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Student Mistakes In Solving SPLDV Story Problems: An Analysis Based On Newman's Procedure

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Abstract*. This study seeks to characterize the categories of errors students make when solving SPLDV word problems using Newman's method. Descriptive qualitative research methods are employed. This study was conducted in class VIII A at SMP Negeri 4 Touluaan during the even semester of the academic year 2021-2022. The research participants were fifteen students. Then, a test comprised of SPLDV story questions was administered to collect data. The test results were then used to select 5 students at random for interviews, based on their distinct errors. The obtained data was analyzed using the following steps: data reduction, data presentation, and conclusion. Most of the class VIIIA students at SMP N 4 Touluaan made reading errors (4.44%), understanding errors (13.33%), transformation errors (26.66%), process skills errors (48.88%), and mnemonic skills errors (68.88%).*

Keywords*: Error analysis, Story problems, Newman's procedure, SPLDV*

Abstrak. Penelitian ini berusaha mengkarakterisasi kategori kesalahan yang dilakukan siswa saat menyelesaikan soal cerita SPLDV menggunakan metode Newman. Metode penelitian kualitatif deskriptif digunakan. Penelitian ini dilaksanakan di kelas VIII A SMP Negeri 4 Touluaan pada semester genap tahun ajaran 2021-2022. Peserta penelitian berjumlah lima belas siswa. Kemudian, tes yang terdiri dari pertanyaan cerita SPLDV diberikan untuk mengumpulkan data. Hasil tes kemudian digunakan untuk memilih 5 siswa secara acak untuk diwawancarai, berdasarkan perbedaan kesalahan mereka. Data yang diperoleh dianalisis dengan langkah-langkah sebagai berikut: reduksi data, penyajian data, dan penarikan kesimpulan. Sebagian besar siswa kelas VIIIA SMP N 4 Touluaan melakukan kesalahan membaca (4,44%), kesalahan memahami (13,33%), kesalahan transformasi (26,66%), kesalahan keterampilan proses (48,88%), dan kesalahan keterampilan mnemonik (68,88%).

Kata kunci: Analisis Kesalahan, Soal Cerita, prosedur Newman, SPLDV

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INTRODUCTION

Education is a process of updating knowledge through the meaning of experience. This process can occur anywhere, such as in the world of ordinary association, or occurs intentionally through an educational institution (Abdur, 2017; Malik, 2017). Education involves supervision from more mature people (Amalia, 2017). Learning is a systematic process or activity that is interactive and communicative between "teacher" educators and students, learning resources, and the environment to create a condition that allows student learning actions to occur (Baharudding, 2021).

Mathematical knowledge is universal, serves as the basis for technological progress, and plays an important role in human intellectual development. Mathematics is compulsory (Dinda, 2018; Triani, 2015). Jhonson and Rising (Grahita, 2014) say that mathematics is structured knowledge, where properties and theories are made deductively based on defined or not defined elements and based on axioms, properties, or theories that have been proven true. In studying mathematics to solve problems, students must be able to relate mathematical concepts (Haryati, 2015; Tia, 2020).

According to Priyanto (2015), most problem-solving in basic mathematics is solved through word problems related to everyday life. Students must be able to understand the content of the questions and know the mathematical objects that must be solved to solve word problems, but many still need help with their work on word problems given by the teacher. According to Suhertin (Grahita, 2014), the causes of mistakes made by students when working on math story problems are because students lack language proficiency. For example, students need help understanding the questions, knowing the meaning of words, concepts, and arithmetic techniques.

Based on interviews conducted with teachers in mathematics for class VIII at SMP N 4 TOULUAAN 2021/2022 on SPLDV material. Information was obtained that the Minimum Completeness Criteria (KKM) in mathematics was 65. Students who achieved KKM were only 40%, while students who did not reach KKM were 60%. SPLDV material contains errors, especially in the form of story questions. Therefore, to solve math word problems, students must have mastered the mathematical concepts taught before. Even so, there are still many students who experience difficulties when solving word problems; this is because they do not understand the SPLDV concept; This error occurred because the student did not understand the meaning of the word problem, so he

made a mistake when recording what was known and asked for. The second mistake was that students needed to be able to convert word problems into mathematical models, and most students made mistakes when solving operational questions, especially those in the form of descriptions.

