Analysis of Conceptual, Procedural and Technical Errors of Mts Negeri 01 Lhokseumawe Students on Social Arithmetic Material

Mahdalena[*1]; Aldi Kusuma[2]; Devina Roza[3] ; Putri Arza[4]; Salsabila Azallia[5]; Shela Ersinta Sinaga[6]
[1,2,3,4,5,6] Institut Agama Islam Negeri Lhokseumawe,
Prodi Tadris Matematika, Fakultas Tarbiyah dan Ilmu Keguruan,
Institut Agama Islam Negeri Lhokseumawe, Kota Lhokseumawe, Aceh, Indonesia
mahdalena@iainlhokseumawe.ac.id[*1], kusumaaldi81@gmail.com[2],
devinaroza20@gmail.com[3], putriarza91@gmail.com[4],
salsabilaazallia26@gmail.com[5], shela2814@gmail.com[6]

Abstract

Analyzing students' conceptual, procedural, and technical errors on social arithmetic materials is very important to understand and improve learning outcomes. This study aims to identify the types of student errors and the level of student errors when dealing with mathematical problems related to social arithmetic material. This research method uses a qualitative research method with a descriptive approach. The subjects of this study were all students of class VII Usaid bin Al-Khudhair at MTs Negeri 1 Lhokseumawe. The data collection technique used in this study is data in the form of a written test description of 10 questions. The results of the study according to data from students at MTs Negeri 01 Lhokseumawe on social arithmetic material revealed an average score of 60.833, with the highest score at 90 and the lowest at 0, indicating overall low performance. Further analysis identified a total of 13 errors, consisting of 6 technical errors (46%), 6 procedural errors (46%), and 1 conceptual error (8%).

Keywords: *Error Analysis; Social Arithmetic; Mathematics Learning.*

Abstrak

Analisis kesalahan konseptual, prosedural, dan teknis siswa pada materi aritmatika sosial sangat penting untuk memahami dan meningkatkan hasil pembelajaran. Penelitian ini bertujuan untuk mengidentifikasi jenis kesalahan siswa dan tingkat kesalahan siswa ketika menangani masalah matematika yang terkait dengan materi aritmatika sosial. Metode penelitian ini menggunakan metode penelitian kualitatif dengan pendekatan deskriptif. Subjek penelitian ini adalah seluruh siswa kelas VII Usaid bin Al-Khudhair di MTs Negeri 01 Lhokseumawe. Teknik pengumpulan data yang digunakan pada penelitian ini adalah data berupa test tertulis uraian sebanyak 10 butir soal. Hasil penelitian menurut data dari siswa di MTs N 1 Lhokseumawe pada materi aritmatika sosial mengungkapkan skor rata-rata 60,833, dengan skor tertinggi di 90 dan terendah di 0, menunjukkan kinerja rendah secara keseluruhan. Analisis selanjutnya mengidentifikasi total 13 kesalahan, terdiri dari 6 kesalahan teknis (46%), 6 kesalahan prosedural (46%), dan 1 kesalahan konseptual (8%).

Kata Kunci: Analisis Kesalahan; Aritmatika Sosial; Pembelajaran Matematika.

*Correspondence:
Email: mahdalena@iainlhokseumawe.ac.id

INTRODUCTION

Mathematics is one of the subjects that has an important role in solving life problems. Mathematics is recommended for elementary school students, junior high school students, and college students. According to Fitriatien (2019), one of the things that supports the development of education is that mathematics is very important in schools so that students can calculate, reason, and solve various sciences in daily life.

Many people think that mathematics in general is difficult and is one of the subjects that students hate. This is supported by Widayanti and Yunianta (2016) who stated that mathematics in general is a difficult subject and a class that is not suitable for children. Looking at the student's view, often students encounter difficulties that can cause errors when solving mathematical problems, as reported by Subaidah et al. (2017) stating that students' difficulties are caused by students' lack of ability to translate everyday texts into mathematics. In addition, students' difficulties in learning mathematics are also caused by conceptual errors. This is in accordance with the opinion of Tall & Razali in Kahar & Layn (2017).

Similarly, many students experience difficulties in solving mathematical problems because they have not mastered mathematical skills. Jumlamiatun et al. (2020) found that the factors causing difficulties in solving problems include students' confusion when determining mathematical models, students' lack of precision, and hasty attitudes when solving social arithmetic problems.

Many students make mistakes and errors when solving social arithmetic, so there is a need for error education in solving problems. According to Rahmania & Rahmawati (2016) stated that error analysis is an effort to investigate a case of diversion that causes mistakes in the answers written by students. If students make turns or deviations in solving problems, it is necessary to analyze errors using certain stages so that they can produce mathematical problems and find out the location of the resilience of the level of influence of the difficulty factor.

