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Analysis of Visual-Spatial Intelligence of First Grade Students in Mathematics Subjects

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Abstract

This research is descriptive qualitative research, this research was conducted at an Islamic elementary school in Ngemplak, Boyolali, Indonesia. The subjects in this study were first Grade students. The informants in this study were first-grade teachers. The data collection methods were tests, observations, interviews, and documentation. To determine the validity of the data, the construct validity technique uses three kinds of triangulation, namely data population, theoretical triangulation, and method triangulation. The analysis technique uses the Interactive model of Miles and Huberman, namely data reduction, data presentation, and conclusion. Based on the results of the research that has been carried out, it can be concluded that: three subjects can meet all the characteristics of visual-spatial intelligence which include imagining, conceptualizing, problem-solving, and pattern searching. Two subjects can meet all the characteristics of visual-spatial intelligence except problem-solving at the point of seeing the problem from different points of view. Two subjects can meet all the characteristics of visual-spatial intelligence except problem-solving at the point of seeing the problem from different perspectives and determining patterns. There is one subject who can meet all the characteristics of visual-spatial intelligence except problem-solving.

Keywords: mathematics, multiple intelligence, visual-spatial intelligence

PENDAHULUAN

Every child born in the world has several bits of intelligence at different indicator levels (Ackerman, 2018). Intelligence is a gift from God to every human being. In essence, all student are intelligent. The difference lies in the type and indicators of intelligence possessed (Kaufman, 2018). There are several influencing factors. Factors that influence the child's intellectual intelligence include age, gender, ethnicity, nutritional status and parenting style (Khumaerah, Hasnah, & Rauf, 2017). One of them is the stimulus or stimulus given to early childhood (Setiawan & Firdaus, 2016). Early age starts from the age of 0 to 8 years. Therefore, intelligence will make it easier for student to develop their knowledge (Emawati, 2015; Setiawan, 2015).

Meanwhile, there are 9 bits of intelligence in the theory of Multiple Intelligences according to (Gardner, 2013), one of multiple intelligences is visual-spatial intelligence (color-image intelligence). The capacity or ability to describe and recognize a pattern or object received by the brain is called visual-spatial intelligence (Prasetyo & Andriani, 2011). The capacity or ability to manage shape, color, space, and create images realistically or mentally will be owned by student who have well-developed visual-spatial intelligence (Sujiono & Sujiono, 2013). In line with that, Chen, Moran, & Gardner (2009) argue that ways to develop student's visual-spatial intelligence include training student's foresight to design and organize, such as arranging the layout at home. Visual-spatial intelligent student can learn in the best way

through doodles, directions, colors, shapes, and spaces. No doubt, in the real world everyone needs skills. When shopping, for example, counting skills are needed to count the items we buy. Therefore, skills and knowledge related to reasoning and arithmetic need to be possessed by humans through mathematics subjects. One of the factors that affect the quality of students' mathematical achievement is their intelligence of students (Faradhila, Sujadi, & Kuswardi, 2017).

According to (Mardiah, Monawati, & Fauzi, 2017) it was concluded that there is a positive and significant relationship between visual-spatial intelligence on learning outcomes of mathematics learning materials for students in class Vb SD Negeri 5 Banda Aceh. Students sometimes have difficulty distinguishing various objects in mathematics learning. Research conducted by (Rimbatmojo, Kusmayadi, & Riyadi, 2017) shows that students with high visual-spatial intelligence do not experience difficulties in every cognitive aspect, students who have visual-spatial intelligence are experiencing difficulties in the field/aspect of knowledge cognitive tasks and strategies, and students who have low visual-spatial intelligence have difficulty in three areas/cognitive aspects, namely cognitive tasks, knowledge of strategies, and self-knowledge. This shows that the lack of visual-spatial intelligence can cause students' cognitive processes in solving open problems to be not optimal. Furthermore, this condition causes students to lack the ability to solve mathematical problems. Therefore, teachers in the field of mathematics need to pay attention to and consider students' metacognition and visual-spatial intelligence.

Based on the observations, it is known that the students of first grade at the school look enthusiastic when they see pictures or striking colors when learning mathematics. This is included in the characteristics of student with visual-spatial intelligence. However, some students admitted that they had difficulty working on math problems, especially on materials related to visual-spatial intelligence (images, symbols, colors). In addition, it is also known that the daily test scores of first grade students in mathematics subjects varied in addition.

