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Analysis of Difficulty of Mathematical Material in Primary Schools on Rounding Length and Weight Measurement Result to the Closest Denomination

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Abstract. Rounding is one of the materials available in the fourth-grade mathematics learning. Rounding is way to simplify the numbers that need to be simplified. Rounding is closely related to fairly complex numbers. Although there are no formulas in the rounding material used to calculate it, it does not make the rounding material fully understood by students. The purpose of this study in the form of written description tests given to 28 students of Asmi 033 Elementary School in Bandung. The results of the analysis show that there are difficulties faced by students in answering the rounding measurement results of the length and weight of the closest unit because the student's ability to digest the question sentence into a mathematical sentence is still low. But there is also a possibility because the prerequisites are lacking, especially in decimal number operations.

Keywords: mathematics, rounding, difficulty learning

INTRODUCTION ~ Along with the times, the community's paradigm about education began to change. Education is no longer considered as an obligation but has become a necessity for human life to face competition in this era of globalization.

In the education world, mathematics is considered as one of the important subjects. Learning mathematics in elementary schools, is not only directed at increasing the ability to count, but also directed at increasing the ability of students to solve problems (Problem Solving), both mathematical problems and other problems that use mathematics to solve them (Lidinillah, 2008). In other words, mathematics has an important role in increasing the ability to think and argue, contribute to support science and technology, and contribute to solving problems of daily life. Therefore, a strong mathematical mastery is needed.

Mathematics is indeed a subject that requires higher logical abilities than other subjects, but this statement can be eliminated if the learning process carried out by the teacher is in accordance with the standards set out in Permendiknas No. 41 of 2007 about process standards for primary and secondary education units. In the appendix section it is said that the implementation of this activity is a learning process to achieve Basic Competence which is carried out interactively, inspiringly, fun, challenging, motivates students to actively participate, and provides sufficient space for initiative, creativity, and independence in accordance with talents, interests, and physical and psychological development of students.

Mathematics is a science with abstract study objects. In the Big Indonesian Dictionary, 'abstract' is defined as 'something that is intangible' or 'just a

picture of the mind'. The meaning of the explanation is that something abstract, intangible in concrete or real form, can only be imagined in the mind. A simple example to illustrate the abstractness of mathematical study objects, one of which can be found in the concepts of numbers and flat shapes. For example, at number 2 is essentially an abstract concept. The concept of 'two' as a number will only be meaningful if it is associated with an object such as two balls, two pens and others. If the representation of the symbol in the form of "2" is something real. Likewise, in the concept of circles in geometry, objects such as bracelets, rings, etc. are not circles but examples that form a circle. Understanding the circle in mathematics itself is a collection of dots that the distance between each other is the same.

From the illustration, it is no exaggeration if mathematics is called a contrasting subject, this is different from the minds of students who are accustomed to being concrete. Therefore, deeper research is needed to what are the learning constraints experienced by students so that students have difficulty in working on math problems, as well as how to minimize these learning difficulties.

Sabri (1995) stated that learning difficulties are students' difficulties in accepting and absorbing lessons. Meanwhile according to Ahmadi & Supriono (2004), learning difficulties are situations where students cannot learn as they should. Meanwhile, according to Masroza (2013), this learning

difficulty is a real disorder in children associated with general and special tasks, which are thought to be caused by neurological dysfunction, psychological processes or other causes so that children who have learning difficulties in a class show low learning achievement.

From some understanding of learning difficulties that have been stated above can be drawn a conclusion that learning difficulties can be interpreted as the child's inability to complete the tasks given by the teacher. The difficulty is related to mathematical objects that are abstract, so some students have difficulty in understanding it.

Brousseau in (Suryadi, 2010), stated that there are three factors that cause learning obstacles, namely ontogeny (mental readiness), didactic (due to teacher teaching) and epistemology (student knowledge which has a limited application context). While Cooney, Davis & Henderson in (Sadiq, 2014), identified several factors that cause learning difficulties, including: (1) physiological factors, related to the malfunctioning of the brain, nervous system or other body parts. (2) social factors, related to the attitudes and circumstances of the family and surrounding community who are less supportive for wholehearted learning. (3) psychiatric factors, related to the lack of support the feelings of hearts (emotions) of students. (4) intellectual factors, related to less than perfect or less normal level of student intelligence. (5) educational

factors, related to the lack of education institutions in general.