Errors made by students in solving word problems can be analyzed using Newman's Theory. This error analysis method was first introduced by an Australian mathematics teacher in 1977 (Priyanto, 2015; Siregar, 2018). According to Newman (Haryati, 2015), there are five types of errors made by students in working on math problems, namely (1) reading errors, (2) comprehension errors, and (3) transfer errors (transformation errors). (4) weakness in process skills (errors in process skills) (5) encoding errors (errors in writing answers). The analysis of student errors can help teachers find where students made mistakes in solving word problems, especially in SPLDV material (Kandouw, 2014; Satiti, 2014). Mistakes made by students can be used as an object of consideration for teachers in improving learning outcomes or student achievement (Laswadi, 2015; Rusman, 2016). This article discusses the Analysis of Student Errors in Solving SPLDV Story Problems Based on the Newman Procedure.

METHOD

This study uses a qualitative methodology and descriptive research design. This investigation is explained so the researcher can get an accurate picture and collect all the necessary data. The research subjects were class VIIIA students at SMP N 4 Touluaan, even during the 2021/2022 academic year semester. The instruments in this study were the researchers themselves, written tests in the form of essays, and interview guidelines. Before the tests and interview guidelines were given, they were first tested for the instrument's validity by a mathematician, namely a lecturer majoring in mathematics or a teacher in mathematics for class VIIIA SMP N 4 Touluaan.

Data collection techniques using tests and interviews. The test used in this study was a written test in the form of essay questions on the SPLDV material. The interviews that the researchers conducted in a structured manner included direct questioning and answering with respondents, which led to an error analysis based on Newman's procedure.

To see the percentage of types of errors made by students, the following is a calculation for each given item of story questions, and the results of the calculation of the percentage of errors will be explained in terms of reading errors, understanding errors,

transformation errors, completion process errors, and errors in determining the final answer with using the formula:

$$P = \frac{n}{N} \times 100\%$$

Information :
P = percentage of types of student errors
n = Number of errors for each type of error
N = The Number of possible errors

The data analysis technique used in this study refers to the opinion of Miles and Hubarmon in Sugiono that activities occur together, which include data reduction, data presentation, data verification, and conclusion.

RESULT AND DISCUSSION

Student errors were analyzed using the Newman method. Based on the student responses analysis, student work results were obtained and categorized according to Newman's procedure as reading errors, comprehension errors, transformation errors, processing skill errors, and errors. Final response (coding error).

Table 1. Types of Student Errors

Number	Name	Type Error		
		Problem 1	Problem 2	Problem 3
1	AP	C,E	T,P,E	S
2	AS	B	P,E	P,E
3	CL	E	E	E
4	DM	C,P,E	T,P,E	C,T,P,E
5	GB	R,P,E	T,P,E	T,P,E
6	JS	B	E	E
7	KM	B	B	E
8	LN	C,E	P,E	S
9	MP	C	T,P,E	P,E
10	MT	C,P,E	S	S
11	PL	R,P	T,P,E	T,P,E
12	RP	P,E	T,P,E	T,P,E
13	SA	E	T,P,E	T,P,E
14	TS	P,E	S	S
15	YS	B	B	E

Description:
R : Reading Error
C : Misunderstanding
Q : Transformation Error
Q: Process Skill Error

E : Error Final answer
B : All right
S : Not answered

Table 2. Percentage of Error Types

Problem	Reading Error	Understanding Error	Transformation Error	Processing Skill Error	Writing Final Answer	Not Answering Question
1	2	5	-	6	9	-
2	-	-	7	9	11	2
3	-	1	5	7	11	4
Total	2	6	12	22	31	6
Percentage	4,44%	13,33%	26,66%	48,88%	68,88%	13,33%

Based on Table 2, the percentage of errors made sequentially with the largest to the smallest percentage, namely errors in writing the final answer with a percentage of 68.88%, process skills errors with a percentage of 48.88%, transformation errors at 26.66%, understanding errors 13, 33% is the same as the percentage of students who did not answer questions and made reading errors of 4.44%.

In reading errors, students still experience difficulties. Namely, students cannot read words, symbols, numbers, or keywords in the problem, especially in question 1, where this GB student needed to correct in writing the x variable and instead wrote the y variable, resulting in an error in the next working process. An example of a reading error is a mistake made by GB students when working on question number 1. An example of this error can be seen in the following figure.

