

# Analysis Number Sense of Students in Different Level using Decision Theory

Tulus<sup>1</sup>, R. I. Marpaung<sup>2</sup> and T. J. Marpaung<sup>1</sup>

<sup>1</sup>Department of Mathematics, Universitas Sumatera Utara, Medan, Indonesia

<sup>2</sup>Department of Mathematics, Universitas Negeri Medan, Medan, Indonesia

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Abstract: In mathematics learning, numbers are often regarded as objects without meaning. When looking at numbers, students often direct their thoughts directly to calculation operations. Students will immediately decide to carry out the calculation process using opaque paper or calculators. In fact, the calculation process is a diverse art, where students can develop their sensitivity to the calculation process in different ways. This research aims to describe the number sense of fifth grade, sixth grade elementary school students and seventh grade of junior high school in Noble School Medan. From this research we can take the conclusion using decision theory, where the students' number sense obtained is still low. A deeper assessment must be made of the results of this test, so that students' number sense is expected to increase and students are more creative in the process of learning mathematics.

## 1 INTRODUCTION

Mathematics is consist of facts, there are different level of facts that will be more difficult when the students go to the next level of class. Memorizing the facts still possible for the students even they are not fluent with the facts. However, teachers have to know how to measure the students' fluency ability in mathematics facts. Susan Jo Russell there are three criteria of fluency:

1. Efficiency  
Efficiency means students must find the answer quickly.
2. Accuracy  
Not just finding the answer quickly, students also must find the correct answer.
3. Flexibility  
When the students cannot find the answer, students must find another way or another approach to find the answer (Mohamed and Johnny (2010).

Then, after knowing the meaning of "FLUENT" in mathematics facts, students must be efficient, accurate and flexible to solve the mathematics problem.

Researcher found, in Noble School grade three, there are some students memorizing the facts of mathematics problem, she/he memorized the calculation operation that they needed for solving the problems, but they just can do it in short time, because they memorized it. Researcher saw in the class, students need to be flexible to find another way to solve the problems, students should RECALL their previous mathematics facts to solve it. Students must fluent to use all mathematics facts to solve the problems.

As an example  $5 + 6$  equal to 11. Most of the students is great in that case, but they did not realize, it was same with  $6 + 6$  then subtract 1. They also did not realize it same wit  $5 + 5$  then add 1. Students just know  $5 + 6$  equal to 11, without realized there are many ways to find it. Students thought they already good in mathematics, but then the researcher gave them two digits addition, all they can do is algorithm. They added those two numbers using line up way. The researcher gave  $35 + 26$ , then students did not have another way, just line it up. They also confused when the researcher gave the word problems. Students is good in algorithm, but they had weak number sense. That is also the reason, why mostly students hated word problems, because counting using algorithm is the students' favorite to do in Mathematics Class.

Those students who had good number sense, they had good sensitivity or intuition about numbers and operations. Those students who had good number sense, they will be fluent in mathematics facts. They can use their sense to approach and make plans for the next step to solve the problems. Number sense is an important skill that all students should be mastered to solve mathematics problems, including the numerical problems in their daily life (Maab et al. (2018).

Number sense is an ability that students must be mastered since they started school, because all students have learnt mathematics since they were kindergarten, the researcher wants to see the students' grade five, six and seven number sense ability. The researcher chose grade five, six and seven, because they have learnt mathematics at least 4 years, so they should be mastered number sense. That is the objective of this research to describe the number sense of fifth grade, sixth grade elementary school students and seventh grade of Junior High School in Noble School Medan.

## 2 BACKGROUND OF THE STUDY

There are many students who did not like mathematics, because for them mathematics is a special lesson for smart kids. There are some students who get extra lessons outside school, they would be more confident because they can count faster. How to make all students who did not get tuition to have the same ability with all the students who get tuition, which was the first question that the researcher wants to solve? Those ability, count faster than other students that is an ability that we can say as number sense.

Number sense is an ability for the kids to be flexible to solve the problems. Basically, number sense is consisted of two words, number and sense. All people, every time we heard the word of number, we'll remember 1, 2, 3, ... . But, actually those numbers can be deeper than just a number. Joseph Marie de Maistre said a crying can be a song because of number, noise can be a rhythm because of number, the spring can be transformed to a dance, then force can be dynamic and outlines figures (Chapra and Steven, 2004).

