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Students Difficulties in Solving Fraction Operations in Elementary School

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Abstract. Fractions is one of the competencies that elementary school students must have. One of the materials on fractions is arithmetic operations fraction. The concept of arithmetic operations fraction is important for student because there are many mathematical aspects related to the concepts and operations of fractions that are needed in everyday life. However, it was found that many students had difficulty in learning the concept of arithmetic operations fraction. The purpose of this study is to describe the difficulties experienced by students and the factors that cause students difficulties in completing arithmetic operations fraction for elementary school students. The method used in this research is a literature study. The subject of this research is an article related to students' difficulties in completing arithmetic operations fraction. Data collection using documenting and reviewing articles related to students' difficulties in completing arithmetic operations fraction. Based on this study, it was found that students had difficulty changing and simplifying fractions, difficulties in calculating addition and subtraction of fractions with unequal denominators, difficulties in understanding the concepts of multiplication and division and when solving fraction story problems. Factors that cause these difficulties are external factors from teacher factors, environment and internal factors within students.

Keywords: Student Difficulty, Fractions, Arithmetic Operations, Elementary School.

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INTRODUCTION ~ Mathematics becomes one of the lessons that exist at every level of education, ranging from elementary school to college. This is a proof that mathematics is needed in the development of knowledge and daily life (Hidayah et al., 2020). Suarjana et al. (2018) said mathematics has an important role in various disciplines and can advance human thinking power. Darijani et al. (2015) also mentioned mathematics is a discipline that studies how to think and process logic both quantitatively and qualitatively. Mathematics can improve the ability to think and argue, providing support and development of science and technology (Susanto in Fidayanti et al., 2020). By mastering mathematical concepts from an early age, it is expected that students will get enough provisions to face mathematical materials at the level of further education and can use them in everyday life. (Suaryani et al., 2016).

According to NCTM (Damayanti & Mayangsari, 2017) the standards in school mathematics are numbers and their operations, algebra, geometry, measurement, and statistics. In elementary school one of the materials studied is fractions. Fractions can be interpreted as part of something whole which can be symbolized $\frac{a}{b}$, where a is called the numerator and b is called the denominator and a and b are integers and $b \neq 0$. The form can also be interpreted as a : b (a divided by b) where a not divisible by b (Amallia & Unaenah, 2018). Fractions become a concept that is continuously studied from elementary school to college. This is because the fractional

material is related to other materials such as decimals, comparisons and scales and measurements (Irfan et al., 2018). In addition, in everyday life the concept of fractions is often encountered in various existing problems. Therefore, fractions become an important material to be mastered and understood by students.

In elementary school, the concept of fractions is one of the competencies that elementary school students must be mastered. NCTM (Yang, 2018) states that in the basic of mathematics curriculum, fractions are the core and challenge in mathematics. One of the materials for fractions is fractional count operations. Fraction counting operations are fractional operations which include addition, subtraction, multiplication and division. Subarinah (Suarjana et al., 2018) said that the concept of fractional count operations is important to be mastered by students because there are many mathematical aspects related to the concepts and operations of fractions that are needed in real life. However, in the field, fractional counting operations are considered difficult for students to learn. This is in line with the opinion of Suciati (2018) which mentions the fractional calculation operation material is one of the materials that is quite complicated, so the chance of errors in students is very large.

According to Soleh (Fitri et al., 2020) there are factors that cause students to make mistakes in solving math problems including: (1) students do not catch a concept correctly, (2) students do not catch the meaning of symbols, (3) students do not understand the origin - propose a principle, (4) students are not fluent in using operations or procedures, (5) students are not comprehensive. The errors that can occur to students in the matter of fractional count operations are conceptual errors, procedural errors, and computational errors. According to Supriyanto and Purwaningsih (Rahayuningrum & Setyawan, 2018) there are several errors that often occur in fractional operations, namely: errors in understanding questions, conceptual errors, counting errors, errors using propositions or properties. In where in the research is stated that the percentage of student errors in working on the application of fractional number operations, namely errors made by students in understanding concepts of 46.4%, student errors made in receiving information of 29.6%, and student errors in calculating 70.4 %. The highest percentage of errors is student error in counting. Similarly, the results of research conducted by Fitri et al. (2020) mentions that the errors made by students in fractional counting operations include conceptual, procedural, and technical errors. Conceptual errors include: (1) errors in the sum and subtraction of fractions of the same and unequal numbers. (2) errors in multiplication and fractional division, (3) errors in equalizing denominators using LCM, (4) errors in converting mixed fractions into ordinary fractions. Procedural errors include (1) errors in addition operations and subtractions in fractional count operations. (2) errors in multiplication and division operations in fractional count operations. Technical errors include (1) errors in summing and reducing numerators. (2) errors in counting multiplication. (3) errors in counting when converting mixed fractions into ordinary fractions.