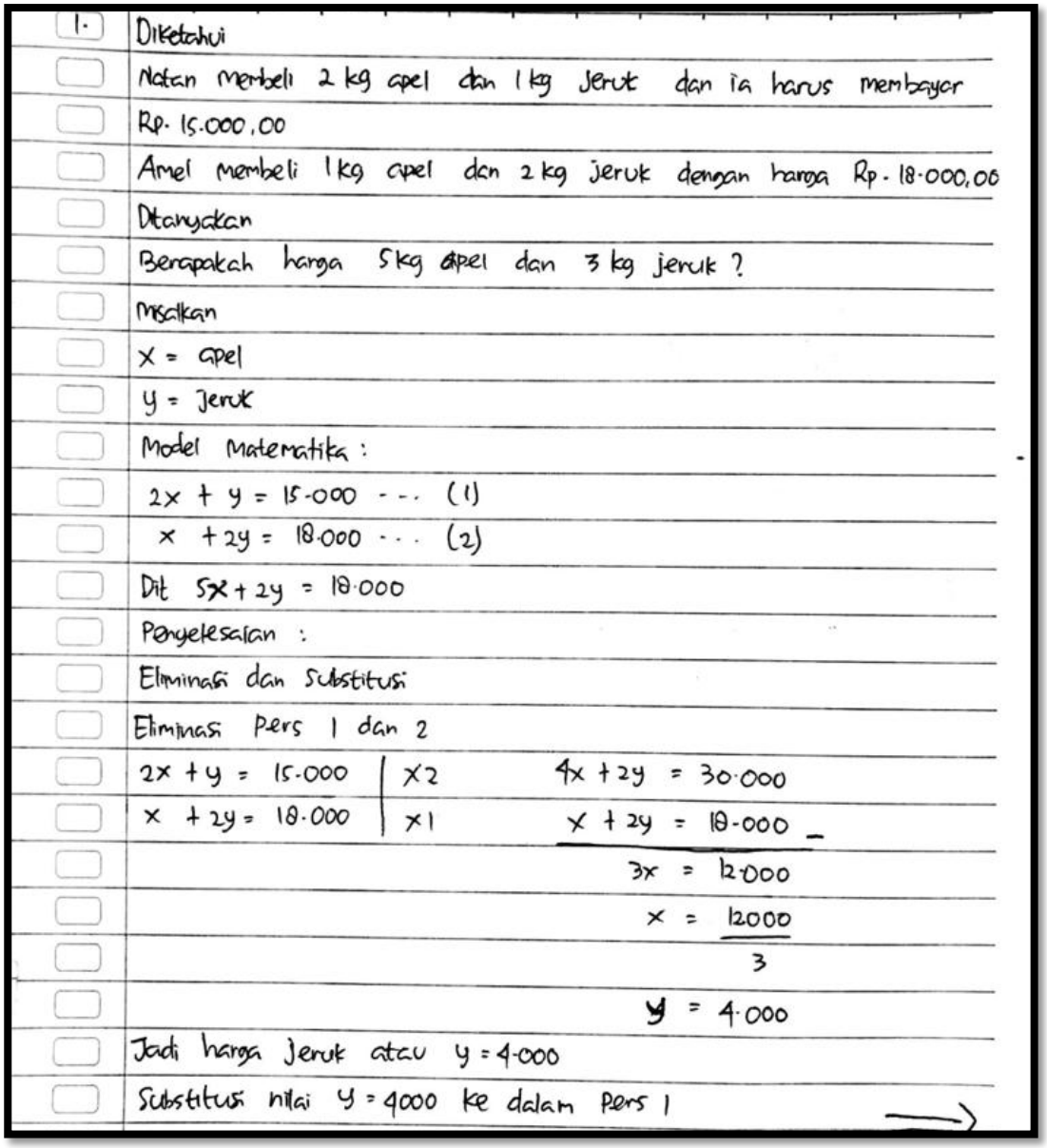
1. Diketahui
Natan membeli 2 kg apel dan 1 kg jeruk dan ia harus membayar Rp. 15.000,00
Amel membeli 1 kg apel dan 2 kg jeruk dengan harga Rp. 18.000,00
Ditanyakan
Berapakah harga 5 kg apel dan 3 kg jeruk ?
Misalkan
x = apel
y = jeruk
Model Matematika :
2x + y = 15.000 ... (1)
x + 2y = 18.000 ... (2)
Dit 5x + 2y = 18.000
Penyelesaian :
Eliminasi dan Substitusi
Eliminasi Pers 1 dan 2
2x + y = 15.000 | x2 | 4x + 2y = 30.000
x + 2y = 18.000 | x1 | x + 2y = 18.000 −
3x = 12.000
x = 12000 / 3
y = 4.000
Jadi harga jeruk atau y = 4.000
Substitusi nilai y = 4000 ke dalam pers 1