External factors and internal factors can affect students' mistakes when separating math problems. As has been stated by Jamal (2019) said that internal and external factors experienced by students can cause difficulties or obstacles to

learning, internal factors are factors in students, for example talent, health, motivation, interests, thoughts, and so on. Meanwhile, external factors from students are external factors of students, for example, family conditions, school environment, and community environment. Low external and internal factors cause a decrease in student learning outcomes in mathematics by, among others, being unable and students in solving these error problems are known by teachers during the process of learning activities in the classroom and from test results.

Students' mistakes when doing math problems need to be looked for and identified factors that cause students to make mistakes. The purpose of the identification is to find out the type of error when solving math problems. The results of Reni & Marhan's (2019) research show that errors are caused by students who cannot read symbols, charts, cannot solve problems properly, are wrong in the solution steps and cannot be published or explained properly. For this reason, an explanation is needed, with an explanation from error analysis can improve student teaching and learning activities when solving math problems. Furthermore, in this study, the factors causing errors were reviewed from the cognitive aspect of students, namely lack of understanding of mathematical concepts related to social arithmetic materials. The cause of this student's mistake can be traced through test answers and interviews.

Social arithmetic is an important mathematical material in the improvement of science because it is used in daily life in the field of economics. This material discusses profit, loss, discount, Bruto, Tara, Netto, interest, and taxes. In solving math problems, it takes a whole in thinking. Although this social arithmetic is not so difficult, but for students to solve problems, critical skills are needed, so students who make mistakes when solving social math problems because many entrepreneurs have just memorized.

Here is an in-depth analysis of errors in social arithmetic material:

Table 1. Analysis of Student Errors in Social Arithmetic Material

Types of Errors	Categories of Errors	Examples
Conceptual	Students do not understand mathematical concepts related to problems, such as mathematical operations (addition, subtraction, multiplication, division), concepts of time, distance, and so on.	Students are wrong in calculating the total purchase because they do not understand the concept of addition.
Procedural	Students do not understand the steps that must be taken to solve the problem. This mistake often occurs because students do not read the questions carefully, so they do not understand the information provided and the steps to be taken.	Students are wrong in the selection of formulas.
Technical	Students make mistakes in writing numbers, counting, or using mathematical symbols. This error can be caused by a student's lack of rigor or because they have not mastered basic math techniques well.	Students are wrong in writing semicolons in decimal numbers.

RESEARCH METHODS

This research method uses a qualitative research method with a descriptive approach. This approach involves examining independent variables separately, without comparison or association with other variables, thus maintaining the independence of the monitored variables. The main objective of this study is to identify the types of student errors and the level of student errors when dealing with mathematical problems related to social arithmetic materials.

The subjects of this study are all grade VII students at Usaid bin Al-Khudhair at MTs Negeri 01 Lhokseumawe. The data collection technique used in this study is a test technique. The test consists of a series of questions aimed at assessing an individual's cognitive abilities, aptitudes, and competencies in the research. In this study, the test was carried out in the form of 10 description test questions.

In this study, the classification of student errors used is student error according to Kiat (2005) there are three categories, namely (1) conceptual errors, namely errors that arise when students lack understanding of the basic concepts involved in a given problem, or when errors arise from students' failure to distinguish related relationships in the problem; (2) procedural errors, i.e. errors that arise from the inability of students to perform manipulations or algorithms, even after understanding the underlying concepts of the problem; (3) technical errors, i.e. errors that stem from one of the shortcomings of mathematical knowledge related to other topics or errors from negligence.

RESULTS AND DISCUSSION

The results of the processing obtained from 30 students consisting of 6 groups, each group of 5 people from MTs Negeri 01 Lhokseumawe on social arithmetic material showed that the average student score was 60.833 with the highest score of 90 and the lowest score of 0. This clearly shows that the overall results are still relatively low. From these results, it certainly shows that there are still many students who have difficulty answering questions correctly, there are still many mistakes made by students. The total number of errors made by students based on the results of data processing is 13 errors. Among them, there were 6 technical errors with an error percentage of 46%, 6 procedural errors with an error percentage of 46% and 1 conceptual error with a percentage of 8%. A recap of mathematical errors made by students in social arithmetic material can be seen in Figure 1 below:

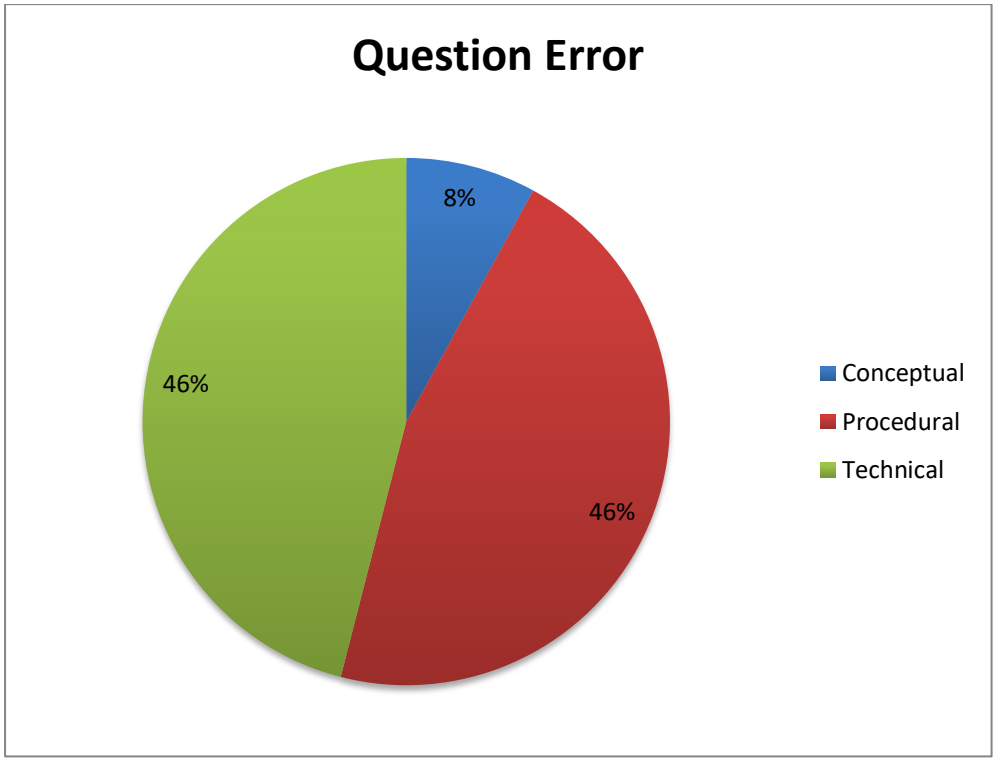

Figure 1. Students' Mistakes

From the picture above, you can see the percentage of errors made by students in solving social arithmetic questions. The mistakes made by students are as follows: The mistakes made by students are as follows:

Technical Errors

Technical errors that are, refer to errors due to lack of knowledge of mathematical content in other topics or errors due to carelessness. Students do not understand the meaning of the question content, so they make mistakes in determining the technique that should be used. The most technical errors were made by students with an error percentage of 46% with a total of 6 errors, so it can be concluded that the level of technical errors is in the "High" category. The following is presented Table 2 which shows the technical mistakes made by students in each question item.

Table 2. Students Technical Errors

Groups	Technical Errors									
	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10
1	--	--	✓	--	--	--	--	--	--	--
2	✓	--	--	--	--	--	--	--	--	--
3	--	--	✓	--	--	--	--	--	--	--
4	✓	✓	--	--	--	--	--	--	--	--
5	--	--	--	--	✓	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--

Table 2 explains that there are 6 question items that are technical errors made by students. Group 4 is the group that makes the most technical errors, namely 2 questions. Furthermore, in group 6 there were no technical errors.

Procedural Errors

The percentage of procedural errors was 46% with the number of errors found, namely 6 errors out of a total of 13 mistakes made by students, so it can be concluded that the level of procedural errors belongs to the "High" category. Table 3 will show the procedural errors in each question item.

Table 3. Student Procedural Errors

Groups	Procedural Errors									
	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10
1	--	--	--	--	✓	--	--	--	--	✓
2	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	✓	--	--	--	--	--
4	--	--	✓	--	--	--	--	--	--	--
5	--	--	✓	--	--	--	--	--	--	--
6	--	--	--	✓	--	--	--	--	--	--

Based on the Table 3, it can be seen that the total procedural errors made by students are 6 errors that occurred in question items 3, 4, 5 and 10.

Conceptual Errors

Conceptual errors are the least common mistakes made by students with an error percentage of 8%, so it can be concluded that the level of conceptual errors belongs to the category of "Very Low". The number of conceptual mistakes made by students can be seen in Table 4 below.

Table 4. Conceptual Mistakes on Students

Groups	Conceptual Mistakes									
	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10
1	--	--	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--	--	--
4	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	✓
6	--	--	--	--	--	--	--	--	--	--

The results presented in Table 4 stated that there was only 1 conceptual error in students, namely group 5 with question number 10. This is because a problem that contains concepts that require students to state a social arithmetic only consists of 1 question out of 10 questions contained in question number 10.

