the nature productively, (8) kinesthetic intelligence, i.e., the ability to use ideas, thoughts, and feelings, and (9) existential intelligence, i.e., the ability to answer questions about human existence (Puspita, 2021).

Mathematical Creative Thinking Skills

Students should possess mathematical comprehension ability to have the mathematical problem-solving ability when students learn mathematics to understand the basic mathematical concept. Therefore, this process can be used as a method to build mathematical creative thinking skills. Sumarno (in Sariningsih, 2014) stated that students must have mathematical comprehension because it is required in solving mathematical problems and other scientific problems, which is one of the developments of the mathematical subject following the time. *National Council of Teachers of Mathematics* (NCTM) (in Purwasih, 2015) mentioned that mathematical comprehension is mathematical thinking skills using reasoning.

The measured critical thinking skill aspects include the flexibility, fluency, and novelty used to identify creative thinking skills (Akmalia, 2016). Mathematical creative thinking skill indicators with problem-solving are explained in the following table.

Table 1 Mathematical Creative Thinking Skill Indicators

Indicator	Problem Solving
Fluency	Students can solve a problem with various ideas completely and correctly
Flexibility	Students can solve a problem with one or more methods
Novelty	Students can provide answers following their abilities

The level of mathematical creative thinking skills is the creative thinking steps used to solve mathematical problems. Siswono (in Aesyati, 2016) divided the creative thinking skill level (TKBK) into five levels, i.e., TKBK 4 (Highly Creative), TKBK 3 (Creative), TKBK 2 (Somewhat Creative), TKBK 1 (Less Creative), and TKBK 0 (Not Creative). This TKBK guideline becomes fundamental for solving self-idea problems to understanding mathematical comprehension using the test method.

METHODOLOGY

The research employed a quantitative approach with the survey method. The researcher examined the relationship between multiple intelligence and primary school students' mathematical creative thinking skills. The research population was students in grade IV SDN Lenteng Agung 01 Pagi, South Jakarta, Indonesia. The research design was as follows:

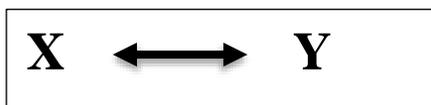


Figure 1. Research Design

The sampling technique used was simple random sampling, amounting to 50 students as the samples. The mathematical creative thinking skills were measured using a test consisting of eight items. Meanwhile, multiple intelligences were measured using a questionnaire comprising 35 items. Data collected were then tested for correlation using the Pearson product-moment correlation test. The research results were then analyzed using the T-test to test the significance of the correlation coefficient acquired.

RESULTS

Statistical Analysis Results

The score of the mathematical creative thinking ability of the IV grade students with the lesson's topic is areas and perimeters of two-dimensional shape, obtaining 70 as the highest score and 30 as the lowest score with an average score of 49.08. Meanwhile, the highest score on multiple intelligence is 100 and the lowest is 57 with an average score of 78.2. From the Pearson product moment correlation test results obtained correlation coefficient of 0.546. The results obtained were then analyzed with the t test and the calculated t value was 4.518 (t count 4.518 > t table 0.346). The results of the analysis prove that there is a significant relationship between multiple intelligences and the ability to

think mathematically creative in elementary school students. The higher the students' multiple intelligence, the higher their mathematical creative thinking abilities.

The Importance Of Having Mathematical Creative Abilities

According to Yusmanida (2014), creative thinking is the ability to see various answers to one problem. The ability to think creatively is the ability of students to solve a problem based on their abilities and develop them in order to obtain new ideas. Students are said to have good creative thinking abilities if they can provide new thoughts on the problems they face, both related to daily life and in learning activities at school. Mathematics is an exact subject related to logic, reasoning, numbers, calculation operations, abstract concepts, and quantitative facts. In mathematical activities, students are required to empower the knowledge they already have and use it to develop a new understanding, namely with mathematical creative thinking ability.

Mathematical Creative Thinking Ability Indicator

Mathematical creative thinking ability is an indicator of students' ability to find ideas and solve problems fluently, flexibly, and in novelty. Silver (1997) provides indicators that can be used to assess students' creative thinking abilities that refer to fluency, flexibility and novelty through problem solving. Silver also explained as follows (a) students are said to be fluency in solving mathematical problems if the student is able to solve problems with a variety of interpretations, methods of solving, or problem answers, (b) students are said to have flexibility in solving mathematical problems if the student is able to solve problems in one way, then by using another way students discuss various methods of solving, and (c) students are said to find novelty in solving mathematical problems if the student is able to examine several methods of solving or answers, then make a different way of solving.

Criteria For Students To Have Mathematical Creative Thinking Skills

Students are said to have good mathematical creative thinking ability if students are able to understand and solve a mathematical problem with varied strategies and ways so that the process of solving mathematical problems can be used directly, quickly and precisely by using mathematical creative processes. Students with good mathematical creativity can solve challenging problems, create models that reflect the real world and solve mathematical problems with mathematical tools, connect mathematics and other knowledge when solving mathematical problems, and able to identify and understand the role of mathematics in the world (Novita & Putra, 2016).

The Benefits Of Mathematical Creative Thinking Skills For Students

Good mathematical creative thinking ability are clearly influenced by the learning provided by the teacher and students' attitudes in understanding mathematical problems. The ability of students to think is very closely related to the level of intelligence. The higher level of student intelligence will make it

easier for students to solve a problem, and vice versa. In this case intelligence is related to the ability to understand the environment, the ability to reason, and the attitude of survival by facilitating the advice and available resources. Karamikabir (2012) in his research explained about several types of intelligence needed in learning mathematics. He explained that to be able to solve problems in learning mathematics, it was necessary to find and reason (logical-mathematical intelligence), enforce the theory (intrapersonal and body kinesthetic intelligence), discuss problems (linguistic intelligence), find harmony and relationships between concepts (musical intelligence).

Effective Learning Model For Students

Different student intelligence should enable them to understand and solve problems in different ways. In accordance with the eight types of intelligence expressed by Gardner, teachers are required to consider the learning model used by taking into account the uniqueness of each student. Good learning is learning where there is an educational interaction between the teacher as an educator and students as the subject of learning. This interaction can work well if students are active in the learning process.

CONCLUSION

The results of the analysis proved that there is a relationship between multiple intelligences and mathematical creative thinking ability in elementary school students. The good multiple intelligence can optimize the ability of students to participate in the learning process along with its problems in the classroom. Multiple intelligence possessed by students will facilitate them in understanding problems through various aspects. In this case, students will use their imagination and creativity in completing mathematical tasks and find solutions to various problems that arise in everyday life.

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