Figure 1. Answers to GB Student's Reading Errors

Based on the results of interview tests conducted with GB students, it can be concluded that students made mistakes in the first stage of the Newman procedure, namely, reading errors. Supported by the results of interviews conducted with GB students, it can be seen that GB students were wrong in writing variable x and instead wrote variable y at the end of elimination. Students quickly work on the questions and must check whether the answers are correct.

In this type of error in understanding the problem, students need to learn how to answer questions properly and correctly, as MT students do, which is wrong because they

do not write down what is known and what is asked of the questions. An example of a misunderstanding is an error made by MT students when working on question no 1. Examples of these errors can be seen in the following figure:

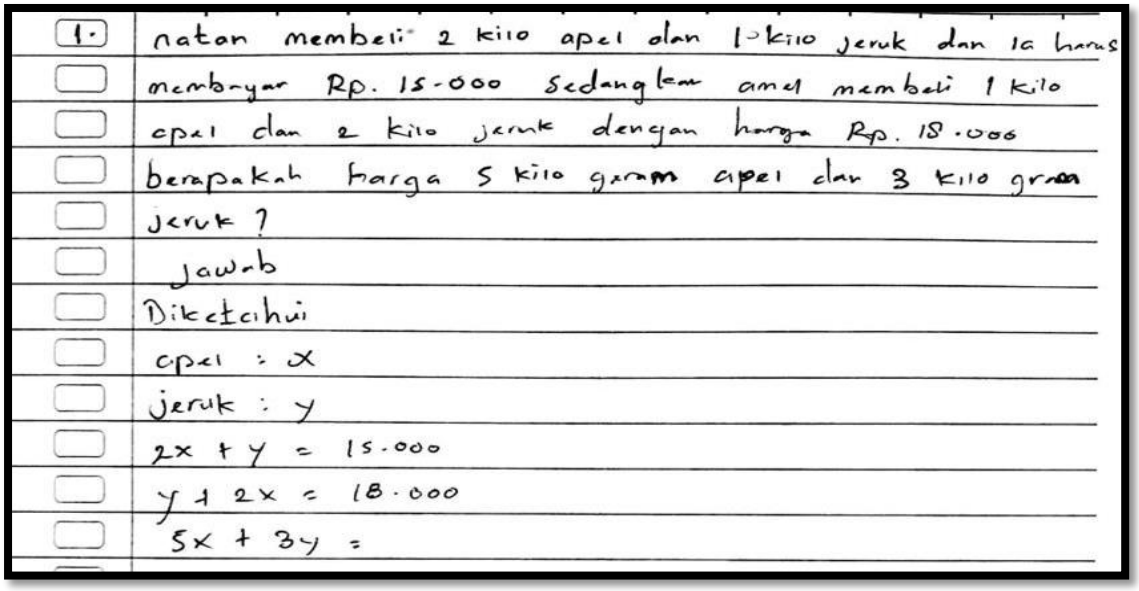

Figure 2. MT Student Answers Misunderstanding

From the identification results during the interview, it can be concluded that the students made a mistake in the second stage of the Newman procedure, namely the error in understanding the problem. In addition, from the results of interviews conducted by MT students, it can be seen that students did not write down what they knew about this problem because students needed to learn how to do the questions due to a lack of knowledge about SPLDV material.

