The Ability of Student with Autism Spectrum Disorder (ASD) in Completing Basic Mathematics Operations (BMO)

1st N Fauziyah
Universitas Negeri Surabaya
East Java, Indonesia
nurfauziyah@umg.ac.id

2nd I K Budayasa
Universitas Negeri Surabaya
East Java, Indonesia

3rd D Juniati
Universitas Negeri Surabaya
East Java, Indonesia

Abstract—**This study is aimed to describe the ability of ASD students in completing basic mathematics operations (BMO), especially operations of addition and subtraction. The research subjects are 21 elementary school students with ASD. The instruments used are divided into five levels of skill areas. It is found that most of students with ASD are only able to recognize the concept of number up to two digits, able to count a set of images of concrete objects, only able to do addition up to the addition of two-digit number with one-digit number, only able to subtract one digit number with one-digit number. Students with ASD are mostly unable to complete addition and subtraction in the form of an open-ended question even though it is in form of an addition of one digit numbers. Most students with ASD are unable to finish word problems of addition and subtraction too. The method used in finishing operations of addition and subtraction is same with the method taught by their teacher, this is because students with ASD have stereotype behavior (imitate).**

Keywords—Ability, Student, Autism Spectrum Disorder (ASD), Mathematics

I. INTRODUCTION

The term autism was first coined by Eugen Bleuler, a psychiatrist and psychologist from Switzerland in 1912 who referred to "an escape from reality". Autism comes from the Greek word "autos" which means self. This term refers to schizophrenia disorders, withdrawing from social life [1].

In the mid-20th century doctors, psychiatrists and psychologists began to research and try to define a group of children with developmental disorders including Leo Kanner. Leo Kanner [2] was the first person to formally publish autism. He wrote that an autistic child is "*have come into the world with innate inability to form the usual biologically provided affected contact with people*". The inability is in the form of late speech, lack of vocabulary, inability to use language for communication, the desire to be alone and the ability to connect objects in their environment only when they want. Kanner [2] based on psychoanalytic theory, it is said that the condition of ASD children may be caused by parenting a cold, stiff and perfectionist.

Gopal [3] found children who had a different set of behaviors which later was called early childhood autism syndrome. Furthermore, he also discovered several common characteristics of ASD children, namely: extreme autistic alones, obsessive desire to maintain common ground, extraordinary ability to memorize, and the limited types of activities carried out spontaneously.

In the same period, Hans Asperger, a psychiatrist from Viennese Austria, found several children who had the same behavior called Asperger's Syndrome [4] . He also explained that these children have deficiencies in social and emotional relationships, lack feelings with others, use less language, but some were found to have talents in mathematics and science. Asperger also said that maybe the cause of autism had something to do with genetics. To deal with autistic children, Asperger offers using a treatment and education approach.

Asperger syndrome has the same criteria as autism but does not have a history of slow speech and slow cognitive and pervasive development disorder criteria found in the World Health Organization (WHO) [5]. Talking slow is meant not being able to say one word at the age of 2 years and not being able to say a phrase at the age of 3 years.

In 1980, it was easier to diagnose autism by using DMS-III (Diagnostic and Statistical Manual, 3rd Ed.) Under pervasive developmental disorders and called infantile autism. Subsequently DMS-III was revised to DSM-IIIR and released in 1987 and removed the word "infantile", so "infantile autism" became "autistic disorder". In 1994 the DSM-IV developed by APA (American Psychiatric Association) was released and until now it has been used as a tool to determine autism.

From year to year the increase in the number of ASD children is getting higher. Gilberg [6] states that in the last 20 years the higher prevalence of autism spectrum disorders (ASD) is estimated to reach 0.2%. A fairly high prevalence requires more attention, especially in studies that can uncover their cognitive processes, especially

cognitive processes in solving mathematical problems. This is needed to determine whether ASD children also experience the same cognitive processes as those experienced by normal children in solving mathematical problems. The ability to solve mathematical problems is related to the process of learning mathematics. In essence mathematics learning is given to students aiming to sharpen their reasoning, as well as develop logical and systematic thinking skills. In the process of learning mathematics there is a process of interaction between the teacher and students, students and students in learning situations in class. Whereas children with ASD are children who experience impaired social interaction behavior and communication. So far, research that has uncovered students' cognitive processes in solving mathematical problems is still focused on normal children.