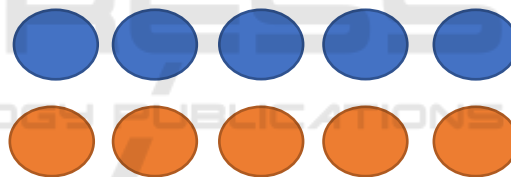
Number is more than a number, then sense is a feeling. So, the students can feel the number, they can be friendly with those numbers. They can be fluent to "communicate" with numbers, they can be flexible to be with those numbers, integers,

fractions, decimals or any kind of numbers, they can be flexible.

Students will always face mathematics problems in their daily life. Those problems can be solved with their number sense, as an example if they went grocery, then they wanted to make sure whether their money enough or not, then they can estimate. Estimation as one of the number sense part. Then, the students will not be fooled when they want to buy or sell anything. If the students can "communicate" with the numbers, they can solve this problem.

Besides that, mental computation becomes a favorite way to count faster. Mental computation growing as one of flexible way, with flexible rules and flexible steps to solve. Mental computation as one part of number sense, as a way to "communicate" with the numbers.

Number sense has not been known widely, especially in Indonesia. There are many teachers, who still teach algorithm to students, they did not teach them the flexibility for solving the problems. Number sense can be taught as a hierarchical way, when the students knew  $5 + 5$  equal to 10, teacher can use that basic to explain  $6 + 6$ ,  $7 + 7$ ,  $6 + 7$ , ... .  $5 + 5$  will be drawn like below.



So, there are 5 blue coins and 5 red coins, will make 10 coins altogether. It means  $5 + 5$  equal to 10 will be the students' basic knowledge, then, when the teacher asked them  $6 + 6$ , it means the students will add 1 blue coin and 1 red coin, just same with 10 coins that the students already had before add with 2 new coins equal to 12 coins. For  $6 + 7$ , the students just add 1 more red coin, it means 12 coins that they had before add with 1 more new coin, it will be 13 coins.

Students will know how to RECALL their basic knowledge as a basic information to build their new knowledge. Students will learn how to be flexible with numbers and will improve the students' number sense. Here, can be seen how to teach number sense, should be started from lower classes. The students must improve their number sense, using recall their basic knowledge and hierarchically improve to the next knowledge. Number sense, will be like coastline, when the students know how to be

flexible with the numbers, they will have deeper understanding to solve their problems.

There are some research that conducted before this research by other researchers about number sense. The research that conducted by Mohini Mohamed and Jacinta Johnny in 32 Primary Four students in Malaysia, showed that students rarely face problem with algorithms, then many students still have low ability in number sense. Besides that, there is other research conducted by Rahmah Johar and Arhamni about the number sense ability of the teachers in Aceh, then the result of the teachers' number sense still low.

These all were the reasons, why the researcher interested to conduct the research in the school, where one of the researcher teach. The researcher conducted the research for grade five to seven, because at least they had learnt mathematics for four years. The researcher want to know the students' number sense ability.

### 3 METHODS

This research conducted in 3 different levels, grade 5, grade 6 and grade 7. The researcher chose ten students randomly from each level. The researcher chose 3 students who got Mathematics score more than 90 in their progress report, 4 students who got Mathematics score between 65 to 70, and 3 students who got Mathematics score lower than 60.

Then, the researcher used decision theory for choosing the materials, then after doing interview, the students 90% said that fractions and decimals, especially the word problems are the most difficult materials. From the interviewed, according to decision theory, using all of the information, then which materials were told frequently, will be chosen for being the materials (Fosnot and Dolk (2001). Then, the researcher made 5 questions,

Note :

Without doing any counting operations, addition, subtraction, multiplication and division, answer these questions and give the reason.

- How many decimals numbers between 3.56 and 3.57?
- Which one is greater,  $\frac{7}{12}$  or  $\frac{7}{9}$  ?
- Which one is greater  $\frac{19}{20}$  or  $\frac{15}{16}$  ?

- Put the point in the right position for the result of  $217.5 \times 0.485 = 1054875$ .
- Does  $\frac{2}{7} + \frac{9}{15}$  greater or less than 0.5?

All of the answers collected and analyzed in descriptive way became :

**CNS**, means correct and using number sense.

**C-NS/C-R**, means correct and did not use number sense or without reason.

**F+R**, means false with reason.

**F-R**, means false without reason.

## 4 ANALYSIS AND DISCUSSION

### 4.1 Disease Free Equilibrium Point

After the researcher did the research, there are some result that the researcher got. For the first question, "How many decimals numbers between 3.56 and 3.57?"