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Errors that occur in completing fractional count operations are caused because students have difficulty in completing the problem of fraction counting operations. Damayanti & Mayangsari (2017) stated that students' learning difficulties in solving problems or solving math problems can be seen from the problem solving errors. The difficulties experienced by students must be known by the teacher for the smooth process of learning and teaching further. When difficulties in learning mathematics are left unattended, there will be adverse effects on students such as students who are less interested in mathematics, are lazy to study mathematics or are bored and bored when learning mathematics. Then mathematics will continue to be a subject he does not like. So that countermeasures are needed so that students who have difficulty learning mathematics can be handled immediately. However, the teacher cannot make decisions in helping students who have learning difficulties if the teacher does not know where the difficulty lies. Therefore, a teacher needs to distinguish the difficulties of students in learning mathematics and also distinguish the causes (Darijani et al., 2015). Students' errors in solving fractional count operations problems can be reduced or lost when students no longer discovery the difficulties of the process of solving them.

Based on the description above, this research would describe the difficulties experienced by students in completing fractional count operations and the factors that cause students difficulties in completing fractional count operations for elementary school students. The title of the research is " Students Difficulties in Solving Fraction Operations in Elementary School".

METHOD

This research aims to describe the difficulties experienced by students and the factors that caused by students difficulties in resolving fractional count operations for elementary school students. The research method is used is a literature study method. The literature study is an activity related to the method of collecting library data, reading and taking notes and processing research materials (Zed, 2014). According to Nazir (2014) literature study is a technique to collect data by conducting a review study of books, literatures, notes and reports that be required to do with the problem being solved. The subject of this research is articles from previous research related to students' difficulties in completing fractional count operations. The articles that the researcher collects are only articles in the 2016-2021 period. From various articles, the researcher has chosen 9 articles which were closely related to students' difficulties in solving fractional count operations and the factors that caused students' difficulties in completing elementary school students' fractional operations. The next step of this research is the researcher do document and review the articles which related to the difficulties experienced by students and the factors caused students' difficulty in resolving fractional count operation in elementary school students.

RESULTS AND DISCUSSION

Students' Difficulty in Resolving Fraction Operations

Problems in learning are problems that can occur in students in learning

activities. Learning difficulties are disorders of both external and internal factors that children have that cause children difficulty in following the learning process normally (Yeni, 2015). Mulyadi (Darijani et al., 2015) also stated that learning difficulties are a certain condition characterized by obstacles in activities to achieve goals, so it requires more effort to be able to overcome them. Learning difficulties can occur because learning activities for individuals do not always run smoothly. There are many factors that affect learning activities. Sometimes students are quick in capturing the material learned, sometimes students find it difficult to receive the material learned. Likewise with the spirit that students have, sometimes students have high spirits, sometimes students can also have low spirits (Amallia & Unaenah, 2018).

This learning difficulty can be experienced by students, including in mathematics. The condition in which students cannot learn normally in the academic field, especially in the field of mathematics, is called learning difficulties in mathematics (Amallia & Unaenah, 2018). Learning difficulties in mathematics are often considered to be common in our society. This is because many students have difficulty in learning mathematics. Difficulties in learning mathematics can occur because the ability of each student in mathematics is different, not all students like mathematics. Difficulty learning mathematics itself according to Darijani et al. (2015) is a condition in learning which is characterized by the presence of certain obstacles in achieving mathematics learning outcomes in accordance with the potential or abilities possessed by students. From this statement, the difficulty in learning mathematics occurs because of the obstacles in the learning process for students however this is certainly unfortune if it is let it be.

