Proceedings Series on Social Sciences & Humanities, Volume 25
Proceedings of International Conference on Social Science (ICONESS)
ISSN: 2808-103X

Analysis of Fuzzy Thinking Processess in Students' Mathematical Communication at SMP Negeri 2 Banyumas

Helmy Wahyu Widiarti[1], Kusno[2], Anton Jaelani[3]
[1,2,3]Magister Pendidikan Matematika, Universitas Muhammadiyah Purwokerto

ARTICLE INFO

Article history:

DOI:
10.30595/pssh.v25i.1730

Submited:
July 22, 2025

Accepted:
August 11, 2025

Published:
August 24, 2025

Keywords:

Analysis; Fuzzy Thinking;
Mathematics Communication

ABSTRACT

Fuzzy thinking means the thinking process with confusion between understanding and not understanding. This research was conducted to find out the students' experiences of fuzzy thinking in mathematics communication in SMP Negeri 2 Banyumas. This was a descriptive qualitative research and the subjects were taken from the students of class 8 C using snowball technique and T.O.L (Think Out Loud) that fulfilled the criteria of fuzzy thinking either the correct one or the incorrect one. From the results, there were 2 students with correct fuzzy thinking and 4 students with incorrect fuzzy thinking. The data were collected using tests, interviews, and documentation then analyzed using Miles and Huberman model consisting of data reduction, data display, and conclusion. The results showed that: 1) the thinking process of the respondents with incorrect fuzzy thinking experienced a change. At first they were able to think correctly, but after the reflection, they were not able to explain correctly, so the answers did not reflect their understanding absolutely; 2)the thinking process of the respondents with correct fuzzy thinking experienced a change. At first they were not able to do the test correctly, but after the reflection, they were able to finish it correctly.

Corresponding Author:
Helmy Wahyu Widiarti
Magister Pendidikan Matematika, Pascasarjana, Universitas Muhammadiyah Purwokerto
Email: helmywahyu4@gmail.com

1. INTRODUCTION

Mathematics is one of the most important basic knowledge for the development of educational science and technology that is useful for the development of the nation. As expressed by Juhrani, Suyitno, H and Khumaedi (2017) that mathematics has an important role in various disciplines and the development of human thinking power. As stated by Supardi (2015:205) thinking is a cognitive process used to understand the surrounding environment, questioning assumptions that lead students to new solutions that can have a positive impact on their quality of life .

In mathematics there are processes of thinking, reasoning, and communicating. To communicate in mathematics requires mathematical communication skills. This is in line with what was expressed by Muklis (2014:413) mathematical communication *is* also a factor that is considered in mathematics learning. Mathematical communication skills are students' abilities in using mathematics as a communication tool or mathematical language to express or pour out ideas and thoughts verbally or in writing using symbols, pictures, tables, or graphs in solving mathematical problems that must be conveyed during mathematics learning.

This mathematical communication is useful for students to be used as an idea or become an object of thought that is conveyed during the learning process. As a teacher, it is necessary to accustom students to

communicate in the learning process, so that what is learned is more meaningful. In mathematical communication, it is very possible for the *fuzzy* thinking process to occur . In the English dictionary (2007:142) *fuzzy* has an unclear or vague meaning . *Fuzzy* thinking means thinking that experiences confusion between understanding and not understanding or between remembering and forgetting. The *fuzzy thinking process* is produced from a spontaneous, inflexible, uncontrolled process, and is shallow and vague. People who think *fuzzy* cannot complete work completely or correctly, but if they are helped a little, they can complete a job.

The eighth grade students at SMP Negeri 2 Banyumas have quite good mathematical communication skills. Based on the results of interviews with teachers, teachers often encounter students who provide their assignments correctly but are confused when explaining the results of the assignments they have done. Likewise, students who provide less accurate assignments are able to explain them correctly.

2. RESEARCH METHODS

The type of research used is qualitative descriptive research, it is said to be descriptive because in this study, the researcher conducted an analysis and presented data systematically regarding the description of the occurrence of the *fuzzy thinking process* in mathematical communication at SMP Negeri 2 Banyumas. This research was conducted in the even semester of the 2019/2020 academic year at SMP Negeri 2 Banyumas. The researcher used the *snowball technique* to distribute written tests given to class VIII C, totaling 32 students with the material of a two-variable linear equation system for taking research subjects. After being invited to reflect using the TOL (*Think Out Loud) technique, there were 6 students who were included in the fuzzy* thinking criteria , both correct *fuzzy thinking and incorrect fuzzy thinking*.