The selection of models, methods, strategies and learning media for mathematics is expected to be able to optimize the level of visual-spatial intelligence and optimize students' cognitive processes. The use of media and learning methods is also not optimal. There are many obstacles behind it, such as the facilities and infrastructure owned by the school.

The intelligence of student needs to be identified and nurtured (Sastre-Riba, Pérez-Sánchez, & Villaverde, 2018). Because student have the potential to contribute new knowledge in mathematics and science for the benefit of society. Based on the research objectives the study intends to find out how far the learning achievement of visual-spatial intelligence for first grade student at the school, Ngemplak, Boyolali for the 2020/2021 academic year is. The purpose of this study was to describe the visual-spatial intelligence of first grade students in solving addition problems in mathematics at the school for the 2020/2021 academic year.

METODE

This study uses a qualitative research type. Then the approach used in this study is a qualitative descriptive approach. The subjects in this study were first grade students at an Islamic elementary school in Ngemplak, Boyolali, Indonesia for the 2020/2021 Academic Year. The research subjects were 8 students. The reason for choosing 8 Class 1 students is because there are signs of visual-spatial intelligence that students have. Meanwhile, the informant in this study was a first grade teacher at the school.

There are 4 data collection methods used in this study: tests, interviews, observation, and documentation. The detailed research method is presented in Figure 1.

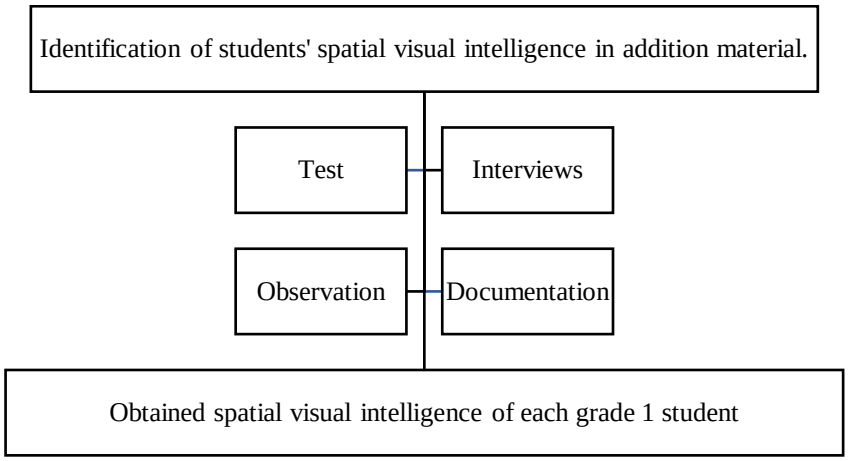


Figure 1. Methods for Collecting Students' Visual Spatial Intelligence Data

The test is in the form of a description of 3 questions related to the completion of the addition. The interviews conducted in this study aimed to explore in-depth information about the participants regarding the visual-spatial intelligence of first grade students in the addition problem material at an Islamic elementary school in Ngemplak, Boyolali, Indonesia. Observation is used to obtain data by observing and seeing important things related to students' visual-spatial intelligence. Documentation is used as data to support the results of tests, interviews, and observations, which aim to obtain data on the condition of the institution and data related to visual and spatial intelligence of first grade students at the school. Documentation in this study is useful for obtaining data related to the school which is a document in nature.

RESULT AND DISCUSSION

Visual-spatial intelligence is one of the most important intelligence to be instilled in student since childhood. Through this intelligence, student will have the potential to contribute new knowledge in the fields of mathematics and science for the benefit of society. First grade students at the school have variations in their visual-spatial intelligence abilities.

One way to see a person's visual-spatial intelligence is with indicators through tests. Before carrying out tests and interviews with students, the researcher first interviewed the homeroom teacher for first grade. The interview was aimed at digging deeper into information about the visual-spatial intelligence of students in first grade. The teacher said that the first graders in class were very active and enthusiastic. Especially if in learning there are pictures and striking colors. The daily test scores of first grade students in mathematics are also relatively high and meet the minimum criteria.

After interviewing the teacher, the researchers then collected data through tests and interviews with students. According to (Prasetyono, 2012) the visual-spatial intelligence test is carried out to test students' abilities to visualize and define an object and think abstractly through symbols or objects. The test questions that will be given to students include indicators of spatial visual intelligence and basic competence in addition. So that after students work, the researchers will know the visual-spatial intelligence possessed by students in solving the problem of flat shape. The test questions of spatial visual intelligence are divided into several indicators (Prasetyono, 2012) according to Table 1.