Based on the analysis of errors that have been presented, the types of student errors and the number of students who did it on each question item can be seen in the figure below:

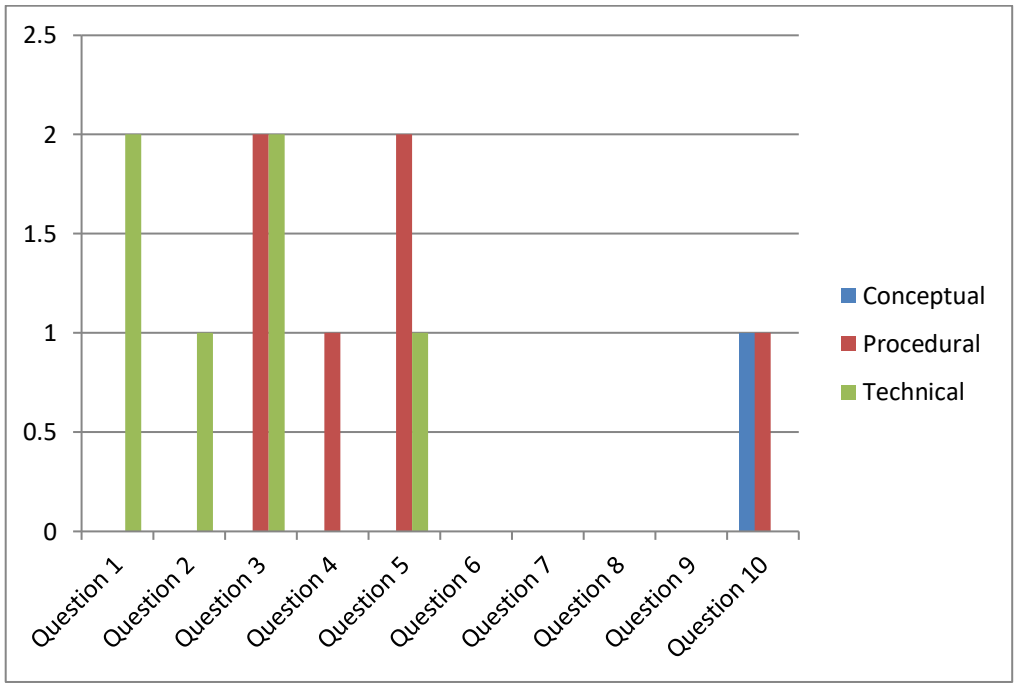

Figure 2. Types of Errors in Each Question Item

Based on the figure above, it can be seen that technical and procedural errors occurred in the students' answers to each question item number 1, 2, 3, 4, 5, and 10, so that it is in line with the percentage of technical and procedural errors, the level of student errors is in the "Same" category. Meanwhile, conceptual errors are the type of mistakes that students make the least, this is clearly illustrated in the graph. Controversial errors occurred in question number 10 only. This is in line with the student error rate which is in the "Very low" category.

Mistakes made by students can be caused by factors that affect student learning. According to Lerner (in Abdurrahman, 2012) explained that various causes of common mistakes made by students in doing mathematical tasks are due to: i) lack of knowledge about symbols, ii) lack of understanding of place values, iii) use of wrong processes, iv) calculation errors, v) unreadable writing. In this study, there are 3 forms of mistakes made by students, namely.

Contextual errors, the factors that cause these errors include: (a) Students do not understand the meaning of the problem, (b) Students are wrong in choosing formulas, and (c) Students cannot apply formulas. As for what students do in conceptual errors based on indicators: (1) Students cannot choose the correct

formula or students forget the formula that must be used. (2) Students are correct in choosing formulas but cannot apply the formula correctly (3) Students are wrong in interpreting terms, concepts and principles or students do not write formulas, theorems, or definitions to answer a problem. This states that the students' mistake can reflect the students' understanding in a mathematical concept that is used to answer the math problem itself.

Procedural errors, the factors that cause procedural errors include: (a) Students do not follow the steps in solving the problem, (b) Students do not practice enough in doing the problem, and (c) Students are unable to solve the problem to a simple stage. As for what students do in conceptual errors based on indicators: (1) The inconsistency of the steps to solve the questions ordered with the steps taken by the students (2) The students cannot solve the questions to the simplest form so that it is necessary to take further steps.

Technical errors, the factors that cause technical errors include (a) Students are not careful in answering questions, (b) Students do not check the results of their work, and (c) Students lack learning and lack of motivation from teachers (Nasrudin, 2017). As for what students do in conceptual errors based on indicators: (1) Students make mistakes in calculating the value of a calculation operation (2) Students make mistakes in their research that there are constants or variables that are missed or errors in moving constants or variables from one step to the next In this study, technical and procedural errors are in the same order, that is, the height done by students. Meanwhile, conceptual errors rank the lowest number of mistakes made by students.

CONCLUSION

Based on the results of the research, it can be concluded that the most common mistakes made by students are technical errors and procedural errors. This shows that students still often make mistakes due to carelessness, such as writing the wrong numbers, not reading the questions carefully, so they cannot determine the right solution steps.

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