3. RESULTS AND DISCUSSION

Based on the description and analysis of the written test results and reflections through interviews from 6 research subjects, the researcher grouped the final results or final answers based on *fuzzy thinking characteristics*

3.1. Students who are thinking *fuzzy* are right

Students who have the correct *fuzzy thinking process* to determine the solution to a written test problem require 3 steps. When viewed from the results of the test questions and the results of reflection through interviews given by students, the researcher describes the thinking process of students who are thinking *fuzzy* correctly as follows **Figure 1**.

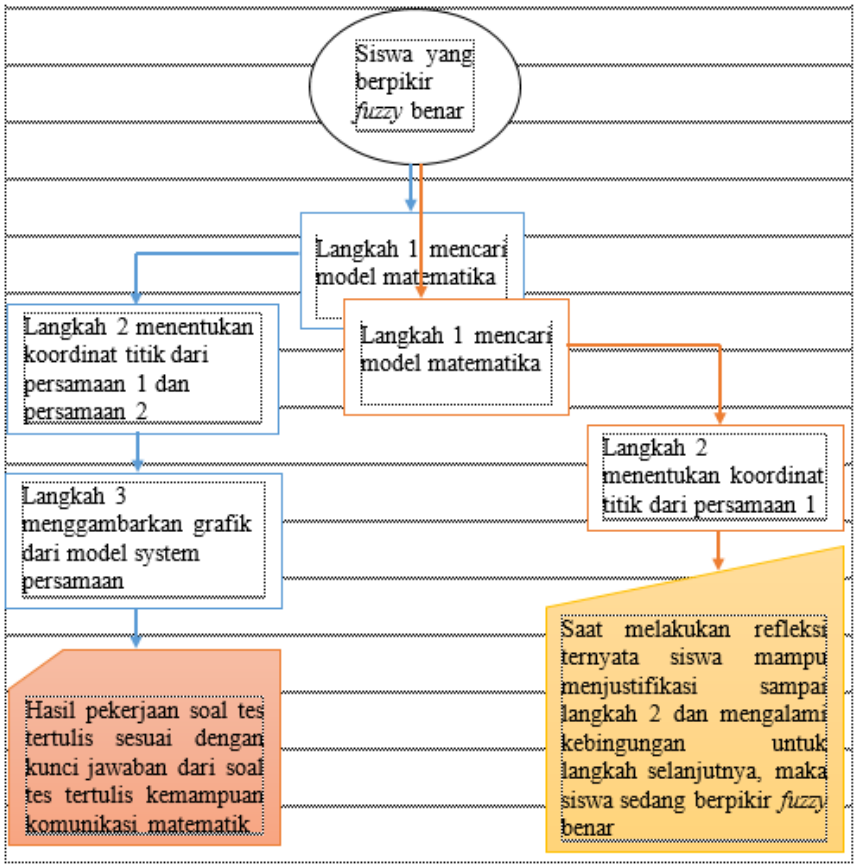

Fig. 1. Students who are thinking *fuzzy* are right.

From the picture of the student's thinking process who is thinking *fuzzy* correctly, it can be explained that the student is able to provide the correct answer according to the answer key of the written test questions of mathematical communication skills, this can be seen in *the flowchart* marked with a blue arrow. Furthermore, the researcher conducted a reflection through an interview, so the results can be seen in *the flowchart* marked with an orange arrow. This can be explained that the student is able to provide justification for step 1 of the results of the written test questions that the student gave, so *the flowchart* depicted between the test results marked in blue and the reflection results marked in orange looks overlapping.

In step 2, the results of the written test work and the results of the reflection do not coincide because the results of the reflection in step 2 in the 2nd equation, the student is unable to provide justification for the answers to the results of his written test work, even though the answers to the results of his written test work are the correct answers. When reflection was carried out through interviews, it turned out that the student was confused when providing justification in step 2 in the 2nd equation. So the student experienced a *fuzzy thinking process* .

In step 3, it does not overlap because the answers given by the students show the correct answers and are in accordance with the answer key for the written test questions on mathematical communication skills. Furthermore, the researcher saw *the flowchart* with an orange arrow, proving that the student when reflecting was unable to provide justification for the results of the written test work in step 3 and was confused when reflecting. So the student showed the correct answer, but was unable to provide justification for his answer, so the truth of the answer was false.

So, if we look at the final results or final answers given by the student, then the student is a student who is thinking *fuzzy* correctly. Because the student is only able to show the correct answer, but is unable to provide justification for his answer, the truth of the answer is illusory.

3.2. Students who are thinking *fuzzy* are wrong

Students who have a *fuzzy thinking process* that is wrong to determine the solution to a written test problem require 3 steps. When viewed from the results of the test questions and the results of reflection through interviews given by students, the researcher describes the thinking process of students who are thinking *fuzzy* wrongly as follows **Figure 2**.

