



Students' Difficulties in Understanding Problems and Making Mathematical Models in the Contextual Problem Solving Process

Sufyani Prabawanto^{1*}, Tatang Herman², Rini Melani³, Christina Monika Samosir⁴,
Syifa Ananda Mefiana⁵

^{1,2,3,4,5} Program Studi Pendidikan Matematika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229 Bandung, 40154, Jawa Barat, Indonesia

*sufyani@upi.edu

Abstract. Understanding problems and making mathematical models are essential factors in solving contextual problems. This research aims to provide a detailed description of students' difficulties in understanding problems and making mathematical models in contextual problem-solving dealing with arithmetic and geometry. This research was qualitative with a phenomenological hermeneutic design. The subject of the research was 60 eighth-grade students from two schools in Bandung. The data collection techniques were tests and interviews. Before using this instrument, it was validated by experts, especially on the content, construct, and face. The steps of data analysis were identifying the meanings, determining the credibility, interpreting the data, identifying the themes, and preparing the final report. There are four conclusions in this research. First, the difficulties met by students in understanding problems are difficulties in understanding mathematical terms, reading comprehension, connecting the initial and goals states, and connecting meanings. Second, the main factors that affect student difficulties in understanding the problem are their lack of carefulness in reading the task and conceptual understanding. Third, the difficulties met by students in making mathematical models are related to their struggles in working mathematically. Finally, the main factors that affect student difficulties in making mathematical models are the students' lack of understanding of mathematical concepts, their in-ability to apply these concepts, and their limited practical experience in mathematical modeling.

Keywords: Understanding problems, Making mathematical models

1 Background

One of the main procedures that students must master in the problem-solving process is that they must understand the problem before they can proceed to the next procedure (Polya, 1957). Understanding the problem is the first step in solving problem (Bransford & Stein, 1993; Polya, 1957). Bernardo (1999) states that the task of understanding the problem is the most important thing in successfully solving the problem. Students

who experience difficulties in understanding problems will certainly influence the subsequent process of solving problems (Abdullah et al., 2015; Mokhtar et al., 2019; Phonapichat et al., 2014; Santoso et al., 2017). Difficulty understanding the problem is the difficulty experienced by students in understanding the main problem as a whole. After understanding the problem, students must master in making the mathematical model. Making a mathematical model is the process of translating a real situation into a mathematical sentence (Blum, 2015). Mathematical modeling is an activity that demands cognitive abilities such as understanding mathematical connections, non-mathematical competencies, and extra-mathematical knowledge, especially for translation and conceptual ideas (Blum, 2015).

The 2018 PISA (Program for International Student Assessment) results show that Indonesian students' scores are lower than the international average score (OECD, 2019). Nationally, around 71% of Indonesian students who take PISA do not reach the minimum competency level in mathematics (Kemendikbud, 2019). The research results of Haji et al. (2018) show that one of the difficulties experienced by students in solving PISA questions is difficulty understanding the problem and making mathematical models. In line with the PISA results, students' abilities in working on Numeracy Minimum Competency Assessment (AKM) questions are also still relatively low (Fauziah et al., 2022). One of the difficulties in solving AKM questions is students' difficulty in understanding the content of the questions and making mathematical models (Cahyanovianty, 2020; Sari et al., 2021).

Several studies in Indonesia found that students' ability to understand problems and create models is still relatively low (Ariyani, 2019; Suhita et al., 2013). The difficulties that students' experiences are understanding the problem and the inability to interpret the problem into a mathematical model (Sulistiowati et al., 2019). The highest difficulty that students experience in solving problems is understanding and formulating the problem (Herman et al., 2022).

To help students overcome the difficulties in understanding problems and making models that have been described previously, a clear description of students' difficulties in understanding problems and making models is first needed. In this study, researchers investigated the difficulties and factors causing students' difficulties in understanding problems and making models. As for identifying students' difficulties in understanding problems and making models, this can be done through analysis. Difficulties in understanding the problem and making models need to be analyzed in depth. An analysis of students' difficulties in understanding problems and making mathematical models can be used as a basis for designing better learning to improve the ability to understand problems and the ability to create models, which leads to increasing students' ability to solve contextual problems. Seeing the small number of studies that specifically discuss the ability to understand problems and create models, there appears to be a great opportunity to examine in more depth the ability to understand problems and create models. Based on the description above, researchers are interested in conducting research with the title "Students' Difficulties in Understanding Problems and Making Mathematical Models in the Process of Contextual Problem Solving."

2 Method

This research was qualitative with a phenomenological hermeneutic design. Phenomenology as a philosophy involves intellectual activities in interpretation and meaning-making (Farid, 2018). Phenomenology cannot understand phenomena as a whole without giving meaning to individual experiences. Therefore, to understand this phenomenon in depth, hermeneutics is needed, which is a philosophy of interpreting meaning (Simega, 2013).