As for some common mistakes made by students who have difficulty in learning mathematics according to Lerner in Sugiharto (2003) is a lack of understanding of: symbols, place values, calculations, use of erroneous processes and illegible writing. Cooney (in Yusmin 2017) said that mathematics learning difficulties are classified into three types including (1) students' difficulties in using concepts, (2) students' difficulties in using principles, (3) students' difficulties in solving verbal problems.

One of the mathematics learning materials in 4th grade is rounding the results of length and weight measurements. In this basic competency 4th grade students are required to be able to achieve several indicators of achievement, namely, determining the results of measurements of length to the nearest unit and rounding the results of measurements of weight to the closest unit.

Rounding is a way to simplify numbers that need to be simplified. Walle (2007) revealed that rounding up a number means replacing the number with another number that is close enough and can be calculated easily. Suyati and Khafid (2004) suggested that rounding is usually to make it easier to determine the results of arithmetic operations. Although there are no formulas in the rounding material used to calculate it, it does not make the

rounding material fully understood by students.

To find out the difficulty of students in working on rounding problems measuring the length and weight to the closest unit, previously the author conducted some diagnostic tests on 28 students at SD3 033 Asmi Bandung. The instrument used in this study was a written description test that referred to the syllabus of mathematics learning in 4th grade elementary school.

Diagnosis is a term that is often used in the medical world which can be interpreted according to the KBBI as: (1) determining the type of disease by examining or checking its symptoms, (2) the process of examining things that are considered to be wrong, (3) disease discovery process based on signs and symptoms by means and tools such as laboratories, photographs and clinics. According to Thorndike and Hagen in Sugiharto (2003) diagnosis can be interpreted as an effort or process of find weaknesses or illnesses through testing and study of symptoms, studies of facts to find characteristics or errors and so forth that are essential, as well as decisions reached after the study of symptoms or facts about a matter.

So it can be concluded that the diagnosis of learning difficulties is an effort or process to understand the types and characteristics and background of learning difficulties by using a variety of objective data making it possible to draw conclusions and find solutions to solve these difficulties.

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METHOD

This study uses a qualitative approach, according to Locke (in Creswell, 2015) qualitative research is an interactive research in which researchers engage in ongoing and continuous experience with participants, this involvement will later lead to a series of strategic, ethical, and personal issues in the qualitative research process. This study uses a descriptive exploratory method through written tests, interviews and field notes. According to Arikunto (2006) that exploratory research is research that aims to explore broadly and deeply about the causes or things that influence the occurrence of something. The subjects used in this study were 28 students of Asmi 033 Elementary School in Bandung. The instrument used in this study was a written description test that referred to the syllabus of mathematics learning in 4th grade elementary school.

Data collection is carried out as follows (1) Students are asked to answer the test questions about the rounding of the measurement results of the length and weight of the closest unit, (2) student workmanship in the form of scribbles in the form of supporting data written test results, (3) researchers take some answers from students who have difficulty being interviewed.

Data analysis conducted in this study was carried out in two stages. (1) identifying and grouping students 'mistakes in answering questions, (2) Further analyzing

the types of students' mistakes based on Cooney's theory.

RESULT

The difficulty of students in solving math problems can be suspected from mistakes in working on it. In this activity, the writer uses a written test in the form of a story that can serve to track the thinking power or reasoning of students in organizing, interpreting, connecting the notions of the child.

Muhibbin (1997) explained that, a matter of story in the Big Indonesian Dictionary is defined as what requires answers and so on, questions in the count and so on or things to be solved or problems. Meanwhile according to Mark John I. Et. Al (1985) story is interpreted as a narrative that illustrates how a thing (event, event, etc.) or essay that tells the action, experience, or suffering of a person, event and so on either actually happened or was fiction.

The topic used is about rounding the results of measurements of length and weight of the closest unit. Problems raised in the problem consist of routine problems with a given limit of resolution with moderate difficulty.

The following are examples of wrong answers made by students. After being identified according to the type of error, then identified according to difficulties suspected to be the cause or source of the occurrence of errors in the form of difficulties in understanding or using

symbols, using appropriate processes, mastering concepts and prerequisites, using language, applying relevant rules, accuracy, calculations or computing , remembering, understanding the purpose of the problem, understanding the decision, understanding the facts, linking concepts to facts.
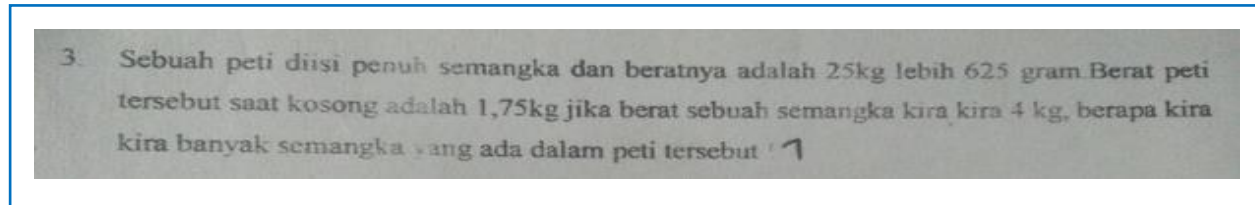

Figure 1. Picture of rounding weight measurement results

Overall, various forms of errors will be made by students when answering questions about rounding the weight measurement results.