Students must transform questions into mathematical models in this type of transformation error. Students experience many errors in determining the correct equation or arithmetic operation when working on word problems. This error will affect other errors, namely process skills errors and errors in writing the final answer. An example of a transformation error is an error made by PL students when working on question no 2. An example of an error can be seen in the following figure:

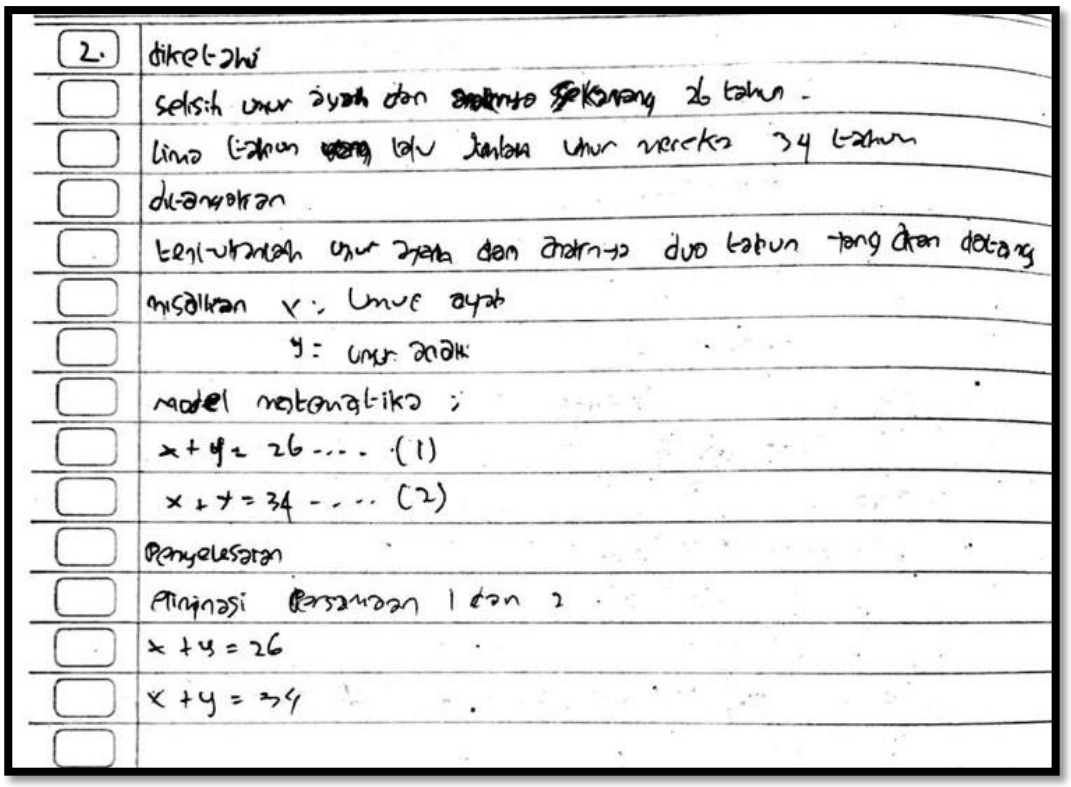

Figure 3. Student's Answers to Transformation Errors

Based on the results of identification through tests and interviews conducted by PL students, it was found that students made mistakes in the third stage of the Newman procedure, namely the mistake of transforming the problem into a mathematical model. The results of the interviews show that students needed to correct the mathematical model, which led to errors in the next settlement procedure. This is because students need clarification and learn how to transform the problem into an equation in the form of a correct mathematical model.

In the type of process skill error, students make conceptual errors and errors in determining the arithmetic operations used and the steps for solving them. Few students can determine arithmetic operations but need to know the steps to solve the problem correctly, so many students can only continue to work on the problem once it is finished. An example of a process skill error is an error made by AS students when working on question no 2. Anaexample of this error can be seen in Figure 4.