Table 1. Visual-Spatial Intelligence Test Indicator

Characteristic	Indicator	No
Imagination	Students are able to use the help of pictures when solving a problem	1, 2
	Students accurately describe the solution to the problem	1, 3
	Students use more than 4 colors in coloring pictures	2
Concept	Students correctly mention the concepts related to the problem	1, 3
	Students connect the concepts they have with known data	1, 3, 2
Solution to problem	Students see problems from different perspectives	3, 2
	Students fluently generate many ideas/problem solutions/questions	3, 2

There were 8 subjects in this study, namely ADL, BSW, BFA, KJH, LRP, NPR, RAS, and RFA. The following will present the results of the research on each respondent.

In Figure 2, the answer to question number 1, ADL can meet all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining and conceptualization. In question number 2, ADL can determine patterns in solving problems and can use the help of pictures in the problem-solving process. This is included in the indicators measured in visual-spatial intelligence. ADL can meet the category of indicators measured in visual-spatial intelligence except for one indicator, namely problem-solving. But in this case, ADL can be said to have visual-spatial intelligence. In question number 3, ADL was able to answer correctly. However, it is not thorough enough so there are questions that have not been answered. ADL can meet the indicators measured in visual-spatial intelligence except for one indicator, namely problem-solving. But in this case, ADL can be said to have visual-spatial intelligence.

The answer to question number 1, BSW can meet all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining and conceptualization. In question number 2, BSW can determine patterns in solving problems and can use the help of pictures in the problem-solving process. This is included in the indicators measured in visual-spatial intelligence. BSW can meet the category of indicators measured in visual-spatial intelligence. In question number 3, BSW was able to answer correctly. BSW can meet the indicators measured in visual-spatial intelligence.