Student Difficulties in Using Concepts

The first difficulty is related to the use of concepts, such difficulties are students not paying attention to the unit of weight, they do not include the unit, this is motivated by the inability of students to express the meaning of the terms that represent the concept of weight competition. In addition, students also have difficulty determining what is known in the problem, determining what is asked in the problem, making mathematical models (mathematical sentences), as well as doing computation (calculation, and interpreting the answers of the model to the original problem).
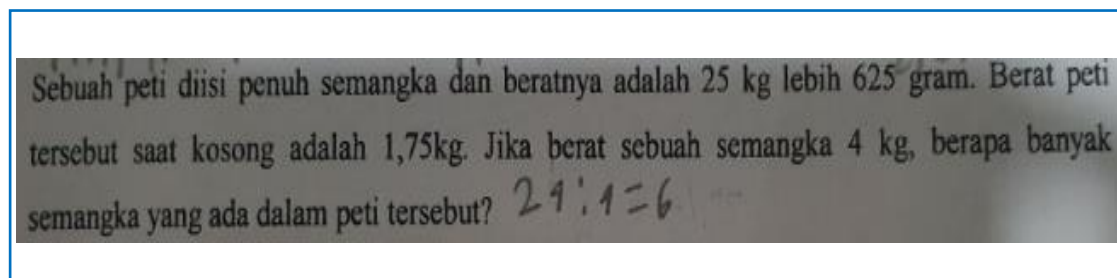

Figure 2. Picture of students having difficulty listing the weight unit

Interviews conducted with SAN found that students have not been able to write mathematical sentences correctly. This was supported by the results of the interview as follows:

Peneliti : *bagaimana pekerjaanmu nomor 3?*
Siswa SAN : *6 semangka bu*
Peneliti : *dari mana SAN? Bisa kamu jelaskan? Ini 24:4 darimana?*

Siswa SAN : *24 kan berat peti yang ada semangkanya dikurangi berat peti kosong. Terus hasilnya dibagi 4 kan berat semangka, jadi isinya 6*
Peneliti : *kalau berat itu satuannya apa ya?*
Siswa SAN : *mmm, kilogram bu.*
Peneliti : *mengapa ini satuan beratnya tidak dicantumkan*
Siswa SAN : *lupa bu…*
Peneliti : *baik...*

Based on the above data it can be concluded that students' mathematical mastery is still below the average. This is possible because students have not been able to explain or define a mathematical concept with their own language and can apply mathematical concepts in daily life.

The next difficulty is related to the mistake of students in completing the decimal number reduction operation using the downward order. This is motivated because students do not master the concept of prerequisite material regarding the concept of arithmetic decimal operations.
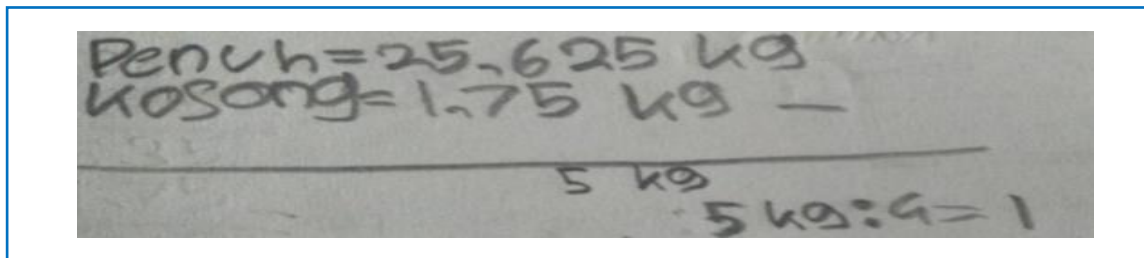

Figure 3. Picture of students mistakenly completing the decimal number counting operation.

