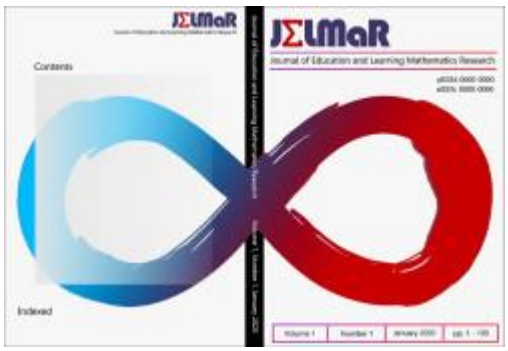

Journal of Education and Learning Mathematics Research (JELMaR)

Online ISSN : 2715-9787
Print ISSN : 2715-8535
Journal Homepage : http://jelmar.wisnuwardhana.ac.id/index.php/jelmar/index

An Errors of Class VIII Junior High School Students in Solving Mathematical Communication Problems Based on the Newman Procedure

Linda Anggraini, Shinta Wulandari, Nurmala R

To cite this article: Anggraini, L., Wulandari, S., & Nurmala, N. (2022). Errors of Class VIII Junior High School Students in Solving Mathematical Communication Problems Based on the Newman Procedure. *Journal of Education and Learning Mathematics Research (JELMaR)*, *3*(2), 103-108. https://doi.org/10.37303/jelmar.v3i2.80

To link this article : https://doi.org/10.37303/jelmar.v3i2.80

Publisher
Department of Mathematics Education,
Faculty of Teacher Training and Education,
Universitas Wisnuwardhana Malang

Journal of Education and Learning Mathematics Research (JELMaR)
Volume: 3, Number: 2, November 2022, pp. 103-108
p-ISSN: 2715-8535, e-ISSN: 2715-9787

Received: 29 September 2022 *Revised: 03 October 2022* *Accepted: 24 November 2022* *Published: 24 November 2022*

An Errors of Class VIII Junior High School Students in Solving Mathematical Communication Problems Based on the Newman Procedure

[1]Linda Anggraini, [2] Shinta Wulandari, [3]Nurmala R
Pendidikan Matematika, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Borneo Tarakan
Email : [1]lindaanggraini7299@gmail.com, [2]shintaw@borneo.ac.id,
[3]nurmala.r17@gmail.com

***Abstract**: Mastery of mathematical communication is the primary capital in solving mathematical troubles. Mathematical communication abilities assist students in handing over thought or answers to a mathematical trouble in the form of oral, written, and image. The studies objective is to discover student mistakes in solving mathematical communication troubles. The form of research is descriptive qualitative so that the researcher is the principle instrument. Technical facts analysis on this research is descriptive qualitative statistics evaluation approach of Miles and Huberman model with ranges of facts discount, records presentation, conclusion drawing and verification. The records reduction level ambitions to pick, recognition, discard needless facts and simplify uncooked records from the outcomes of pupil errors analysis. The studies subjects have been students of class VIII A SMP Negeri 2 Tanjung Palas Utara. The studies confirmed that the students did now not make studying errors however made errors in knowledge, reworking, processing skill, and solving mathematical verbal exchange issues.*

Keyword: Mathematical Communication, Newman Method, Student Error

INTRODUCTION

The outcomes of the PISA (program for international student assessment) examine released simultaneously on Tuesday, December 3, 2019 confirmed that Indonesia was ranked 72 out of seventy-eight with a median math rating of 379 at the same time as the world popular score for arithmetic was 489. Then the outcomes of the 2015 PISA study, Indonesia turned into ranked 69th out of seventy-five with a score of 386. further, the survey effects from PERC (The Political economic risk consultant) stated that junior high college students in Indonesia had been ranked 32 for natural Sciences and ranked 34 for mathematics from 38 nations surveyed in Asia, Australia, and Africa.

The PISA assessment is based on four college students' mathematical skills, specifically knowledge, problem fixing, reasoning, and conversation skills. further, the NCTM (national Council of teacher of mathematics) in 2000 established 5 mathematical skills, namely mathematical reasoning, mathematical representation, mathematical connection, mathematical communication, and mathematical problem fixing. Mathematical communication abilities are one of the critical aspects within the PISA assessment and also are covered in the 5 mathematical competencies in keeping with the NCTM.