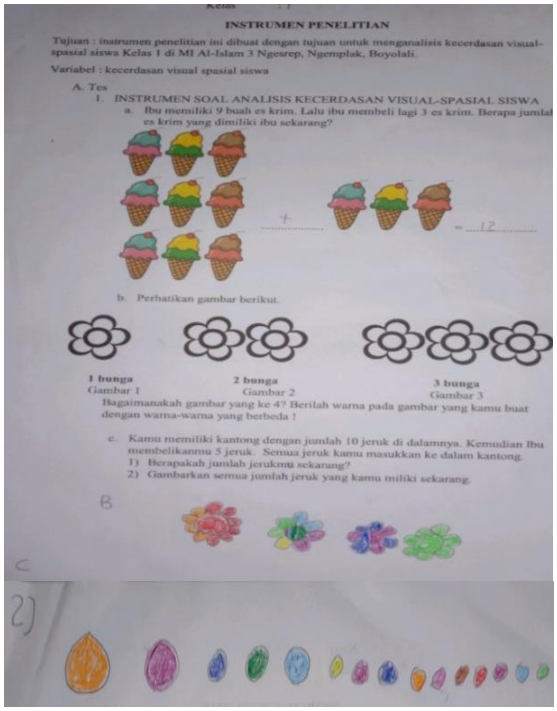


Figure 2. ADL Answer Sheet

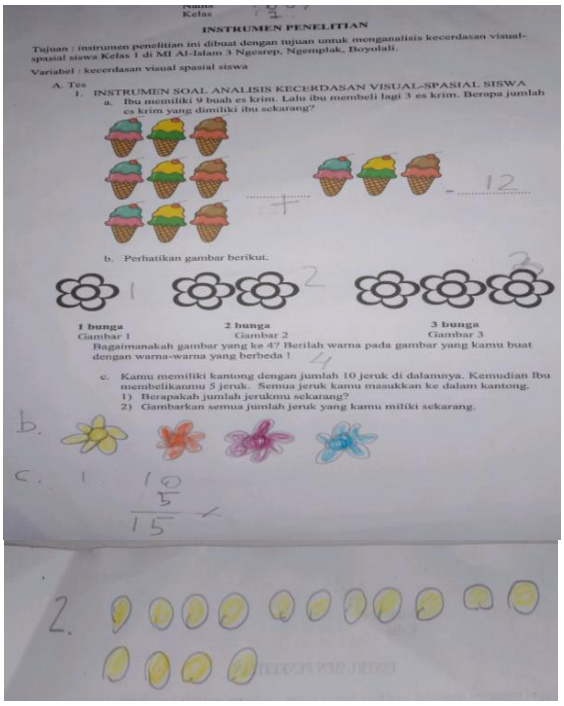
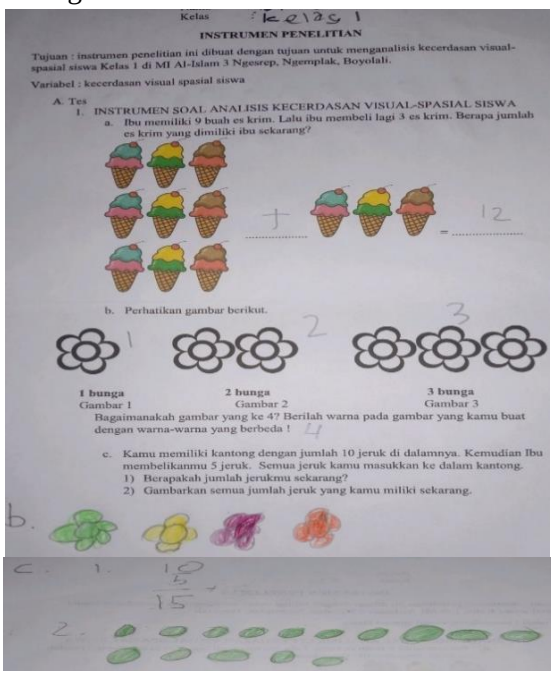


Figure 3. BSW Answer Sheet

In Figure 4, it can be seen in question number 1, BFA can fulfill all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining and conceptualization. In question number 2, BFA can determine patterns in solving problems and can use image assistance in the problem-solving process. This is included in the indicators measured in visual-spatial intelligence. BFA can meet the category of indicators measured in visual-spatial intelligence. In question number 3, BFA was able to answer correctly. BFA can meet the indicators measured in visual-spatial intelligence.


Kelas : 1 Satu

INSTRUMEN PENELITIAN

Tujuan : instrumen penelitian ini dibuat dengan tujuan untuk menganalisis kecerdasan visual-spasial siswa Kelas 1 di MI Al-Islam 3 Ngesrep, Ngemplak, Boyolali.

Variabel : kecerdasan visual spasial siswa

A. Tes

1. INSTRUMEN SOAL ANALISIS KECERDASAN VISUAL-SPASIAL SISWA

a. Ibu memiliki 9 buah es krim. Lalu ibu membeli lagi 3 es krim. Berapa jumlah es krim yang dimiliki ibu sekarang?

b. Perhatikan gambar berikut.

1 bunga Gambar 1 | 2 bunga Gambar 2 | 3 bunga Gambar 3

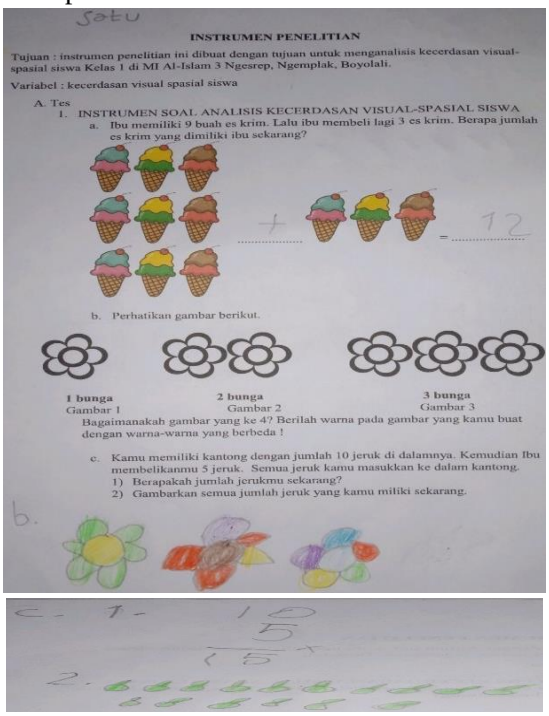
Bagaimanakah gambar yang ke 4? Berilah warna pada gambar yang kamu buat dengan warna-warna yang berbeda !

c. Kamu memiliki kantong dengan jumlah 10 jeruk di dalamnya. Kemudian Ibu membelikanmu 5 jeruk. Semua jeruk kamu masukkan ke dalam kantong.
1) Berapakah jumlah jerukmu sekarang?
2) Gambarkan semua jumlah jeruk yang kamu miliki sekarang.