One of the difficulties in learning mathematics experienced by students is the difficulty in completing fractional count operations. These difficulties inhibit students in understanding the concept of fractional counting operations. Based on the results of the analysis the researcher has been analyzed, it has been conducted on nine articles related to students' difficulties in completing fractional counting operations, the difficulties that are arisen in completing fractional counting operations are:

Difficulty converting and simplifying fractions

Based on the results of the research, it has been developed in four articles which stated that students had difficulty changing or simplifying fractions. Students find it difficult because they do not understand how to simplify fractions into simple fractions. Students who have difficulty simplifying fractions certainly have an impact on fractional count operations including addition, subtraction, multiplication and division operations. When students cannot change or simplify fractions, the result of calculating two numbers will be wrong. Likewise, according to Wu (Rohmah, 2019) not clearly defined and interpreted fractions will cause confusion in understanding ratios, proportions, or percent. This proves that mathematical concepts are ordered, stratified and continuous. This means that the material has been given to students is the basic

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concepts which are the foundation for the distribution of further concepts. The success of mastering early mathematical concepts in students opens the way in the delivery of further mathematical concepts so that students will find it easier to understand mathematical concepts in subsequent materials (Qadarsih, 2017). When students have not mastered a mathematical concept, students will have difficulty in learning further mathematical concepts.

Difficulty calculating addition and subtraction of fractions with unequal denominators

Difficulty in calculating addition and subtraction of fractions, especially with unequal denominators, is a difficulty that is often experienced by students. Based on the results of the research, the researcher has found six articles which stated that in addition and subtraction operations with unequal denominators, students often had difficulties in adding and subtracting of fraction. Students do not equate the denominators of the two fractions but directly add or subtract the numerators of the fractions. This is caused of students do not understand how to equate denominators in fractions. In equating the denominators, students have difficulty in finding the LCM of two fractional numbers to get the smallest multiple of the two fractions. The difficulty in finding the the least common multiple (LCM) is caused by students who do not understand the the least common multiple (LCM).

This is in line with Suciati's research (2018) which suggests that students better understand addition and subtraction operations if the denominators of the fractions are the same as compared to fractions with different denominators. This is caused by addition and subtraction with the denominator are the same way to solve the problem, because the students directly perform addition or subtraction operations on the numerator without looking at the denominator. In contrast to solving fractions with different denominators, when performing addition or subtraction operations, you must equalize the denominator by finding the LCM of the two fractions' denominator values. Therefore, students still need to learn about the concepts of addition and subtraction of fractions, both using the same denominator and different denominators. (Rohmah, 2019) mentions the need to use manipulation (concrete or virtual) and using multiple representations of fractions is considered important in studying fractions, especially fractional operations. This is because abstract mathematical concepts are difficult for students to imagine (Ermayani et al., 2019).

Difficulty in understanding the concept of multiplication and division

Based on the results of the research, there were two articles that mentioned the difficulties of students in understanding the concept of multiplication and division of fractions. In multiplication material, students do not understand the concept of multiplication of fractions where the concept is the numerator times the numerator and the denominator times the denominator $\frac{a}{b}$x $\frac{c}{d}$=$\frac{axc}{bxd}$. Students tend to use the method of adding fractions to work on multiplication of fractions. Therefore, students immediately add the numerator with the numerator and the denominator with the denominator. Then, students also have difficulty in the

concept of dividing fractions. Students do not understand the concept of division which can be converted into multiplication $\frac{a}{b}:\frac{c}{d}=\frac{axd}{bxc}$. Students tend to forget the concept of converting division into fractional operations.

The difficulty of multiplication and division material is in line with research conducted by Suciati (2018) which states that in multiplication operations students do not understand the operations used, thus adding up the value of the numerator and adding up the value of the denominator. Likewise with the arithmetic division operation students do not understand the concept so that an error occurs in the calculation process. When compared, students have more difficulty in the concept of division than the concept of multiplication. This is because in the concept of division students must first convert to the concept of multiplication and this is often forgotten by students. So, in the learning process the teachers are able to train students by often giving questions with the purpose of students always remember the concepts of multiplication and division of fractions (Suaryani et al., 2016).

Difficulty when solving fraction story problems

The results has showed that solving fractions story problems was a difficulty experienced by elementary school students. The reason is that students do not understand the story questions of counting operations, addition and subtraction, which are presented in the form of story questions. In addition, students have difficulty in converting story questions into mathematical modeling. So students find it difficult to complete. In this case, students do not understand how to do story problems because in it there are some steps in solving story problems. In which, this mathematical modeling includes planning for completion in solving story problems by writing down the known, asked, and completed parts. Because students have not been able to write down mathematical modeling systematically, it seems that students in working on story problems only rewrite the story questions.