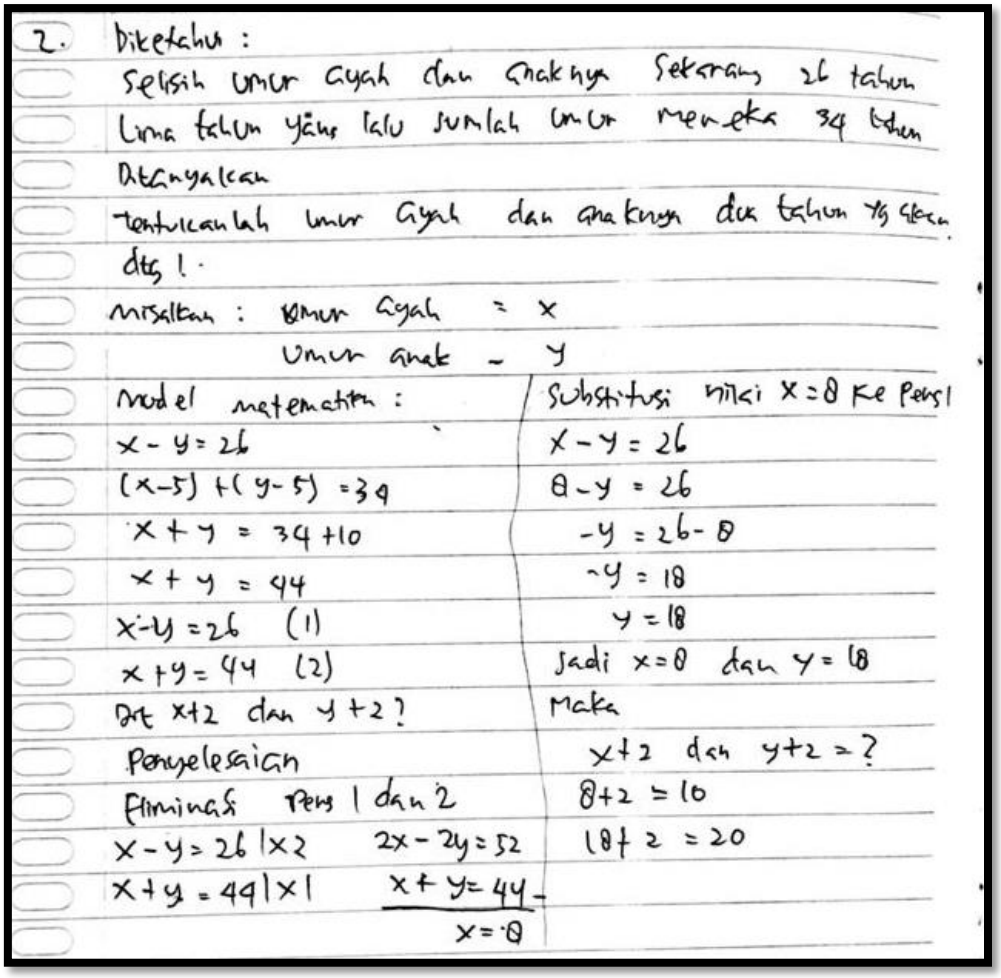

Figure 4. AS Student Answers Process Skill Error

From the results of identifying AS students' answers, they made mistakes in the fourth stage according to Newman's procedure, namely process skill errors. Based on the results of tests and interviews conducted with US students while working on the questions, US students needed to be corrected in determining systematic problem-solving. This was because students needed to understand the correct way to eliminate equations 1 and 2, so students were wrong in certain parts, which resulted in the student's final answer being also wrong.

In writing the final answer, many students needed help finding the final result of the question correctly, students could not write the final answer, and students could not write the final answer with a conclusion. An example of an error in writing the final answer is an error made by JS students when working on question no 3. An example of this error can be seen in Figure 5.