The study was carried out in the eighth-grade classrooms of two secondary schools in Bandung, involving a total of 60 students. The methods used are tests, and interviews. After taking the test, 12 students were selected to be research subjects for in-depth interviews. These twelve students were selected based on the characteristics of their answers when taking the test. Interviews were conducted to explore the reasons why they reached these conclusions and possible solutions. For data collection carried out using think aloud, students are given paper and pens to work on questions and explain their mental activities in understanding and solving problems.

The main instrument in qualitative research is the researcher himself. The researcher, as an instrument, will collect, process, and interpret data (Creswell, 2014). Supporting instruments in qualitative research are contextual problem tests and interview guidelines. The test provided consists of 8 contextual problems, comprising 6 questions assessing problem understanding and 2 questions assessing the ability to make mathematical models. The test is given in the form of long-answer questions so that researchers can examine students' flow of thinking through the answers given. Before being given to students, the test was validated by mathematics education experts for content, construct, and face validity. The interviews used in this research were semi-structured interviews. Semi-structured interviews are in-depth interviews that also allow for deeper discovery (Magaldi & Berler, 2020). Interviews were conducted until no more new information could be obtained from the participants or until they felt they had provided sufficient information.

There are four fundamental principles in this research, namely credibility, transferability, dependability, and confirmability (Yin, 2015). The indicators used for understanding problems in this study include understanding mathematical terms, reading comprehension, connecting the initial and goals states, and connecting meaning. On the other hand, the indicators for making mathematical models involve students' ability to construct models pictorially or abstractly.

3 Result and Discussion

3.1 Students' Difficulties in Understanding Problems

The following is the percentage of students who experience difficulty in understanding the problem.

Table 1. Students' Difficulties in Understanding Contextual Problems

No	Types of Difficulties	Number of students who experience difficulty
1	Difficulty in understanding mathematical terms	55%
2	Difficulty in reading comprehension	72%
3	Difficulty in connecting the initial and goals states	54%
4	Difficulty connecting meaning	79%

Based on Table 1 above, the difficulty most students face in understanding problems is connecting meaning. 79% of students have difficulty connecting meanings. The next difficulty with the highest percentage is difficulty in capturing implied and explicit meaning. 72% of students have difficulty capturing implied and explicit meaning.

3.2 Students' Difficulty in Making Mathematical Models

The following is the percentage of students' difficulty in making mathematical models.

Table 2. Students' Difficulties in Making Mathematical Models

No	types of Mathematical Models	Percentage of Students Who Experience Difficulty
1	Pictorial mathematical model	92,5 %
2	Abstract mathematical model	87,5 %

Based on table 2 above, the difficulty most students face in making mathematical models is difficulty in making mathematical models in pictorial form. The number of students who had difficulty making pictorial mathematical models was 92.5%. Meanwhile, the number of students who had difficulty making abstract mathematical models was 87.5%.

3.3 Factors Affecting Students' Difficulties in Understanding Problems

Understanding mathematical terms

Problem 1:

There are 9 number cards, namely cards with the numbers 5, 17, 25, 3, 10, 11, 9, 15 and 31. Bella takes cards with the numbers 5, 15 and two other cards so that the sum of the four numbers on the cards is the card is 32. What is the ratio of the two numbers on the other two cards?

$$\begin{aligned} \Rightarrow 32 &= 5 + 15 = 20 \\ 32 &= 20 + 9 + 3 \\ \Rightarrow 5 + 15 + 9 + 3 &= 32 \end{aligned}$$

Fig. 1. S1's Answer

Figure 1 shows that the student can determine the other two number cards so that the total of the four cards is 32. However, from the result of this answer, it is not clear that the student wrote an answer regarding the ratio between the other two number cards. To confirm the student's answer, an interview was conducted with the subject. The results of the interview can be seen as follows:

- R* : Can you explain your answer to this problem?
S1 : Bella takes 4 cards, miss. The total of the four cards is 32. Two cards are already known, namely, 5 and 15, which total 20. So, the other two cards must total 12. So, the possible cards are cards 9 and 3.
R : OK, that's right. But try to re-read the problem. What is the question?
S : The Ratio of the two numbers on the other two cards.
R : Okay. So, what is the ratio?
S1 : I don't know miss.
R : Do you know what the ratio is?
S1 : No.
R : Have you ever heard the word 'ratio' before? You've studied it, right?
S1 : Yes. I've studied it, miss. But I've forgotten.

Based on the results of the answer and interviews with S1, the student experienced difficulty interpreting the word "ratio". The factor that affects the student's difficulty is that the student does not understand the concept of ratio well, so the student cannot determine how to solve it to find the correct answer. Students' lack of knowledge about words results in their not being able to interpret words correctly.