In solving mathematical problems, abilities are needed in basic mathematical operations, which consist of addition, subtraction, multiplication and division operations. For this reason, it is important to conduct research focusing on examining the profile of ASD children's abilities in solving basic mathematical operations. Based on the principle and standard in mathematics learning by The National Council of Teachers of Mathematics [7], computational fluency is defined as "heaving efficient and accurate methods for computing". To be efficient, student must perform calculations at a rate appropriate for a given skill level. To be accurate, students must perform calculations correctly. Therefore, to be computationally fluent, students must correctly answer mathematics problems at an identified level of difficulty within a given time period.

Based on the background above, the researcher is interested in examining the ability of children with ASD in solving basic mathematical operations, especially operations of addition and subtraction. In this study, Basic Mathematics Operations (BMO) includes understanding the concept of numbers through pictures or symbols, understanding the concept of numbers through concrete objects, close-ended question of addition operation, close-ended question of subtraction operation, open-ended question of subtraction operation, open-ended question of addition operation completed with the symbol of numbers, open-ended question of subtraction operation completed with the symbol of numbers, word problem of the concept of addition and subtraction.

II. METHODOLOGY

This study is aimed to describe the profile of autistic students' ability in solving basic mathematical operations. To describe it, a written test is conducted, then the answers of the students are divided into two categories: the right answer (correct) and the wrong answer (incorrect). Based on these data, the autistic students' ability profile will be formulated. Thus, this study is categorized as a quantitative study with the descriptive approach.

A. Participant of the research

The subjects in this study are 1st to 6th grades ASD students of elementary schools in Gresik, East Java, Indonesia which consist of 21 students. The whole subjects have been identified as ASD students through the test of DSM (Diagnostic Statistical Manual) IV developed by APA

(American Psychiatric Association). The research subjects are from RC (Resource Center), several inclusive schools and autism therapy center. Resource Center is an Implementer unit which is directly under the Department of Education which handles the therapy for children with special need and provides recommendations for those children so that they get a place to study in an inclusive school. While that elementary school is an inclusive school and a pilot inclusion school. Gender, IQ, and family backgrounds are not considered in this research. Characteristics of the subject can be seen in the Table I.

TABLE 1. THE SUBJECT CHARACTERISTIC

Characteristic	N	%	M	SD
Gender			10.5	7.78
Female	5	23.8		
Male	16	76.2		
Grade			3.5	1.64
1	6	28.6		
2	5	23.8		
3	2	9.5		
4	3	14.3		
5	2	9.5		
6	3	14.3		
Age			10.5	0.71
8-11 years old	11	52.4		
12-16 years old	10	47.6		

B. Research instruments

This study is aimed to describe the profile of ASD students' in solving Mathematics Basic Operations (BMO). Instruments in this study include the addition and subtraction operations which are divided into nine instruments, namely: understanding the concept of numbers through pictures or symbols are used to collect data regarding the ability of students with ASD in recognizing the concept of numbers ranging from 1 to 3 digits; understanding the concept of numbers through counting the pictures of concrete objects to determine how the students' ability to associate numbers with the quantity of a set of concrete objects is; close-ended addition operation is aimed to reveal the ability of students with ASD in addition operation; close-ended question of subtraction operation is used to know the ability of the students with ASD in subtraction operation; open-ended question of addition operation is used to determine whether the students with ASD really understand the concepts of addition operation; open-ended question of subtraction operation is used to gain data about a good understanding of subtraction concept; open-ended question of addition operation is completed the symbol of numbers; the open-ended question of subtraction operation is completed with the symbol of numbers; word problem about the concept of addition and subtraction is used to determine the ability of ASD students in applying their ability in the operations of addition and subtraction.