This is in line with the research results of Murtiyasa & Wulandari (2020) where in their research mentions the difficulties of students when solving fraction story problems, namely: First, students do not understand the meaning of the questions. Second, students do not understand the problem so they can not determine the operation used to solve the problem and students do not know the formula or operation used. Third, students have difficulty doing calculations. Fourth, students are accustomed to directly writing the final answer. Difficulty in solving fraction story problems indicates that students' problem solving abilities are not optimal. Where with problem solving skills students can understand the problem by writing down what is known and asked, then plan how to solve it, carry out the plans that have been made, and re-examine problem solving. This is in line with the four stages in problem solving proposed by Polya (Irfan et al., 2018), namely: (1) Understanding the problem; (2) Develop a problem-solving plan; (3) Implement problem solving plans; and (4) Re-checking the problem solving.

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Factors Causing Students' Difficulty Completing Fraction Operations

The difficulty of students in solving fractional count operations must have a contributing factor. Based on the results of the study, there are external and internal factors that cause students' difficulties in completing fractional count operations. The factors that cause students are as follows:

External factors,

a. Teacher factor; Teacher factors can cause difficulties for students. This can happen because the teacher in giving the material is too fast so that students do not understand, the lack of practice questions given by the teacher triggers the low student learning outcomes. And there is no use of media or props.
b. Inadequate infrastructure factor
c. Environmental factors, which include unfavorable classroom conditions, unfavorable living or learning places, and unsupportive peers are factors that cause student difficulties in learning.

Internal factors

a. Factors of students' initial knowledge; Students' difficulties in completing fractional count operations can be caused by a lack of students' initial knowledge. Lack of prior knowledge of students causes students to have difficulty solving fractional count operations, students cannot add or subtract fractions with unequal denominators, students cannot simplify fractions.
b. Factors of student concept understanding; Difficulties in completing arithmetic operations are also caused by the lack of students' understanding of the material.
c. Factors of interest and motivation of students; The difficulty of students in completing arithmetic operations can be caused by a lack of interest and motivation of students, for example, students do not like mathematics or students who are lazy to learn mathematics.
d. Physical condition factor; Students' physical condition also affects students' difficulties in completing fractional count operations. In which a students are in bad condition or sick, they could not study the lesson well.

So it can be concluded that students' difficulties in completing fractional count operations can be caused by many factors. Not only internal factors within students, but also some factors which influence their internal factors. This is in line with what was stated (Yeni, 2015) that there are many factors that influence children's learning difficulties in mathematics, such as lack of interest and motivation in mathematics, inappropriate learning in teaching mathematics, and lack of support from their parents and the surrounding environment in learning mathematics. Mathematics lessons for students are due to lack of understanding of parents and the environment towards mathematics. The variety of factors that cause learning difficulties in students, so that efforts to overcome learning difficulties must also be adjusted to the factors that cause them (Darijani et al., 2015). Teachers can choose appropriate learning strategies according to students' conditions, take a personal approach to students who lack learning motivation, create fun learning, use learning media so that students can be

interested in participating in learning. So that students no longer have difficulty in solving fractional count operations.

CONCLUSION

Learning difficulties can be experienced by students in math lessons, including in fractional calculation operation materials. This difficulty hinders students from achieving desired learning outcomes. Where the difficulties experienced by students in completing fractional calculation operations are difficulty changing and simplifying fractions, difficulty doing calculations of fraction addition and subtraction with unequal denominators, difficulty in understanding the concepts of multiplication and division, and difficulty when solving fractional story problems. The difficulties experienced by students in completing this fractional count operation are caused by external factors as well as internal factors. External factors that cause students to have difficulty in completing fractional calculation operations are teacher factors, facilities and infrastructure, and environmental factors. As for the internal factors that cause students to have difficulty in completing fractional count operations are the student's initial knowledge factor, the student's concept understanding factor, the student's interest and motivation factors and the student's physical condition factor. Teachers can choose the right learning strategy according to student conditions, take a personal approach to students who lack learning motivation, create fun learning, use learning media so that students can be interested in following learning. So that students no longer have difficulty in completing the problem of fractional count operations.

REFERENCES

Amallia, N., & Unaenah, E. (2018). Analisis Kesulitan Belajar Matematika Pada Siswa Kelas III Sekolah Dasar. *Attadib Journal Of Elementary Education*, 3(2), 123–133.