Figure 4. BFA Answer Sheet

In figure 5, the answer to question number 1, KJH can fulfill all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining and conceptualization. In question number 2, KJH was able to meet the category of indicators measured in visual-spatial intelligence except problem-solving. In question number 3, KJH was able to meet the indicator categories measured in visual-spatial intelligence namely imagination and conceptualization.

Based on Figure 6, in question number 1, LRP can meet the characteristics and indicators measured in visual-spatial intelligence, namely imagining and conceptualizing. Question number 2, can meet the category of indicators measured in visual-spatial intelligence except problem-solving, conceptualization, and pattern searching. In question number 3, the LRP has not met the indicators of visual-spatial intelligence namely imagination and conceptualization.


Satu

INSTRUMEN PENELITIAN

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A. Tes

1. INSTRUMEN SOAL ANALISIS KECERDASAN VISUAL-SPASIAL SISWA

a. Ibu memiliki 9 buah es krim. Lalu ibu membeli lagi 3 es krim. Berapa jumlah es krim yang dimiliki ibu sekarang?

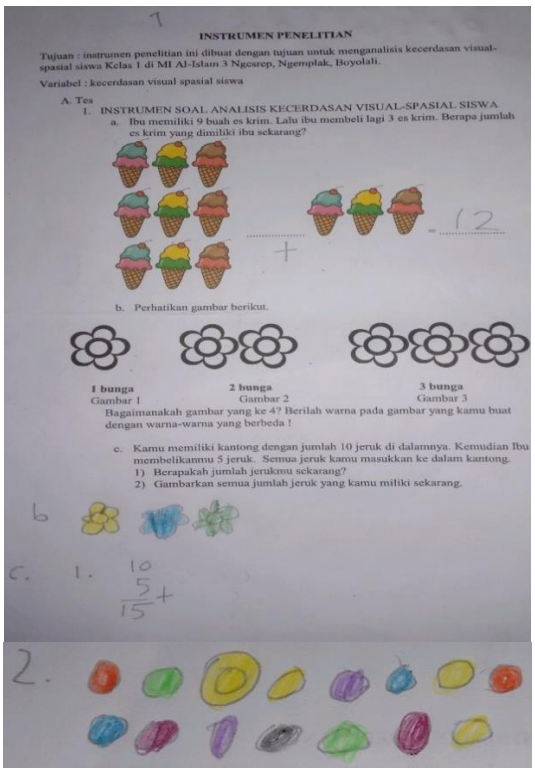
b. Perhatikan gambar berikut.

1 bunga Gambar 1 | 2 bunga Gambar 2 | 3 bunga Gambar 3

Bagaimanakah gambar yang ke 4? Berilah warna pada gambar yang kamu buat dengan warna-warna yang berbeda !

c. Kamu memiliki kantong dengan jumlah 10 jeruk di dalamnya. Kemudian Ibu membelikanmu 5 jeruk. Semua jeruk kamu masukkan ke dalam kantong.
1) Berapakah jumlah jerukmu sekarang?
2) Gambarkan semua jumlah jeruk yang kamu miliki sekarang.

Figure 5. KJH Answer Sheet


INSTRUMEN PENELITIAN

Tujuan : instrumen penelitian ini dibuat dengan tujuan untuk menganalisis kecerdasan visual-spasial siswa Kelas 1 di MI Al-Islam 3 Ngesrep, Ngemplak, Boyolali.

Variabel : kecerdasan visual spasial siswa

A. Tes

1. INSTRUMEN SOAL ANALISIS KECERDASAN VISUAL-SPASIAL SISWA

a. Ibu memiliki 9 buah es krim. Lalu ibu membeli lagi 3 es krim. Berapa jumlah es krim yang dimiliki ibu sekarang?

b. Perhatikan gambar berikut.