Researcher provides the first instrument to the research subjects, then she asks students to work on the problems in the instrument, gives an explanation on how to do it one by one until all of the questions are answered by the subjects. In this study, the researcher guides the subjects to solve the questions without leading the subjects to help them to find

the answers. If a question cannot be answered by the subjects, then it will be continued to the next question. This is done until the last instrument.

Students with ASD cannot do an activity in a long time like a normal child, at a certain moment, they will be willing to do the activity that we ask, but at a certain moment, in a sudden, they can refuse to do the activity that we ask. If this happens then the data collection can be continued on the next day.

If a student with ASD does not want to solve the question or the researcher faces difficulty in conditioning the student, then the data collection cannot be done and it can be done on the next day when the student is willing to solve the questions without coercion. At the time of data collection, the researcher is accompanied by the teachers of the subjects, it is necessary to ease the researcher to communicate with the subjects and to avoid subjects who are often rebellious or tantrum. Data collection is conducted carefully and cannot be done with coercion, so that the data obtained can describe the actual capabilities of the subjects.

C. Data analysis techniguess

The data obtained is compared by the age and types of operation (skill area). Based on the age, it is divided into two, they are the ages of 8 to 11 years old and the ages of 12 to 16 years old. From nine instruments, some skill areas obtained which are divided into five levels, namely: (1) the concept of one-digit, two-digit and three-digit numbers , the number concept through a set of concrete object pictures; (2) the addition and subtraction of one-digit number with one-digit number, addition and subtraction of two-digit number with one digit number, addition and subtraction of two-digit number with two-digit number; (3) open-ended question of addition and subtraction if the result addition

and reduction is known, open-ended question of addition and subtraction if the first number is known, open-ended question of addition and subtraction if the second number is known; (4) open-ended question of addition and subtraction if the results of addition and subtraction are known, open-ended question of addition and subtraction if the first number is known, open-ended question of addition and subtraction if the second number is known but it is completed with the pictures of numbers; (5) word problem associated with addition and subtraction are divided into two, word problems containing two and three information. In data analysis each skill area is classified into two categories, they are right answer (correct) and wrong answer (incorrect). The capability profile is presented in the form of diagrams which each skill is distinguished into the age level according to the above categories.

III.   RESULTS

A. Level 1

At level 1, namely the ability to recognize the concept of numbers, a data was obtained that for students with ASD at the ages of 8 to 11 years old: 10 out of 11 students with ASD have understood concept of one-digit number, 7 out of 11 students have been familiar with the concept of two-digit number, 4 out of 11 students have recognized the concept of three-digit number and 9 out of 11 students have been able to count a set of objects pictures. For ASD students at the ages of 12 to 16 years old: 9 out of 10 students have been familiar with one-digit numbers, 5 of the 10 students have known the concept of two-digit number and three-digit number and 6 out of 10 students have also been able to count a set of object images. The data can be seen in table II.

TABLE II. THE ABILITY TO RECOGNIZE THE CONCEPT OF NUMBERS

Level 1	8-11 years old		8-11 years old	
	able	unable	able	unable
Understand the concept of one-digit numbers	10	1	9	1
Understand the concept of two-digit numbers	7	4	5	5
Understand the concept of three-digit numbers	4	7	5	5
Count a set of object images	9	2	6	4

B. Level 2

At level 2, namely the ability in the operations of addition and subtraction, a data was obtained that for students with ASD at the ages of 8 to 11 years old; 9 out of 11 students have been able to add one-digit number with one-digit number, 8 out of 11 students have been able to add two-digit number with one-digit number, 5 out of 11 students have been able to add two-digit number with two-digit number, 8 out of 11 students have been able to subtract one digit number with one digit number, 5 of 11 students have been able to subtract two-digit number with one-digit number and 3 of 11 students have been able to subtract two-digit number with two-digit number.

Furthermore, for students with ASD at the ages of 12 to 16 years old, it was found that : 6 of 10 students have been able to add one-digit number with one-digit number, 6 out of 10 students have been able to add two-digit number with one digit number, 4 out of 10 students have been able to add two-digit number with two-digit number, 6 out of 10 students have been able to subtract one-digit number with one-digit number, 5 out of 10 students have been able to subtract two-digit number with one-digit number and 4 out of 10 students have been able to subtract two-digit number with two-digit number. The data is shown in table III.