This was supported by the results of the interview as follows:

Peneliti : Coba sekarang perhatikan jawabanmu. Kamu menjawab bila berat peti penuh dikurangi berat peti kosong hasilnya 5 kg, benar?
Siswa AA : Iya bu benar.
Peneliti : berat peti terisi penuh 25 kg lebih 625 gram dikurangi 1,75 kg. Agar kedua bilangan tersebut bisa dikurangi, apa yang harus kita lakukan?
Siswa AA : yang gram-nya diubah dulu jadi kilogram kan bu, kaya yang aku kerjain
Peneliti : baik, jadi berapa berat peti penuhnya?
Siswa AA : 25,625 kg bu.
Peneliti : lalu, coba kita perhatikan lagi apa benar penulisan angka satunya di bawah angka 2 seperti ini?
Siswa AA : mmmmmm, eh saya lupa bu, seharusnya angka 1 di

bawah angka 5 bu dan tanda komanya sejajar.

To be able to understand and solve rounding length and weight measurement results, students must have the prerequisite conceptual abilities, one of which is to recall the standard units of length and the relationships between them, completing arithmetic operations and daily problems involving long units.

Student Difficulties in Using Principles

The second difficulty is related to the use of principles, among them the difficulty is according to Cooney that students are already able to state a principle but they cannot express its meaning, resulting in them not being able to apply the principle.
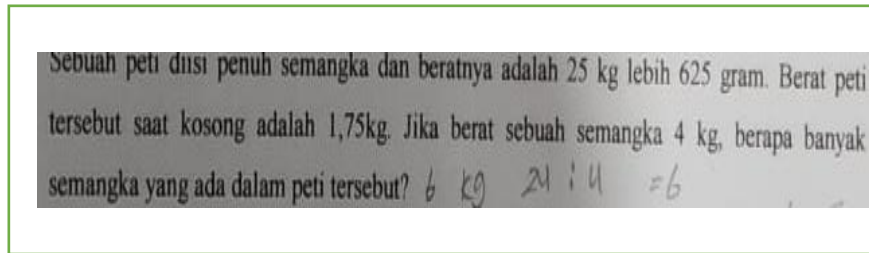
> Sebuah peti diisi penuh semangka dan beratnya adalah 25 kg lebih 625 gram. Berat peti tersebut saat kosong adalah 1,75kg. Jika berat sebuah semangka 4 kg, berapa banyak semangka yang ada dalam peti tersebut? 6 kg 24 : 4 = 6

Figure 4. Picture of difficulty of students in concluding answers

Based on the results of interviews conducted with NA, it is found that students have difficulty in expressing the meaning of the questions that have been presented so that they are unable to infer the final answer.

Peneliti	*: coba perhatikan, ini jawaban kamu banyak semangka yang ada dalam peti adalah 6 kg?*
Siswa NA	*: iya bu, kan pertama ini dikurangu dulu ini, terus hasilnya dibagi ini! (Sambil menunjuk ke berat peti berisi penuh, berat peti kosong dan berat sebuah semangka)*
Peneliti	*: kenapa jadi kilogram?*
Siswa NA	*: oh harusnya buah ya bu, kirain tetep kilogram.*

Student Difficulties in Resolving Verbal Problems

The third difficulty is in solving verbal problems that is the difficulty of students in interpreting the form of questions that have been presented, students also feel confused with the existing form of questions. Students are also unable to determine what is known in the problem, determine what is asked in the problem, make a mathematical model (mathematical sentences), and do the computation (calculation, and interpret the model's answers to the original problem). This is motivated by the ability of students to digest sentences about the story into mathematical sentences that are still low. This difficulty is motivated by the inability of students to use concepts and principles in solving these problems, resulting in students becoming confused about how to do the problem.
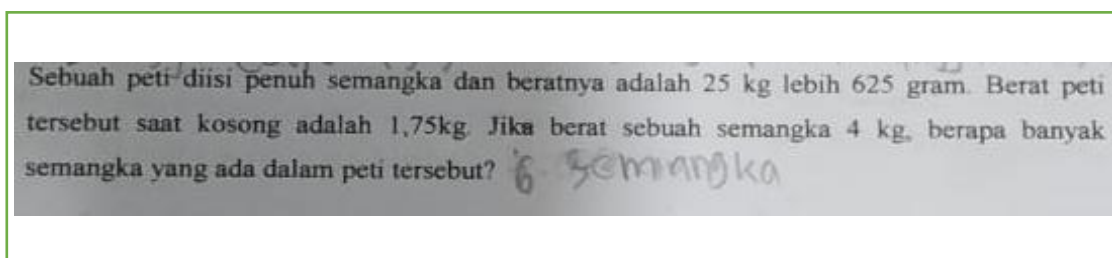