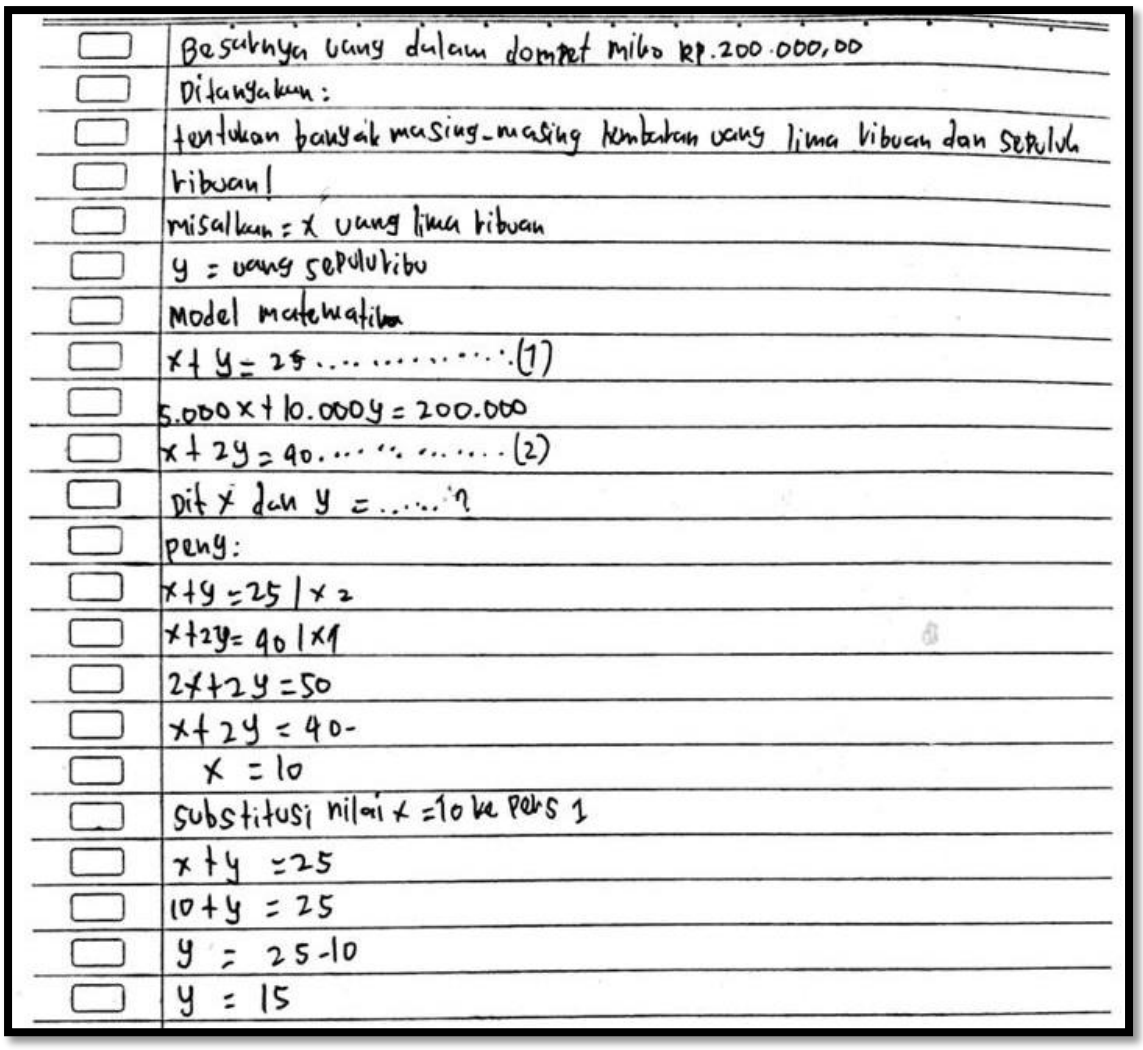
Besarnya uang dalam dompet mibo Rp.200.000,00
Ditanyakan:
tentukan banyak masing-masing lembaran uang lima ribuan dan sepuluh ribuan!
misalkan = x uang lima ribuan
y = uang sepuluhribu
Model matematika
x + y = 25 ..... (1)
5.000x + 10.000y = 200.000
x + 2y = 40 ..... (2)
Dit x dan y = ... ?
peny:
x+y = 25 | x 2
x+2y = 40 | x 1
2x+2y = 50
x+2y = 40 -
x = 10
Substitusi nilai x = 10 ke pers 1
x+y = 25
10+y = 25
y = 25-10
y = 15

Figure 5. JS Student Answers Wrong Writing of Final Answers

Based on the identification results above through tests and interviews, it was found that students made mistakes in the fifth stage of the Newman procedure, namely determining the final answer. In addition, the interview results with JS showed that students needed to remember to write conclusions at the final stage of working on the questions, even though in the previous questions, JS students wrote the final results in the form of conclusions but not with question no.3.

CONCLUSIONS

Based on research that has been conducted on students of SMP Negeri 4 Touluaan, it can be concluded as follows:

1. Of the five types of Newman procedures, the percentage of errors made sequentially by class VIIIA students of SMP N 4 Touluaan, namely 4.44% made reading errors, 13.33% made errors in understanding, 26.66% made transformation errors, 48.88% made process skill errors, as much as 68.88% made mistakes in writing the final answer and even a percentage of 13.33% of students did not answer the questions.