TABLE III. THE ABILITY IN THE OPERATIONS OF ADDITION AND SUBTRACTION

Level 2	8-11 years old		8-11 years old	
	able	unable	able	unable
Understand the addition of one-digit numbers with one-digit numbers	9	2	6	4
Understand the addition of two-digit numbers with one-digit numbers	8	3	6	4
Understand the addition of two-digit numbers with two-digit numbers	5	6	4	6
Understand the subtraction of one-digit numbers with one-digit numbers	8	3	6	4
Understand the subtraction of two-digit numbers with one-digit numbers	5	6	5	5
Understand the subtraction of two-digit numbers with two-digit numbers	3	8	4	6

C. Level 3

At level 3, namely the ability in the operations of addition and subtraction with open-ended questions for ASD students at the ages of 8 to 11 years old, It was found that: 3 out of 11 students have been able to do open-ended question of addition if the result was known, 3 out of 11 students have been able to do open-ended question of addition if the first number was known, 3 of 11 students have been able to solve open-ended question of addition if the second number was known, 3 of the 11 students have been able to do open-ended question of subtraction if the result of the subtraction was known, 3 of the 11 students have been able to do open-ended question of subtraction if the first number was known and 3 of 11 students have been able to solve open-ended question of addition if the second number was known.

TABLE IV. THE ABILITY IN THE OPERATIONS OF ADDITION AND SUBTRACTION WITH OPEN-ENDED QUESTIONS

Level 3	8-11 years old		8-11 years old	
	able	unable	able	unable
Understand open-ended question of addition if the result was known	3	8	4	6
Understand open-ended question of addition if the first number was known	3	8	4	6
Understand solve open-ended question of addition if the second number was known	3	8	4	6
Understand open-ended question of subtraction if the result was known	3	8	3	7
Understand open-ended question of subtraction if the first number was known	3	8	3	7
Understand solve open-ended question of subtraction if the second number was known	3	8	2	8

Furthermore, for students with ASD at the ages of 12 to 16 years old: 4 out of 10 students have been able to solve open-ended question of addition if the sum was known, 4 out of 10 students have been able to solve open-ended question of addition if the first number was known, 4 out of 10 students have been able to do open-ended question of addition if the second number was known, 3 of the 10 students had been able in solving open-ended-question of the result of subtraction was known, 3 of the 10 students have been able to do open-ended question of subtraction if the first number was known and 2 of 10 students have been able in solving open-ended question of subtraction if the second number was known. The data is shown in table 4.

D. Level 4

At level 4, namely the ability to add and subtract open ended questions along with image of numbers to be paired to form the correct operation.
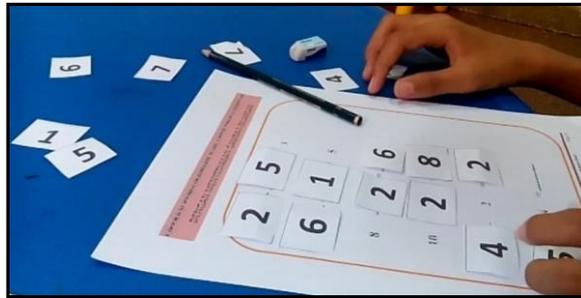
Fig. 1. Open-ended question with the images of numbers

At this level, for students with ASD at the ages of 8 to 11 years old, a data was obtained : 3 out of 11 students have been able in solving open-ended question of addition if the result was known, 3 out of 11 students have been able to do open-ended question of addition if the first number was known, 3 out of 11 students have been able in solving open-ended question of addition if the second number was known, 3 of the 11 students have been able to do open-ended question of subtraction if the result of subtraction was known, 3 of the 11 students have been able to do open-ended question of subtraction if the first number was known and 3 of 11 students have been able to solve open-ended question of subtraction if the second number was known.