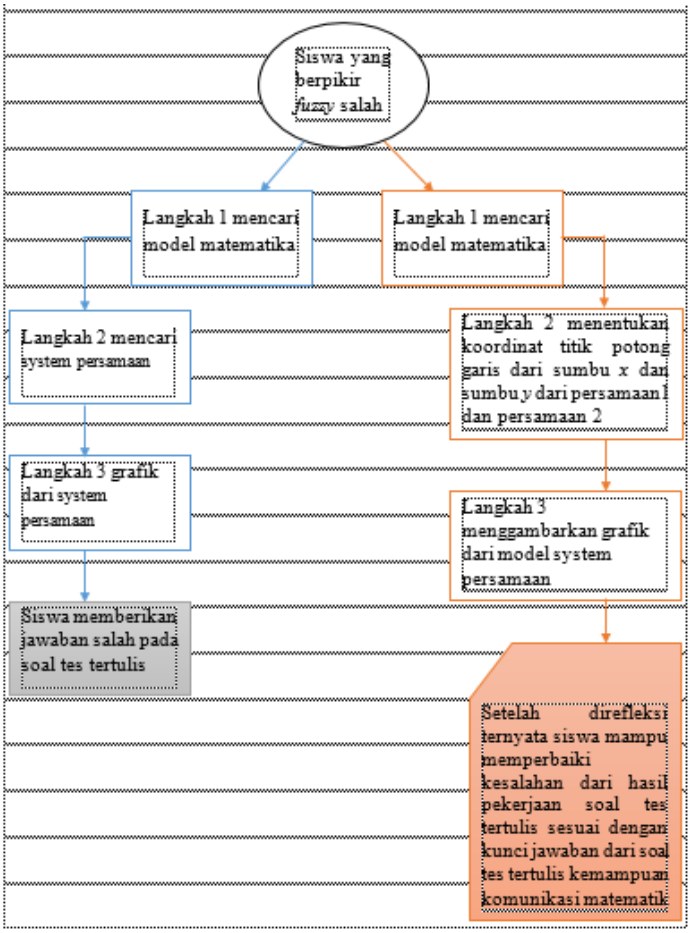

Fig. 2. Students who are thinking *fuzzy* are wrong

From the picture of the student's thinking process, it can be explained that the students gave answers to the written test questions on mathematical communication skills that had less than perfect answers, this can be seen in *the flowchart* marked with a blue arrow that has less than perfect answers in answering the questions , namely $x + y = 3.000.000$. Then the researcher reflected through interviews from the answers given by the students and it turned out that the students were able to correct the mistakes in the answers given in the results of the written test questions. So the results of the reflection can be seen in *the flowchart* marked with an orange arrow. So the students were able to provide the right answers by writing down the answers, namely $x + y = 400 \text{and} 8000x + 6000y = 3.000.000$ From the written test results in step 1, the researcher then adjusted the test results with the reflection results through interviews from the answers that students wrote in step 1 and it turned out that students were able to improve them.

In step 2, the results of the written test work and the results of the reflection look far apart because the results of the reflection in step 2 are different from the results of the written test answers given by the students. The answers to the test results given by the students turned out to be less than appropriate to answer the problems in the written test questions, this can be seen from the blue *flowchart* . Then the researcher gave time to reflect on the answers given by the students and it turned out that the students were able to correct the mistakes in their test answers, this can be seen in the orange *flowchart* . *So the student has a fuzzy* thinking process .

Next, the researcher looked at *the flowchart* marked with a blue arrow, showing that the results of the written test work in step 3 with the reflection results looked far apart because the reflection results in step 3 were different from the results of the written test answers given by the students. The answers to the test results given by the students turned out to be less than accurate in answering the problems of the written test questions, then the researcher conducted a reflection through interviews from the answers given by the students and it turned out that the students were able to correct the mistakes in the answers from their written test results.

If seen from the results of the test questions given by the student, the answers are wrong, then the researcher conducted a reflection, it turned out that the student was able to correct the errors in the answers to his test results from questions 1 point a, point b, and point c. So it can be concluded that if seen from the final results or final answers given by the student, the student is a student who is thinking *fuzzy* wrong.