The reason why mathematical communication skills are so important according to PISA and NCTM is because mathematical communication skills are the main capital of students in solving math problems. Baroody (1993) states that mathematical communication is a capital in solving, exploring, and investigating mathematics, as well

as a means in social activities to exchange ideas, opinions, and can sharpen ideas in convincing others. Simply put, even though students are actually able to solve a mathematical problem correctly but cannot communicate it well, then the solution cannot be understood and recognized by others. Without good mathematical communication skills, students do not have sufficient capital to deal with mathematical problems so that students' mathematical abilities will be hampered.

Mathematical communication capacity is a manner for students to convey ideas or solutions to a trouble mathematically. Qodariiyah and Rohaeti (2015) advise that mathematical communication is a technique of conveying mathematical ideas in other kinds orally or in writing. In addition, NCTM (in Hendriana, Roehati & Sumarmo, 2017) states that mathematical communication is an crucial mathematical primary competency of mathematics and mathematics training.

There are three indicators of mathematical communication abilities in line with Hodiyanto (2017), specifically: (1) Writing (written text), and is the reason an concept or solution to a hassle or picture the use of their personal language; (2) Drawing, specifically explaining ideas or solutions to mathematical problems within the shape of photos; (3) Mathematical expressions, specifically mentioning troubles or normal events within the language of mathematical models, or greater virtually mathematical modeling.

In analyzing student errors, there are many methods that can be used, one of which is the Newmann's Error Analysis (NEA) method. This method can be used to identify the location of student errors in the results of working on math problems. There are 5 stages in the NEA method, namely: (1) Reading Errors, caused because students are not able to recognize symbols in questions and are unable to interpret the meaning of words or terms in questions; (2) Errors in understanding questions (Comprehension Errors), due to students not being able to fully understand what is known; (3) Transformation Errors, caused because students are not able to make mathematical models of the problems given and do not know what formulas and arithmetic operations will be used; (4) Process Skill Errors, caused because students do not know the procedures and steps to be used or are unable to carry out the procedures and steps used appropriately; (5) Errors in writing the final answer (Encoding Errors), caused by students not being able to find, show, and write down the final answer.

The purpose of this study was to analyze and describe student errors in solving mathematical communication problems based on Newman's method. According to Septiani, Septian & Setiawan (2020) low mathematical communication can be improved by first analyzing the errors made by students in solving mathematical communication skills problems. Error analysis itself according to Astuty and Wijayanti (2013) is an attempt to observe, find, and classify errors with certain rules.

In analyzing student errors, there are many methods that can be used, one of which is the Newmann's Error Analysis (NEA) method. This method can be used to identify the location of student errors in the results of working on math problems. There are 5 stages in the Newman method, namely: (1) Reading Errors, caused because students are not able to recognize symbols in questions and are unable to interpret the meaning of words or terms in questions; (2) Error Understanding (Comprehension Error), due to students not being able to understand what is known and the command of the question completely; (3) Transformation Error, caused because students are not able to make mathematical models of the problems given and do not know what formulas and arithmetic operations will be used; (4) Process Skill Error, caused because students do not know the procedures and steps to be used or are unable to carry out the procedures in the steps used appropriately; (5) Encoding Error, caused because students are not able to find, show, and write the final

answer.

METHOD

This form of studies is descriptive qualitative using a qualitative approach. the muse of qualitative studies is phenomenology. Qualitative studies is research that intends to understand the phenomenon of what is skilled by way of studies subjects consisting of behavior, notion, motivation, movement and others, holistically and with the aid of scientific description (Moleong, 2017).

The qualitative method was chosen based on several considerations. First, it is easier to adjust when dealing with more than one reality (plural). Second, it presents directly the relationship between the researcher and the research subject. Third, this method is more sensitive and more adapted to the sharpening of many influences on the patterns of values encountered. Then another reason is that this method is designed to understand the phenomenon of student errors and identify what students' mistakes are in solving mathematical communication problems.