TABLE V. THE ABILITY IN THE OPERATIONS OF ADDITION AND SUBTRACTION WITH OPEN-ENDED QUESTIONS

Level 4	8-11 years old		8-11 years old	
	able	unable	able	unable
Understand open-ended question of addition if the result was known	3	8	3	7
Understand open-ended question of addition if the first number was known	3	8	3	7
Understand solve open-ended question of addition if the second number was known	3	8	3	7
Understand open-ended question of subtraction if the result was known	3	8	3	7
Understand open-ended question of subtraction if the first number was known	3	8	3	7
Understand solve open-ended question of subtraction if the second number was known	3	8	3	7

Meanwhile, for students with ASD at the ages of 12 to 16 years old, 3 out of 10 students have been able in solving open-ended question of addition if the result was known, 3 out of 10 students have been able to do open-ended

question of addition if the first number was known, 3 out of 10 students have been able in solving open-ended question of addition if the second number was known, 3 of the 10 students have been able to do open-ended question of subtraction if the result of subtraction was known, 3 of the 10 students have been able to do open-ended question of subtraction if the first number was known and 3 of 10 students have been able to solve open-ended question of subtraction if the second number was known. The data shown in table V.

E. Level 5

At level 5, namely the ability to solve word problems related to the concept of addition and subtraction for students with ASD at the ages of 8 to 11years old, a data was found that : 3 out of 11 students have been able to solve

word problems related to the concept of addition containing two information, 3 out of 11 students have been able to finish word problems related to the concept of subtraction containing two information, 1 of 11 students have been able to solve word problem related to the addition and subtraction concepts that contained three information.

While for students with ASD at the ages of 12 to 16 years old, 2 of 10 students have been able to solve word problems related to the addition concept containing two information, 2 of 10 students have been able to solve word problems related to the concept of subtraction which contained two information, 1 of 10 students have already been able to solve word problems related to addition and subtraction concepts that contained three information. The data is shown in the table VI.

TABLE VI. THE ABILITY TO SOLVE WORD PROBLEMS RELATED TO THE CONCEPT OF ADDITION AND SUBTRACTION

Level 5	8-11 years old		8-11 years old	
	able	unable	able	unable
Understand word problems related to the concept of addition containing two information	3	8	2	8
Understand word problems related to the concept of subtraction containing two information	3	8	2	8
Understand word problems related to addition and subtraction concepts that contained three information	1	10	1	9

IV. DISCUSSION

The results of this study indicates that the majority of elementary school students with ASD are able to recognize the concept of one-digit number. Among the 21 subjects studied there were only two students who are not able to recognize single-digit numbers well. Those students consisted of one female and one male. Female students experienced severe communication disorders, while the male student not only experienced severe communication disorder, but also experienced impaired interaction, often did rebel, hitting, screaming and cry.

On the concept of two-digit number most (12 out of 21 students) of the subjects have been able to identify it well, but for the concept of three-digit number most (9 students from 21 students) of the subjects have not recognized it properly. Subjects who did not recognize the three-digit number were only able to spell out the numbers. The number of three hundred and twenty-one, they spelled it three two one. Furthermore, for the ability of counting a set of concrete objects pictures, generally autistic students have been able to count it well (15 of 21 students).

Most of students with ASD (15 of 21 students) have been able to add single-digit number with one-digit number. They solved the addition using the way as taught by their teacher. For the example, the addition of 2 plus 3, they calculated it using the way of saying "two is in mouths and three is on the fingers (showing three fingers)," and then they said "after two, three (holding the first finger), four (holding the second finger), five (holding the third finger), so the answer is five. "In each addition operation, they used that way although the numbers summed were very simple, for the example "2 + 1". This is in accordance with the characteristics of children with ASD that constantly uses repetitive language (repeated) or stereotypes (imitate).

Furthermore, related to the ability of adding two-digit number with one-digit number, most of the students (14 of 21 students) have been able to do it. The way how they did it was same as the way how they solved the addition of one-digit number with one-digit number. Meanwhile, for the addition of two-digit number with two-digit number most of the students were not able to finish it (only 9 out of 21 students who were able to finish it) this was because they could not use such the sum way that one of the number added up was one-digit number. Because they used their fingers as the tools of addition while fingers were limited to the number 10 only.