4. CONCLUSION

Based on the results of the analysis of the *fuzzy thinking process* in mathematical communication that occurred in class VIII C students of SMP Negeri 2 Banyumas, several conclusions can be drawn as follows: 1. Correct *Fuzzy Thinking* in Mathematical Communication, respondents with correct *fuzzy thinking criteria* , the thinking process changes, initially they can think correctly as shown by the test results. However, after reflection it turns out that they cannot explain correctly. This is because they forget, especially when determining the coordinates of the intersection points of each line with the *x- axis* and *y- axis* . One of the causes of forgetfulness is that when working on the test the respondents asked their friends, so the answers did not reflect their absolute understanding. 2. Wrong *Fuzzy Thinking* in Mathematical Communication, respondents with incorrect *fuzzy thinking criteria* , their thinking process changes, initially they cannot do the test correctly. After reflection it turns out that they can complete it correctly. This is because: 1) Respondents give less precise test results, when reflection is carried out it turns out that respondents remember their previous answers. Then the respondents correct the mistakes in the answers they wrote, so that the answers become the correct answers. 2) Respondents gave inaccurate test results, but were able to correct the errors in their answers when reflecting because respondents reread the story questions and reworked them according to the example questions in the textbook. So that the answers given by respondents became the correct answers. 3) Respondents were less careful when reading the test questions, when working on the test questions they were confused and asked their friends, so that the answers they gave were inaccurate. When invited to reflect, respondents were able to correct the errors in the answers they wrote, so that their answers became the correct answers. 4) Respondents were confused when working on the written test and explaining the results of their tests. After reflection, it turned out that respondents were able to correct the errors in the answers they wrote, so that their answers became the correct answers.

Acknowledgments. The heading should be treated as a 3rd level heading and should not be assigned a number.

REFERENCES

Adnan, M. (2017). *Analysis of Students' Reasoning and Communication Abilities in Solving Algebra Problems for Class VII MTs Sultan Hasanuddin, Gowa Regency* . Alauddin State Islamic University, Makassar

Amir, A. (2014). *Reasoning and Communication Skills in Mathematics Learning* . IAIN Padangsidimpuan

Asikin, M & Junaedi, I. (2013). *Mathematical Communication Skills of Junior High School Students in RME (Realistic Mathematics Education) Learning Settings* . Semarang State University. UJMER 2(1)

Faroh, N. (2011). *The Influence of Mathematical Reasoning and Communication Skills on the Ability to Solve Story Problems on the Main Material of Sets in Semester 2 Class VII MTs Nurul Huda Mangkang Semarang in the 2010/2011 Academic Year* . Semarang State Islamic Institute

Husna, A. (2018). *Analysis of Students' Pseudo Thinking in Solving Comparative Problems Differentiated Based on Mathematical Ability* . UIN Sunan Ampel Surabaya

Juhrani, Suyitno, H & Khumaedi. (2017). *Analysis of Mathematical Communication Ability Based on Students' Self-Efficacy in the MEA Learning Model* . Semarang State University. UJMER 6(2), 251 – 258

Lailiyah, Siti. , et al . (2015). *Thinking Process Versus Mathematical Reasoning* . Proceedings of the National Seminar on Mathematics and Mathematics Education No. 978-979-028-728-0

Lutfianannisak, Sholihah, U. (2018). *Students' Mathematical Communication Ability in Solving Problems on Function Composition Material Reviewed from Mathematical Ability* . IAIN Tulungagung. Mathematics Education Journal 1(1)

Muklis, Yoga Mohamad & Sanhadi, D. (2016). *Contribution of Self-Efficacy and Mathematical Communication Ability to Students' Mathematics Learning Achievement* . Sebelas Maret University

Marhiyanto, Bambang & Arifin, Syamsul. (2007). *8 Billion Dictionary* : CV. Buana Raya

Nurjan, S. (2016). *Psychology of Learning* . Ponorogo: Wade Group Minister of Education Regulation Number 22 of 2006 concerning Content Standards

Rachmayani, D. (2014). *Implementation of Reciprocal Teaching Learning to Improve Students' Mathematical Communication Skills and Mathematics Learning Independence* . Muhammadiyah University of Jakarta. UNSIKA Education Journal

Romadhina, D. (2007). *The Influence of Reasoning Ability and Mathematical Communication Ability on the Ability to Solve Story Problems on the Subject of Curved Side Space Buildings of Grade IX Students of SMP Negeri 29 Semarang Through the Problem Solving Learning Model* . Semarang University

Saelan, Athia. (2009). *Fuzzy Logic* . Bandung Institute of Technology

Sari , R. (2016). *Metacognitive Activities in Solving Mathematical Problems Reviewed from the Gender of Grade VII Students of SMP Negeri 1 Nanggulan, Kulon Progo Regency* . Sebelas Maret University. Surakarta

Sugiyono. (2015). *Educational Research Methods* . Bandung : Alphabet

Supardi, D, Mardiyana & Subanti, S. (2015). *Analysis of Students' Thinking Process in Solving Mathematical Problems Based on Polya's Steps Reviewed from the Emotional Intelligence of Grade VIII Students of Al Azhar Syifa Budi Middle School in the 2013/2014 Academic Year* . Sebelas Maret University, Surakarta. Electronic Journal of Mathematics Learning, Vol 3(2), pp. 204-214

Yani, M, Ikhsan, M & Marwan. (2016). *The Thinking Process of Junior High School Students in Solving Mathematical Problems Based on Polya's Steps Reviewed from the Adversity Quotient* . Syiah Kuala University