The subjects of this study were students of class VIII A of SMP Negeri 2 Tanjung Palas Utara for the academic year 2021/2022 as many as 15 students. The research location is SMP Negeri 2 Tanjung Palas Utara which is located at Jl. Pembangunan of RT 07 RW 02 Kelubir Village, Tanjung Palas Utara District, Bulungan Regency, Kalimantan Utara.

The main instrument in this research is the researcher himself. Moleong (2017, p. 9) states that researchers are instruments because if they use non-human tools, it is impossible to make adjustments to the realities that exist in the field and only humans can understand the relationship between realities in the field.

As the main instrument, researchers need supporting instruments, namely questions of mathematical communication and interview guidelines that have been validated. Mathematical communication problems are used to determine the location of student errors while interviews are to obtain more information about the mathematical communication skills of the research subject.

Technical analysis of information on this studies is descriptive qualitative records analysis approach Miles and Huberman model with degrees of facts reduction, information presentation, conclusion drawing and verification. The information reduction degree targets to pick, awareness, discard needless information and simplify raw information from the effects of student error analysis. The data presentation stage makes it easier to understand what is happening and allows drawing conclusions and taking action. Conclusions can be drawn after all the data has been collected. This conclusion is about what mistakes students make in solving mathematical communication problems.

RESULT AND DISCUSSION

The answer sheet for the mathematical communication test of class VIII A SMP Negeri 2 Tanjung Palas Utara was analyzed using the Newman procedure and the following results were obtained:

Table 1. Results of Error Analysis on Student Answer Sheets based on the Newman Procedure

Description:

Subject Code	*Error Type*
S1	Co
S2	Co, Tf, PrSl, Ed
S3	Co, Tf, PrSl, Ed
S4	Co, Tf, PrSl, Ed
S5	Co, Tf, PrSl, Ed
S6	Co, Tf, PrSl, Ed
S7	Co, Tf, PrSl, Ed
S8	Co, Tf, PrSl, Ed
S9	Co, Tf, PrSl, Ed
S10	Tf, PrSl, Ed
S11	Co, Tf, PrSl, Ed
S12	Co, Tf, PrSl, Ed
S13	Co, Tf, PrSl, Ed
S14	Co, Tf, PrSl, Ed
S1	Co, Tf, PrSl, Ed

Co : *Comprehension*
Tf : *Transformation*
PrSl : *Process Skill*
Ed : *Encoding*

Of the 15 subjects who took the mathematical communication test, 2 subjects were taken whose answers were unique and were then interviewed regarding student work sheets. The 2 subjects are S4 and S13. The uniqueness is seen from the opportunity to extract in-depth data on the subject related to the research focus.

Subjek 4

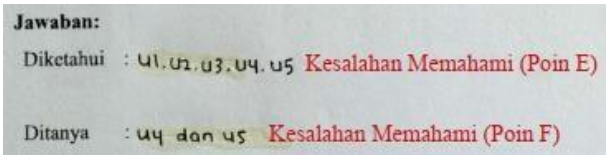

Figure 1. Answers for S4 on the Mathematical Communication Test

From the picture above, it can be seen that S4 uses the problems in the test questions, namely U_4 and U_5 as information that is known from the questions. This shows that S4 is less able to choose/use data from relevant questions. In addition, in item 1 there are two problems that must be solved by students, namely determining the values of U_4 and U_5 and drawing the number pattern, but in the "asked" section, S4 only writes one command from the item so that important information is missed. These two things indicate that S4 may not be able to fully understand the problem.

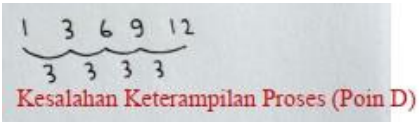

Figure 2. Answers for S4 on the Mathematical Communication Test

Based on the picture above, S4 writes that the difference in this sequence is 3 so that the value of the next sequence is added to 3. This shows that S4 was careless in the calculation process because he was wrong in determining the difference in the sequence, so the value of the next sequence was not correct.