For subtraction of one-digit number with one-digit number, some participants, 14 of 21 children, have been able to finish it. They did it by calculating backwards. For the example 5 minus 3, they showed their three fingers and they counted them down by saying "before five, four (while holding the first finger), before four, three (holding the second finger), before three, two (holding the third finger), so the answer is two. This method was used by the teacher to teach them the technique of subtraction.

Furthermore, the ability to solve the subtraction question of two-digit number with one-digit number, most of the students have not been able to finish it (only 9 out of 21 students who were able). How they do it also by counting backwards. For the subtraction of two-digit number with two-digit number, more students were not able to finish it (only 7 of the 21 students who were able to finish it). Only students who were able to calculate the multilevel addition technique who could finish it.

The ability to complete the addition in the form of open-ended questions whether for the question that the sum or first number or the second number was known, most of the students were not able to finish it. There were only 7 students of 21 students who were able to finish it, although

the questions given were about one-digit number so the questions were very simple. As seen in Figure 2.

```
..........  +  ..........  =    5

..........  +  ..........  =    8

    2    +  ..........  =  ..........

    4    +  ..........  =  ..........

..........  +    1    =  ..........

..........  +    3    =  ..........
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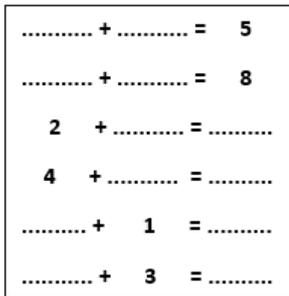
Fig 2. The Example of open ended questions in addition

In solving open-ended of subtraction, more students were unable to finish it. There were only six students out of 21 students who were able to finish it. Below were the examples of open-ended questions in forms of subtraction which can be seen in Figure 3.

```
..........  -  ..........  =    3

..........  -  ..........  =    4

    7    -  ..........  =  .......

    9    -  ..........  =  .......

..........  -    5    =  .......

..........  -    6    =  ........
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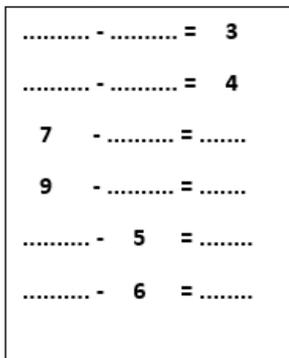
Fig. 3. The Example of open ended questions in subtractions

Although the questions given in the form of open-ended were so simple which were only limited on one-digit number, but most students were not able to do it. Moreover, there were eight students who have been able to complete the operation of addition and subtraction up to two digits but they were not able to solve this open-ended question. This problem became a big question for the researcher. Based on the interviews with the teacher assistant of children with special need, it revealed that the students have not been taught about open-ended questions. This was in

accordance with the nature of autistic students, that students with ASD were less able to develop the knowledge they have, they were only capable of doing limited to what has been taught previously. Thus, it showed that autistic children have not had a conceptual understanding (conceptual understanding) but only had an understanding of procedural (procedural understanding) to the concept of addition and subtraction.

Researcher rechecked their understanding of the concepts of addition and subtraction by delivering a matter of addition and subtraction in the form of open-ended questions, but it was completed with pictures of numbers that could be used by the subjects to pair the appropriate number in the question (Figure 4.). But this apparently did not produce results. Students who were able to solve this question has not increased which was only 6 students who were able to finish it out of 21 students.
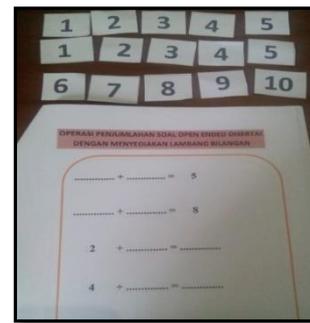
Fig. 4. The Example of open ended questions with picture of numbers

In the final stage, researcher revealed the autistic student's ability to apply the concepts of addition and subtraction by providing word problems associated with the concept. The result was there were only 5 students out of 21 students were able to complete the addition and subtraction word problems containing only two information. For the word problems associated with the concept of addition and subtraction that contained three information, there were only 2 students out of 21 students who were able to finish it. Although the question created was very simple which could be seen in figure 5.