1 bunga Gambar 1 | 2 bunga Gambar 2 | 3 bunga Gambar 3

Bagaimanakah gambar yang ke 4? Berilah warna pada gambar yang kamu buat dengan warna-warna yang berbeda !

c. Kamu memiliki kantong dengan jumlah 10 jeruk di dalamnya. Kemudian Ibu membelikanmu 5 jeruk. Semua jeruk kamu masukkan ke dalam kantong.
1) Berapakah jumlah jerukmu sekarang?
2) Gambarkan semua jumlah jeruk yang kamu miliki sekarang.

Figure 6. LRP Answer Sheet

In Figure 7, the answer to question number 1, NPR can meet all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining, and conceptualization. In question number 2, NPR can meet the category of indicators measured on visual-spatial intelligence. Includes imagining, conceptualizing, pattern finding, and problem-solving. In question number 3, NPR was able to answer correctly. NPR can meet the indicators measured on visual-spatial intelligence. Includes imagining, conceptualizing, and problem-solving.

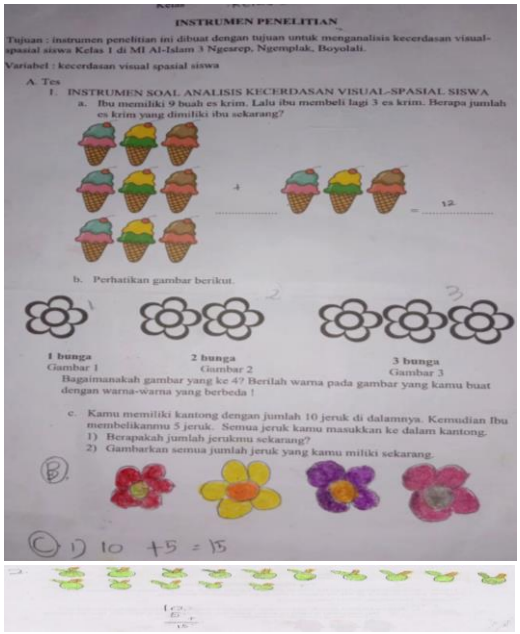


Figure 7. NPR Answer Sheet

Based on the answer sheet presented in Figure 8, in question number 1, RAS can fulfill all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining, and conceptualization. In question number 2, RAS can meet the category of indicators measured in visual-spatial intelligence except problem-solving. In question number 3, RAS can meet the category of indicators measured in visual-spatial intelligence, namely imagining and conceptualizing.

In Figure 9, the answer to question number 1, RFA can meet all the characteristics and indicators measured in visual-spatial intelligence. Includes imagining and conceptualization. In question number 2, RFA can meet the category of indicators measured in visual-spatial intelligence except for one indicator namely problem-solving. But in this case, RFA can be said to have visual-spatial intelligence. In question number 3, RFA was able to answer correctly. However, it is not thorough enough so there are questions that have not been answered. RFA can meet the indicators measured in visual-spatial intelligence except for one indicator, namely problem-solving. But in this case, RFA can be said to have visual-spatial intelligence.