Problem 2:

Toni has a younger brother. Toni's brother is 5 years younger than Bella. If Toni's brother is currently 10 years old, how old is Bella now?

5 Tahun karena usia Bella lebih muda dari adik toni yang berusia 10 tahun

5 years old, because Bella's age is younger than Toni's brother who is 10 years old

Fig. 2. S2's Answer

Figure 2 shows that the student cannot answer problem 2 correctly. This can be seen from the incorrect calculation results, where the student's final answer was 5 years,

while the correct answer was 15 years. To confirm the student's answer, an interview was conducted with the subject. The results of the interview can be seen as follows:

R : Can you explain your answer to this problem?

S2 : Bella is 5 years old, miss. Bella is younger than Toni's brother.

R : Why did you answer 5 years?

S2 : Because it said '5 years younger than'. It means that we do subtraction.

R : Your answer is still wrong. Toni's brother is 5 years younger than Bella. So, who is younger? Is Toni's brother or Bella?

S2 : Toni's brother, right?

R : Yes, that's right, Toni's brother, not Bella. Then why did you write that Bella is younger?

S2 : The language is too difficult to understand, miss.

Based on the results of the answer and interviews with S2, the student was unable to interpret the phrase "5 years younger than". The factor that affects the student's difficulty is that the student still lacks understanding of the concept of age comparison, which results in the student not being able to properly understand the phrase "5 years younger than". Apart from that, based on the interview results, it was also discovered that the student was not careful in reading the question, which resulted in the student making mistakes in determining calculation techniques and being unable to complete the solution steps to arrive at the meaning of the phrase "5 years younger than".

Problem 3:

A mother's age is 5 years older than 3 times her daughter's age. If the mother's current age is 41 years, how old is the daughter's current age?

usia ibu = 41 tahun
anak perempuan = 26

$= 8 \times 3 = 15$
 $= 41 - 15 = 26$

Mother's age = 41 years old
Daughter's age = 26

Fig. 3. S3's Answer

The picture above shows that the student cannot answer problem 3 correctly. This can be seen from the incorrect calculation results, where the student's final answer was 26 years, while the correct answer was 12 years. From the results of the answers, it can be seen that the student still misinterpreted the sentence "A mother's age is 5 years older than 3 times her daughter's age." The student's solution step did not symbolize the meaning of the sentence where the student did the wrong calculation, namely

multiplying 5 and 3. To confirm the student's answer, an interview was conducted with the subject. The results of the interview can be seen as follows:

- R* : Can you explain your answer to this problem?
S3 : Because in the question it is written '5 years older is 3 times her daughter's age' It means that I do multiplication. $5 \times 3 = 15$. Then I do subtraction $41 - 15 = 26$. So, the daughter's age is 26 years.
R : Are you sure that "5 years older than 3 times her daughter's age" means 5×3 ?
S3 : Actually, I don't know, miss
R : The meaning of "A mother's age is 5 years older than 3 times her daughter's age" is not 5×3 . Have you tried reading the question over and over again to understand the sentence?
S3 : Not yet, miss.

Based on the results of the answer and interviews with S3, the student was unable to interpret the sentence "A mother's age is 5 years older than 3 times her daughter's age". The factor that affected the student's difficulty is that the student was not careful when interpreting sentences that contained phrases, which resulted in them not being able to determine the solution correctly. The student did not try to read the problem repeatedly to understand the sentence "A mother is 5 years older than 3 times her daughter's age". The difficulties found above are in accordance with the research results of Herman et al. (2022), who found that one of the main factors that causes students to have difficulty understanding problems is difficulty interpreting language in words, phrases, sentences, and between sentences.

Reading comprehension

Explicit meaning is the meaning written directly in the text or statement. This has a clearly stated meaning and requires no additional interpretation. Meanwhile, implicit meaning is meaning that is hidden or not stated explicitly in a text or statement. This is a meaning that needs to be revealed or concluded based on understanding and reasoning.

Problem 4:

Pak Hadi has a garden. The garden's perimeter is rectangular. Mr. Hadi plans to plant mini elephant grass throughout the garden area. The perimeter and width of Pak Hadi's Garden are 50 meters and 10 meters, respectively. The price of mini elephant grass is IDR 20,000 per square meter. If Mr. Hadi has IDR 5,000,000, how much money does Mr. Hadi have left after buying the grass?