Randy has 3 candies, then he buys 4 more candies. When he met his friend, he gave 2 of the candy to his friend. How much is Randy's candy now?

Fig. 5. The example of word problems

The ability of students with ASD in accommodating the information was still limited, although the word problem was read slowly by the researcher and the information was parsed or segregated, yet they were still not able to understand the meaning of the word problems so that most students with ASD we're able to solve the question. The result was in line with the research conducted by Roux, Dion, Barette and Dopere [7] and Fauziyah, Budayasa and Juniati [8].

The results of this study was in line with the results of research conducted by Bae, Chiang, and Hickson [9] and

Whitby [10], that students could gain the knowledge of mathematics even though it was very limited. The mathematical knowledge acquisition process can be done through drills. Students with ASD have problems in solving math questions in form of word problem. The result of this study showed that subjects faced difficulties to communicate the results of learning to others and they seem only revealed everything they have received without being able to change or establish their own sentence. They tended to be only able to answer questions with only one answer. When they were confronted to a word problem, then they

would make a similar problem they have ever received before.

The results of this study were also consistent with the study conducted by Calhoon, Emerson, Flores, & Houchins [11], that the ability to resolve Mathematics Operation Test-Revised (MOT) of 224 students 9th -12th who had mathematics disabilities (MD) could only finish up to level 2 and 3 from 6 levels given with the skill areas of addition, subtraction, multiplication, division, rational numbers, fractions and decimals [12].

V. CONCLUSION

Most students with ASD have been able to recognize the concept of single-digit numbers, among 21 subjects there were only 2 students who are unable to solve the question. Meanwhile, for the concept of two-digit number, there were 12 students from 21 students who were able to recognize the concept of three-digit number well, but for recognizing the concept of three-digit number, most (9 students from 21 students) subjects have not been recognized properly. The ability of counting a set of concrete objects pictures, most of them were able to do it well (15 of 21 students).

The majority of students with ASD (15 of 21 students) have been able to add single-digit number with one-digit numbers. While for the ability to add two-digit number with a single digit, most students (14 of 21 students), they have also been able to do it. They solved the addition using the way as taught by their teacher. For the example, the addition of 2 plus 3, they calculated it by way of saying to "two in the mouth and three fingers (showing three fingers)," and then they said "after two, three (holding the first finger), four (while holding the second finger), five (while holding the third fingers), so the answer is five. Addition operation was done with that way although the numbers summer were very simple, for the example "2 + 1". This was in accordance with the characteristic of children with ASD who were constantly using repetitive language (repeated) or stereotypes (imitate).

While for the addition of two-digit number with two-digit number, most of students were not able to finish it (only 9 out of 21 students who were able to finish it), this was because they solved the addition question with the help of their fingers so that it was only limited to number 10.

For the subtraction of one-digit number with one-digit number, most of them have been able to finish it which consists of 14 students from 21 students. While the ability to solve subtraction questions of two-digit number with single digit number, most students have not been able to finish it (only 9 out of 21 students who were able). They did it by calculating backwards. For the example 5 minus 3, they showed their three fingers and counted it down by saying "before five, four (while holding the first finger), before four, three (holding the second finger), before three, two (holding the third finger), so the answer is two. This method used by their teacher to teach them the technique of subtraction. While the ability to subtract two-digit number with two-digit number, more students were not able to finish it (only 7 of the 21 students who were able to finish it). Only students who were able to calculate using

multilevel addition technique who could finish the questions.

The ability to complete addition in the form of open-ended questions whether for the question which was only to the sum was known, or the first number was known, or the second number was known, most students were not able to finish it. There were only 7 students from 21 students who were able to finish. While in solving open-ended subtraction, more students were not able to finish. There were only six students out of 21 students who were able to finish it, although all of the questions given were one-digit numbers so the questions were very simple. Moreover, there were only eight students who have been able to complete the operation of addition and subtraction up to two digits but they were not able to solve these open-ended questions.