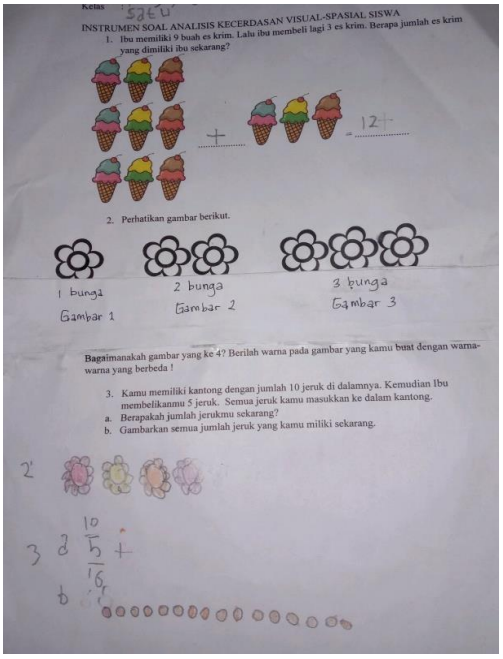


Figure 8. RAS Answer Sheet

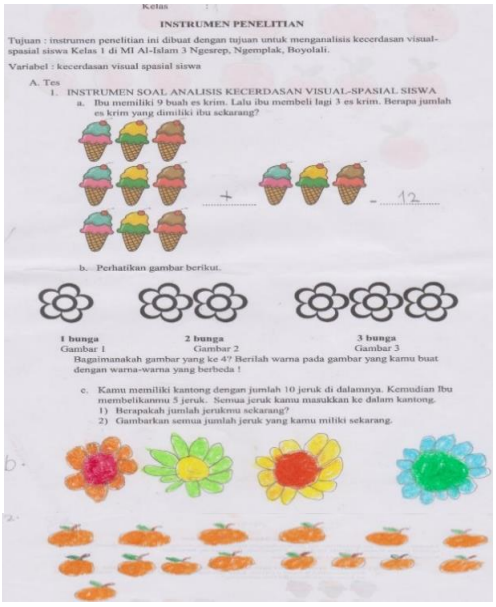


Figure 9. RFA Answer Sheet

The results showed that the majority of first grade student at an Islamic elementary school in Ngemplak, Boyolali, Indonesia have visual-spatial intelligence that has the potential to be developed. This is proven through questions containing indicators of visual-spatial intelligence according to (Prasetyono, 2012), from 8 students there are 3 students who meet all the characteristics of visual-spatial intelligence. The other 5 fulfill some of the characteristics of visual-spatial intelligence.

After the researchers found some research data, namely observations, interviews, and documentation related to the analysis of students' visual-spatial intelligence in mathematics subjects in first grade, the researchers interpreted the results as follows. Based on the results of tests and interviews that have been conducted, students the school are proven to have visual-spatial intelligence. This can be seen from the results of the work and strengthened by interviews. Some students can meet all indicators of visual-spatial intelligence. The subjects in question are (pseudo name) BSW, BFA, and NPR. The subject can fulfill all the characteristics of visual-spatial intelligence, namely the characteristics of imagination, concept, pattern search, and problem-solving.

Several other students were also able to fulfill some of the indicators of visual-spatial intelligence. The subjects in question are ADL and RFA. ADL and RFA can fulfill the characteristics of visual-spatial intelligence, namely conceptualizing and imagining. However, both of them cannot meet the problem-solving indicators, namely the point of seeing a problem from a different perspective. In addition, the subjects KJH and LRP can also fulfill the characteristics of visual-spatial intelligence, namely conceptualizing and imagining. However, KJH and LRP did not meet the problem-solving indicators, namely at the point of seeing a problem from a different perspective and determining a pattern.

It is known that there is one subject who can fulfill almost all characteristics of visual-spatial intelligence except problem-solving. The subject in question is: RAS. RAS subjects were able to meet the indicators of students' visual-spatial intelligence, namely conceptualizing and imagining. This is evidenced by the results of the RAS tests and interviews that have been discussed previously.

Aspects of visual-spatial intelligence are sensitivity on elements, shapes, compositions, sizes, and colors (Hastuti & Santia, 2018). Those who are visually spatially intelligent learn to observe shapes, colors, and objects and have very imaginative abilities, can imagine in detail, and love to construct things in three dimensions using bombiq, blocks, bricks, and legos. In addition, approaches that can be taken to stimulate visual-spatial intelligence according to (Aqila, 2015) are to train the right brain to use picture puzzles or puzzles, to give freedom of expression/creation, to complete drawing/writing tools needed by student, and to invite them to organize their work. This is as has been done by the first grade teacher, namely making learning fun so that students feel happy and eliminating the student's assumption that mathematics is difficult. In addition, also added games, interesting ice breaking, and practice questions. Plus collaboration with parents. Because during online learning, students are guided by their parents directly.

However, there are some shortcomings in conveying learning. Observations made on October, 2020, it is known that the facilities and infrastructure at the school also do not support learning activities. This is due to the lack of school funds to purchase adequate facilities. So that when learning takes place, teachers use makeshift facilities to support learning.

SIMPULAN

Based on the data exposure and discussion that has been described previously, it can be concluded as follows. There are three subjects that can fulfil all the characteristics of visual-spatial intelligence, namely conceptualizing, imagining, pattern searching, and problem-solving. The subjects in question are: BSW, BFA, and NPR. There are two subjects who can fulfil almost all the characteristics of visual-spatial intelligence

except problem-solving at the point of seeing the problem from a different point of view. The subjects in question are ADL and RFA. There are two subjects that can fulfil almost all the characteristics of visual-spatial intelligence except problem-solving at the point of seeing the problem from a different perspective and determining patterns. The subjects in question are KJH and LRP. There is one subject who can fulfil all the characteristics of visual-spatial intelligence except problem-solving on all points. The subject in question is RAS.

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