Grade	CNS	C-NS	C-R	F+R	F-R
5 <sup>th</sup>	0%	0%	0%	55%	45%
6 <sup>th</sup>	2%	0%	0%	35%	63%
7 <sup>th</sup>	2%	0%	0%	45%	53%

From the result above, it can be seen so clear, number sense of the students still so low. The percentage of the students who can answered correct using number sense there are just  $1\frac{1}{3}\%$  from the total number of students. There are 0% from grade 5, 2% from grade 6 and 2% from grade 7. There are  $98\frac{2}{3}\%$  who still wrong for answering the first question.

For the second question, "Which one is greater,  $\frac{7}{12}$  or  $\frac{7}{9}$ ?"

Grade	CNS	C-NS	C-R	F+R	F-R
5 <sup>th</sup>	30%	50%	20%	0%	0%
6 <sup>th</sup>	45%	50%	5%	0%	0%
7 <sup>th</sup>	60%	35%	5%	0%	0%

From the result above, it can be seen that all students from grade fifth to grade seventh can answer the question correctly, none of them wrong, but, when the researcher separate their answer according to the way they answered it, the researcher can see that the percentage of the students who used number sense for solving the problems, there are 40% from grade

fifth, 45% from grade sixth and 60% from grade seventh. The conclusion, there are 45% of the whole students, who used number sense as their way to solve the problem and 55% of the whole students who answered correctly without using number sense and none of them are wrong.

For the third question, “Which one is greater  $\frac{18}{19}$  or  $\frac{14}{15}$  ?”

Grade	CNS	C-NS	C-R	F+R	F-R
5th	30%	50%	0%	0%	20%
6th	40%	45%	0%	0%	15%
7th	55%	35%	0%	0%	10%

From the result above, there was happened a little bit different. There are some students who answered it wrong. There are, 20% students who answered it wrong and without reason in grade fifth, 15% in grade sixth and 10% in grade seventh, the conclusion there are 15% students who answered it wrong. There are 30% students who answered it correctly using number sense in grade fifth, 40 % in grade sixth and 55% in grade seventh. The conclusion, there are  $41\frac{2}{3}\%$  who answered it correctly using number sense and  $43\frac{1}{3}\%$  who answered it correctly without using number sense. For the fourth question, “Put the point in the right position for the result of  $115.4 \times 0.325=37505$ .”

Grade	CNS	C-NS	C-R	F+R	F-R
5th	0%	57%	0%	43%	0%
6th	0%	79%	0%	21%	0%
7th	0%	100%	0%	0%	0%

From the result above, there were none students who were answered it correctly using number sense, but there are  $78\frac{2}{3}\%$  who answered correctly without number sense. The students who answered it wrong are  $21\frac{1}{3}\%$ . The conclusion, there are 100% students who cannot answer the question using number sense. For the fifth question, “Does  $\frac{2}{5} + \frac{9}{20}$  greater or less than 0.5?”

Grade	CNS	C-NS	C-R	F+R	F-R
5th	0%	57%	0%	43%	0%
6th	0%	79%	0%	21%	0%
7th	0%	100%	0%	0%	0%

From the result, it was seen that the percentage was same with the fourth condition. There was none students who answered the question correctly using number sense, they answered it correctly without number sense, they used the algorithm there are  $78\frac{2}{3}\%$  students who answered it correctly and the rest answered it wrongly,  $21\frac{1}{3}\%$ . The conclusion, there are 100% students who cannot answered the question correctly using number sense.

After the researcher look at all of the answers of all students, the researcher took the conclusion, that there are many students who still weak in number sense. They used algorithm for solving the problems, while actually they can used their number sense and solve the problems without counting much on the scrape paper. Students wasted their time for counting, while they can use their number sense.

According to decision theory, the materials that the researcher took were, fraction and decimals, the researcher can took the conclusion that, the number sense ability of the students in grade five, six and seven in Noble School still low.

## 5 CONCLUSIONS

From the research, generally the students are weak about the concepts of number and the operations, they still weak in understanding the relationship between the number and the operations. Besides, the students had focus to get high score, then they did many similar questions, until they can memorize the algorithm, without understanding about the algorithm and just do it because it is became routinely.

Based on table 1, from the first question, it can be seen that the percentage of the students there are  $98\frac{2}{3}\%$  who wrong and the students who can answered correct using number sense there are just  $1\frac{1}{3}\%$  from the total number of students.

Based on table 2, from the second question, it can be seen there are 45% students, who used number sense as their way to solve the problem. Then, based on table 3 there are  $41\frac{2}{3}\%$  who answered it correctly using number sense. Based on table 4 and 5 there are 100% students who cannot answer the question using number sense.

Based on the research, it can be seen that the students still have low understanding about fraction and decimal, specially using number sense, then in the future the researcher hope the students can

improve their understanding in fraction and decimal using number sense.

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