2. Mistakes made by students when solving word problems on the subject matter of a two-variable linear equation system, namely students cannot write down what is known, students do not understand the story problems given, cannot complete algebraic operations, cannot complete calculations correctly and students do not write down final result conclusion.

REFERENCES

Aan Komariah, D. S. (2014). *Metodologi Penelitian Kualitatif.* Bandung: Alfabetha.

Abdur Rahman As'ari, M. T. (2017). *Matematika Kelas VIII/Kementrian Pendidikan dan Kebudayaan.* Jakarta: Kementrian Pendidikan dan Kebudayaan.

Amalia, S. (2017). Analisis Kesalahan Berdasarkan Prosedur Newman Dalam Menyelesaikan Soal Cerita Ditinjau Dari Gaya Kognitif Mahasiswa. *Pendidikan Matematika FKIP Universitas Peradaban Bumiayu*, 14.

Baharuddin, N. A. (2021). *Analisis Kesalahan Siswa dalam Menyelesaikan soal Cerita Sistem Persamaan Linear Tiga Variabel Berdasarkan Newman Kelas X SMA Barrang Lompo.* Makassar: Universitas Muhammadiyah Makassar Fakultas Keguruan Dan Ilmu Pendididkan Program Studi Pendidikan Matematika.

Dinda Rahmawati, L. (2018). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Program Linier Dengan Prosedur Newman. *Pascasarjana Pendidikan Matematika Universitas Sebelas Maret*, 13.

Grahita, A. (2014). *Identifikasi Kesalahan Siswa dan Pemberian Scaffolding dalam menyelesaikan Soal Matematika pada Materi Operasi Pecahan Bentuk Aljabar Kelas VII C SMP Pangudi Luhur Segitiga.*

Haryati, T. (2015). *Analisis Kesalahan Siswa SMP Kelas VII Dalam Menyelesaikan Soal Cerita Pemecahan Masalah Berdasarkan Prosedur Newman.* Skripsi tidak diterbitkan: Semarang : Universitas Negeri Semarang .

Kandouw, T. R. (2014). *Pembelajaran Matematika Dasar Bagi Anak Berkesulitan Belajar.* Yogyakarta: Ar-ruz Media.

Laswadi. (2015). Pendekatan Problem Solving Berbantuan Komputer dalam Pembelajaran Matematika. *Aljabar*, 6(1).

Malik, A. (2017). *Analisis Kesalahan Menyelesaikan Soal Cerita Sistem Persamaan Linear Dua Variabel (SPLDV) Pada Siswa Kelas VIII SMP Negeri 1 Orong Telu.* Jakarta: Program Pascasarjana Universitas Terbuka.

Priyanto, A. S. (2015). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Pokok Bahasan Teorema Pythagoras Berdasarkan Kategori Kesalahan Newman di Kelas VIII A SMP Negeri 10 Jember. *Artikel Ilmiah Mahasiswa(1)*, pp. 1-5.

Rusman. (2016). *Pembelajaran Tematik Terpadu Teori, Praktik, dan Penilaian.* Jakarta: Rajawali Pers.

Satiti, T. (2014). *Analisis Dengan Prosedur Newman Terhadap Kesalahan Peserta Didik Kelas VII Dalam Menyelesaikan Soal Pemecahan Masalah Matematika.* Semarang: Jurusan Matematika Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Semarang.

Siregar, D. P. (2018). *Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Cerita Matematika Berdasarkan Prosedur Newman di SMP Muhammadiyah 02 Medan T.P 2017/2018.* Medan: Fakultas Keguruan dan Ilmu Pendidikan Universitas Muhammadiyah Sumatera Utara.

Tia Pramesti, S. (2020). analisis Kesalahan Siswa Berdasarkan Prosedur Newman Dalam Menyelesaikan Soal Cerita Materi Pecahan Pada Kelas IV S Negeri Manyaran 02 Semarang . *Universitas PGRI Semarang Indonesia*, 11.

Triani, e. a. (2015). The Use Of Auditory, Intelectually, Repetition Model With Multimedia to Improve Match Learning at The Fourth Grade Students of SDN 5 Kutosari in The Academic Year of 2014/2015. *Jurnal Kalam Cendekia PGSD Kebumen*, Vol. 3, No.4.1.