Furthermore, in case of solving open-ended questions which was completed with the symbol of numbers, there were only six students out of 21 students who were able to finish. This was because they have never been taught about open-ended questions. In accordance with the nature of autistic students, that students with ASD were less able to develop the knowledge they have, they were only capable of solving question limited to what have been thought to them previously. Thus, it showed that autistic children did not have a conceptual understanding (conceptual understanding) but only had an understanding of procedural (procedural understanding) to the concept of addition and subtraction.

There were only 5 students from 21 students who were able to complete the addition and subtraction word problems containing only two information. For the word problem associated with the concept of addition and subtraction that contains three information, there were only 2 students out of 21 students who were able to finish it. Even though the word problem created was very simple.The ability of students with ASD in accommodating the information was still limited, although the word problem was read slowly by the researcher, and the information was parsed or segregated, yet they were still unable to understand the meaning of the word problems so that most students with ASD we're able to solve the question.

VI. SUGGESTION

Students with ASD are constantly using repetitive language or stereotypes (imitate), so that the learning process is necessary to grant more varied forms of questions. At the time that the students have already understood the way of solving questions given by the teacher, then the teacher should try to provide encouragement for students to use other ways in accordance with the ability of students if it is possible to do. For students with ASD who only have procedural understanding without conceptual understanding, the teacher can use realistic media in the learning process. Furthermore, associated with the ability of students with ASD in accommodating the information which is still limited and their lack of ability to understand word problem even though it is very simple, then in the process of learning about word problem, the teacher can use the simulation

technique, so that students can experience directly the context in a word problem.

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REFERENCES

[1] Firth, *Autism: Explaining the Enigma*. Oxford, 2003.

[2] L. Kanner, "Autistic disturbances of affective contact.," *Acta Paedopsychiatr.*, vol. 35, no. 4, pp. 100–136, 1968.

[3] V. Gopal, "Autisme: Satu Pengenalan," *J. Keningau*, pp. 27–34, 2001.

[4] L. Wing, "Asperger's syndrome: A clinical account," *Psychol. Med.*, vol. 11, no. 1, pp. 115–129, 1981, doi: 10.1017/S0033291700053332.

[5] O. W. Health, *Progress report of the world health organization*. World Health Organization, 1994.

[6] E. Fombonne, "The epidemiology of autism: A review," *Psychol. Med.*, vol. 29, no. 4, pp. 769–786, 1999, doi: 10.1017/S0033291799008508.

[7] NCTM, *Principles and Standards for School Mathematics*. National Council of Teachers of Mathematics, 2000.

[8] N. Fauziyah, I. K. Budayasa, and D. Juniati, "Cognition processes of student with low functioning autism in solving mathematical problem," *J. Phys. Conf. Ser.*, vol. 1469, no. 1, 2020, doi: 10.1088/1742-6596/1469/1/012167.

[9] C. Roux, E. Dion, A. Barrette, V. Dupéré, and D. Fuchs, "Efficacy of an Intervention to Enhance Reading Comprehension of Students With High-Functioning Autism Spectrum Disorder," *Remedial Spec. Educ.*, vol. 36, no. 3, pp. 131–142, 2015, doi: 10.1177/0741932514533998.

[10] Y. S. Bae, H.-M. Chiang, and L. Hickson, "Mathematical Word Problem Solving Ability of Children with Autism Spectrum Disorder and their Typically Developing Peers," *J. Autism Dev. Disord.*, vol. 45, no. 7, p. 2200—2208, Jul. 2015, doi: 10.1007/s10803-015-2387-8.

[11] P. J. S. Whitby, "The Effects of Solve It! on the Mathematical Word Problem Solving Ability of Adolescents With Autism Spectrum Disorders," *Focus Autism Other Dev. Disabl.*, vol. 28, no. 2, pp. 78 –88, 2012.

[12] M. B. Calhoon, R. W. Emerson, M. Flores, and D. E. Houchins, "Computational Fluency Performance Profile of High School Students With Mathematics Disabilities," *Remedial Spec. Educ.*, vol. 28, no. 5, pp. 292–303, Sep. 2007, doi: 10.1177/07419325070280050401.