> Sebuah peti diisi penuh semangka dan beratnya adalah 25 kg lebih 625 gram. Berat peti tersebut saat kosong adalah 1,75kg. Jika berat sebuah semangka 4 kg, berapa banyak semangka yang ada dalam peti tersebut? 6 semangka

Figure5. Picture of students have difficulty determining what is known in the problem, determine what is asked in the problem, and make a mathematical model

This was supported by the results of the interview as follows:

Peneliti : *bagaimana jawabanmu nomor 3?*
Siswa QDM : *6 semangka bu*
Peneliti : *dari mana QDM? Bisa kamu jelaskan?*

Siswa QDM : *lupa lagi aku bu, tapi isinya 6*

CONCLUSION

Difficulties in learning mathematics experienced by students in the discussion of rounding the results of measurements of length and weight of the closest unit are due to the ability of students to digest sentences about story into mathematical sentences is still low. But there are also those that are possible because the prerequisites are lacking, especially in calculating decimal numbers. To be able to understand the concept of rounding the length and weight measurement results, students must have the following prerequisite concept abilities:

1. Recall the standard length units and the relationships between them.
2. Complete the arithmetic operations and daily problems involving units of length.
3. Complete rounding and estimation of the length measurement results to the nearest unit.
4. Recall the standard unit of weight and the relationship between them.
5. Complete daily arithmetic operations and problems involving units of weight.
6. Complete rounding and estimation of the weight measurement results to the nearest unit.
7. the ability to understand the concept of addition, the concept of multiplication, the concept of multiplying two numbers by stacking.

REFERENCES

Ahmadi, A, &Supriono, Widodo (2004). *Psikologi Belajar*. Jakarta: Rineka Cipta

Arikunto, S. (2006). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta.

Creswell, J.W (2015). *Penelitian Kualitatif & Desain Riset*. Yogyakarta: Pustaka Belajar.

Kemendikbud. (2013). *Materi Pelatihan Guru Implementasi Kurikulum 2013*. Jakarta: Kementerian Pendidikan dan Kebudayaan.

Khalid, M., & Suyati (2004). *Pelajaran Matematika: Penekanan pada Berhitung 4A untuk Sekolah Dasar Kelas IV Semester 1*. Jakarta; Erlangga

Lidinillah, D.A.M. (2008). *Strategi Pembelajaran Pemecahan Masalah di Sekolah Dasar*. Jurnal Pendidikan Dasar, 1(10), 67-77

Sabri, M. Aliyusuf (1995). *Psikologi Pendidikan*. Jakarta: CV. Pedoman Ilmu Jaya.

Mark John I. Et. Al. (1985).*Metode Pemgajaran Matematika untuk Sekolah Dasar, Terjemahan Bambang Sumantri*. Surabaya: Erlangga.

Masroza, Fitria. 2013. *Prevalensi Anak Berkesulitan Belajar Di Sekolah Dasar Se Kecamatan Pauh Padang.* Online: http://download.portalgaruda.org/article.php?article=24454&val=1496.

Muhibbin Syah. (1997). *Psikologi Pendidikan dengan Pendekatan Baru.* Bandung: PT.Remaja Rosdakarya, 1997

Radatz, H. (1971). *Error Analysis in Mathematics Education.* Journal for Research in Mathematics Education,163-172

Shadiq, F (2014). *Pembelajaran Matematika Cara Meningkatkan Kemampuan BerpikirPeserta didik.* Yogyakarta: Graha Ilmu

Sugiharto. (2003). *Diagnosis Kesulitan Siswa SMU salam Menyelesaikan Soal-Soal Matematika,* Tesis, PPS UNY

Suryadi, D. (2010). *Metapedadidaktik dan Didactical Design Research (DDR): Sintesis hasil pemikiran berdasarkan lesson study. dalam teori, paradigma, prinsip, dan pendekatan pembelajaran MIPA dalam konteks Indonesia.* Bandung: FPMIPA UPI.

Van De Walle, J.A (2007) *Matematika Sekolah Dasar dan Menengah.* Jakarta: Erlangga

Wood, D. R. (2007). *Professional Learning Communities: Teachers Knowledge,* and Knowing. Theory into Practic, 46(4), 281-29

Yusmin, Edy. 2017. *Kesulitan Belajar Siswa Pada Pelajaran Matematika (Rangkuman Dengan Pendekatan Meta-Ethnography).* Jurnal Visi Ilmu Pendidikan.