Damayanti, N. W., & Mayangsari, S. N. (2017). Analisis Kesalahan Siswa dalam Pemahaman Konsep Operasi Hitung pada Pecahan. *Edutic - Scientific Journal of Informatics Education*, 4(1), 1–7.

Darijani, N. N. Y., Meter, I. G., & Negara, I. Gst. A. O. (2015). Analisis Kesulitan-Kesulitan Belajar Matematika Siswa Kelas V dalam Implementasi Kurikulum 2013 di SD Piloting Se-Kabupaten Gianyar Tahun Pelajaran 2014/2015. *e-Journal PGSD Universitas Pendidikan Ganesha*, 3(1).

Ermayani, L., Suarjana, I. M., & Parmiti, D. P. (2019). Analisis Kemampuan Siswa dalam Menyelesaikan Soal Pecahan Sederhana. *Jurnal Pedagogi dan Pembelajaran*, 1(1), 9–17.

Fidayanti, M., Shodiqin, A., & Yp, S. (2020). Analisis Kesulitan dalam Pembelajaran Matematika Materi Pecahan. *Journal for Lesson and Learning Studies*, 3(1), 88–96.

Fitri, Hamdani, & Kresnadi, H. (2020). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Operasi Hitung Pecahan Kelas V Sekolah Dasar. *Jurnal Pendidikan dan Pembelajaran Khatulistiwa*, 9(12), 1–8.

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p-ISSN: 2829-0976

Hidayah, N., Budiman, A., & Cahyadi, F. (2020). Analisis Kesulitan Siswa Kelas V Dalam Memecahkan Masalah Matematika Pada Materi Operasi Hitung Pecahan. *Thinking Skills and Creativity Journal*, 3(1), 46–51.

Irfan, A., Juniati, D., & Lukito, A. (2018). Profil Pemecahan Masalah Pecahan Siswa SD Berdasarkan Adversity Quotient. *APOTEMA : Jurnal Program Studi Pendidikan Matematika*, 4(2), 1–9.

Murtiyasa, B., & Wulandari, V. (2020). Analisis Kesalahan Siswa Materi Bilangan Pecahan Berdasarkan Teori Newman. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(3), 713–726.

Nazir, M. (2014). *Metode Penelitian*. Bogor: Ghalia Indonesia.

Qadarsih, N. D. (2017). Pengaruh Kebiasaan Pikiran (Habits Of Mind) terhadap Penguasaan Konsep Matematika. *SAP (Susunan Artikel Pendidikan*), 2(2), 181–185.

Rahayuningrum, A., & Setyawan, F. (2018). Analisis Kesalahan Siswa Kelas V SD Dalam Menyelesaikan Masalah Sehari-Hari Yang Berkaitan Dengan Operasi Hitung Pecahan. *Seminar Nasional Pendidikan Matematika Ahmad Dahlan*.

Rohmah, S. K. (2019). Analisis Learning Obstacles Siswa Pada Materi Pecahan Kelas IV Sekolah Dasar. *al-Aulad: Journal of Islamic Primary Education*, 2(1).

Suarjana, I. M., Parmiti, D. P., & Safitri, P. E. A. (2018). Analisis Kesulitan Siswa dalam Menyelesaikan Operasi Hitung Pecahan Siswa Sekolah Dasar. *International Journal of Elementary Education*, 2(2), 144–155.

Suaryani, N. W., Suarjana, I., & Suartama, I. K. (2016). Analisis Kemampuan Siswa dalam Menyelesaikan Operasi Hitung Pecahan pada Siswa Kelas V. *e-Journal PGSD Universitas Pendidikan Ganesha*, 4(1), 1–10.

Suciati, I. (2018). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita pada Operasi Hitung Pecahan Siswa Kelas V SDN Pengawu. *Jurnal Ilmiah Pendidikan Matematika*, 1(1), 17–29.

Yang, D.-C. (2018). Study of fractions in elementary mathematics textbooks from Finland and Taiwan. *Educational Studies*, 44(2), 190–211.

Yeni, E. M. (2015). Kesulitan Belajar Matematika di Sekolah Dasar. *Jurnal Pendidikan Dasar*, 2(2), 1–10.

Zed, M. (2014). *Metode Penelitian Kepustakaan*. Yayasan Pustaka Obor Indonesia