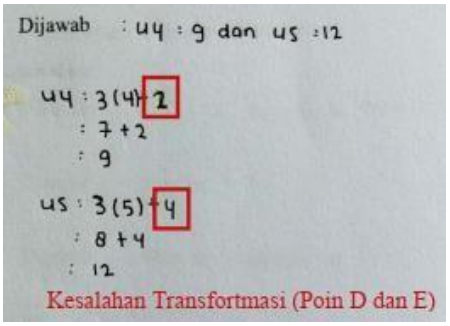

Figure 3. Answers for S4 on the Mathematical Communication Test

Based on the picture above, S4 was wrong in planning the solution because the formula used was not a triangular number pattern formula. S4 also cannot complete or continue the solution of the answer because it cannot visualize the shape of the triangular number pattern. This can indicate that S4 is suspected of making mistakes in transforming and processing skills. In addition, S4 does not provide a solution to the problem in the form of an image of a triangular number pattern. Reduction of data from interviews with S4 as follows:

R : What do you know from the questions?
I : Whats is known is U_1, U_2, U_3, U_4 and U_5
R : Why are U_4 and U_5 also included in the unknown?
I : After U_3 there are dots, so I guess it"s contonued
R : Then if indeed U_4 and U_5 are known, what is the value?
I : 9 dan 12
R : Why 9 and 12?
I : Because it is a multiple of 3
R : Can you name the first 5 numbers in multiples of 3?
I : 1, 3, 6, 9, and 12
R : Why did you write that you only know up to U_5? Not up to U_9 or more?
I : Because what U_4 and U_5 are asking
R : What about the formula?
I : I remember from the notebook
R : Why didn't you draw the pattern?
I : I can't find the answer until time runs out

Based on the results of the interview above, it can be seen that S4 wrote U4 and U5 as known information because they did not understand the meaning of the information from the question. S4 is less able to choose or use data from relevant questions because it uses U4 and U5 as "known" data. The values of U4 and U5 are searched using an incorrect difference and S4 does not write down the values of the known sequences. This shows that S4 made a misunderstanding because he was not able to understand the items and could not explain correctly and completely when interviewed. Jha and Singh (in Hariyani and Aldita, 2020) stated that a subject who could not understand the overall meaning of the item and did not write down what was known and asked about the item completely could be declared to have misunderstood.

From the results of the interview, S4 said that 3 is the difference obtained in Figure 2 and assumes 1, 3, and 6 are multiples of 3. Then S4 transforms the information to plan a solution using a formula that the subject remembers from the notebooks that have been collected. The formula that the subject uses to find the value of U_4 is $u_n = 3(\text{□}) + 2$, while to find the value of U_5 uses the formula $u_n = 3(\text{□}) + 4$. This shows that S4 made

a transformation error because it could not transform the formula correctly. In addition, in Figure 3, it can be seen that S4 made an error in the arithmetic operation because u_4 = 3(4) + 2 = 12 + 2 = 14 instead of 9. This shows that S4 performs process skills because they are not able to understand the arithmetic operations used and are careless in the calculation process. In Rahmawati and Permata's research (2018), transformation errors occur because the subject cannot determine the right formula and arithmetic operations, while process skill errors occur because the subject is unable to complete the completion steps correctly. Then at the stage of writing the final answer, S4 could not describe the solution in the form of an image of a triangular number pattern. So that the errors made by S4 on the mathematical communication test are misunderstandings, transformation errors and process skills errors and writing errors.

Subjek 13

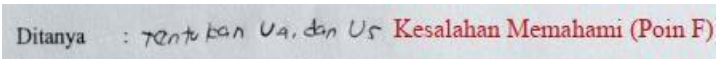

Figure 4. Answers for S13 on the Mathematical Communication Test

There are two commands that students must complete in point 1, first determine U4 and U5, second draw the number pattern. Based on Figure 4, it can be seen that S13 only wrote one command so that important info was missed.

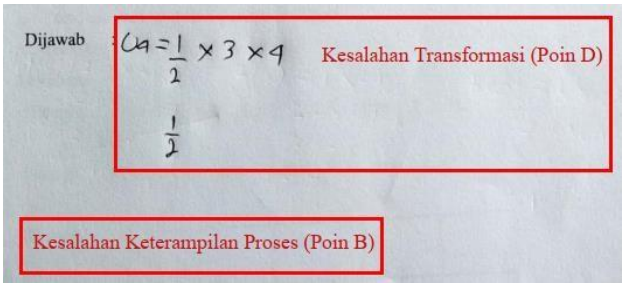

Figure 5. Answers for S13 on the Mathematical Communication Test

Based on the picture above, it can be seen that S13 cannot recognize 1, 3, 6,… is a triangular pattern so the formula written is not correct. This shows that S13 is wrong in planning the solution. In addition, S13 cannot draw a triangular number pattern which is included in the settlement procedure in item 1. The reduction of data from interviews with S13 related to item 1 can be seen as follows:

R : Do you think that question you were asked about was only this?
I : Yes
R : Than what about point "b"?
I : Oh yeah I forgot, hurry up so it's over quickly
R : Okay, then for this answer, can you explain how to get the formula and others?
I : I just wrote it carelessly
R : Then where is the picture for?
I : I don't know what picture to take
R : Do you know how to draw a triangular number pattern?
I : No

Based on the results of the interview above, it can be seen that S13 only wrote one command from the item because he was in a hurry and could not explain the instructions from the question completely during the interview so that at this stage S13 had made a misunderstanding. This is supported by research by Rahmawati and Permata (2018) which states that misunderstandings occur if the subject does not write down the information from the item completely. Then at the next stage, S13 made a transformation

error because it could not recognize 1, 3, 6, … are triangular number patterns so that the formula used was not correct. This is in accordance with the research of Rahmawati and Permata (2018) if the subject cannot determine the right formula and arithmetic operation to solve the problem on the item, then the subject makes a transformation error. Subjects who make transformation errors are likely to make process skills errors. Then S13 cannot describe the pattern of triangular numbers so that the solution given does not exist. In working on mathematical communication test questions, S13 made mistakes in understanding, transformation, process skills, and writing.

CONCLUSION

Based on the results of the researcher's analysis of student errors in solving mathematical communication problems using the Newmann's Analysis Error method, it can be concluded as follows: (1) Students did not make reading errors because all subjects could read mathematical communication test questions properly and correctly; (2) Misunderstanding occurs because students cannot write and mention what is known and asked completely and accurately; (3) The transformation error occurs because the subject is wrong in transforming the formula that will be used to solve problems on the mathematical communication test; (4) Process skill errors occur because the subject cannot understand the arithmetic operations used and is careless in the calculation process; (5) Errors in writing the final answer occurred because the subject did not write down the solution to the given problem.

REFERENCES

Astuty, K. Y. (2013). Analisis Kesalahan Siswa kelas V dalam Menyelesaikan Soal Matematika pada Materi Pecahan di SDN Medokan Semampir I/259 Surabaya. *MATHEdunesa*, 2(3).

Baroody, A. J., & Coslick, R. T. (1993). Problem Solving, Reasoning, and Communicating, K-8: Helping children think mathematically. Merrill.

Hariyani, S., & Aldita, V. C. (2020). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Sistem Persamaan Linear Dua Variabel Berdasarkan Prosedur Newman. *Al-Khwarizmi: Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam*, 8(1), 39-50.

Hendriana, H., Roehati, E. E., & Sumarmo, U. (2017). Hard Skill dan Soft Skill matematik siswa. *Bandung: Refika Aditam*

Hodiyanto, H. (2017). Kemampuan Komunikasi Matematis dalam Pembelajaran matematika. *AdMathEdu,* 7(1).

Moleong, L, J. (2017). Metodologi Penelitian Kualitatif. Bandung: PT REMAJA ROSDAKARYA.

Qodariyah, L., & Hendriana, H. (2015). Mengembangkan Kemampuan Komunikasi dan Disposisi Matematik Siswa SMP Melalui Discovery Learning. *Edusentris*, 2(3).

Rahmawati, D., & Permata, L. D. (2018). Analisis Kesalahan Siswa dalam Menyelesaikan Soal Cerita Program Linear dengan Prosedur Newman. *Jurnal Pembelajaran Matematika*, 5(2).

Septiani, D. T., Septian, A., & Setiawan, E. (2020). Analisis Kesalahan Siswa pada Kemampuan Komunikasi Matematis dalam Pembelajaran yang Menggunakan Pendekatan Sintifik. *Jurnal Edukasi dan Sains Matematika (JES-MAT),* 6(2).

Tohir, M. (2019). Hasil PISA Indonesia tahun 2018 turun disbanding tahun 2015.