Dik: keliling > 50m
lebar > 10m
Harga > Rp. 20.000 / meter²

• 50 meter X Rp. 20.000
Rp. 1.000.000

→ 20.000
50
00000 X
100000 +

• 10 meter X Rp. 20.000
Rp. 200.000

→ 20.000
10
00000 X
200000 +

Total >> Rp. 1.200.000

Balance

Sisa >> Rp. 5.000.000
Rp. 1.200.000 -
3.800.000 //

Perimeter = 50m
Width = 10m
Price = Rp.20.000/m²

Fig. 4. S4's Answer

Problem 4 contains implicit and explicit meanings. The implicit or hidden meaning in problem 4 is that students must first determine the length and area of the garden before they can answer the question asked. In this case, S4 cannot answer problem 4 correctly. S4 did not determine the length and area of the garden in advance. In solving problem 4, S4 multiplied the perimeter of the garden by the price of grass per square meter, multiplied the width of the garden by the price of grass per square meter, and then added up the prices. To confirm the student's answer, an interview was conducted with the subject. The results of the interview can be seen as follows:

- S4 : *The perimeter is 50 meters, and the width is 10 meters. And the price of grass is 20,000 per meter square. I multiplied 50 by 20,000, which is 1,000,000. Then I multiplied 10 by 20,000, i.e., 200,000. Then the number is 1,200,000. Because Mr. Hadi's money is 5,000,000, so, Mr. Hadi has 3,800,000 left.*
- R : *Are you sure about it?*
- S4 : *Sure, miss. Am I doing it wrong, miss?*
- R : *Yes. It is still wrong. The price of the grass is 20,000 per square meter. This means you have to find the area of the garden first. Do you know how to find the area if the perimeter and width are known?*
- S4 : *I forgot how miss.*

Based on the results of the answer and interviews with S4, the student was unable to grasp the implicit meaning of the problem given. The student did not look for the length and area of the garden first. The factor that affects the student's difficulty is the student still lacks contextual knowledge possessed by the student. Understanding

implicit meaning requires understanding the context surrounding a given text or situation.

If students do not have a sufficient understanding of the context, they may have difficulty grasping the implicit meaning. In this case, students' understanding of the context regarding the area of a rectangle is still lacking. The difficulties above are in line with the opinion of Emanuel et al. (2021), who say that students do not understand the problem because they are not able to digest the meaning well, so they often have difficulty understanding.

Connecting the initial and goals states

Problem 5:

Rafael plans to buy a new bicycle brand A. Rafael has savings of IDR 2,500,000 and from his mother IDR 750,000. The next day, Rafael read a brochure from the "Golden Bike" bicycle shop with the following price list.

Table 3. Price list in the "Golden Bike" store

Brand	Price
A	Rp3.000.000
B	Rp3.000.000
C	Rp3.500.000
D	Rp4.000.000

The brochure also states that purchasing a bicycle from brand A will get a 10% discount, and purchasing a bicycle from brand B will get a 20% discount. Determine the price of a brand-A bicycle after discounting.

Jadi harga sepeda A 6.250.000

$$\begin{array}{r} 2.500.000 \\ + 750.000 \\ \hline 3.250.000 \end{array}$$

$$\begin{array}{r} 3.250.000 \\ + 3.000.000 \\ \hline 6.250.000 \end{array}$$

So, the price of A bike is 6,250,000

Fig. 5 S5's answer

In the problem above, the student is required to identify necessary information and ignore unnecessary information. The information needed is the price of brand A bicycles and the discount amount for brand A bicycles, namely 10%. The rest is unimportant information and should be ignored. In answer S5, the student used unimportant information to solve the problem. The student is fooled by this unnecessary information. From the results of S5's answer and interviews, the student was unable to identify the required information. The factor that affects the student's difficulty is the student's inability to assess relevance. The student has difficulty judging what is relevant and what

is not. The student feels all the information in the text is important. Another factor is a lack of understanding of the concept or context owned by students. Without sufficient understanding of a particular concept or context, students may not know what information is needed.

The above student difficulties are in line with research by Febrianti & Nurjanah (2022), which found that one of the student difficulties was that students were unable to differentiate relevant information (for example, using all the information in the question or ignoring relevant information) or were unable to gather information that was required but was not in the question.

Connecting meaning.

Problem 6:

Adi, Budi, Cyndi, and Demas often do assignments in groups. Adi, Budi, Cyndi, and Demas' houses in order from left to right. On Monday, Adi rode a bicycle to Cyndi's house, covering a distance of 300 meters. On Tuesday, Budi walked to Demas' house, covering a distance of 550 meters. The distance from Adi's house to Budi's house is the same as the distance from Budi's house to Cyndi's house. Determine the distance from Adi's house to Demas' house.

Karena adi berangkat ke rumah Cyndi menggunakan sepeda maka adi juga akan ke rumah Demas mengendarai sepeda.

Jarak : ADI - Cyndi = 300 m
 ADI - Budi = $300 : 2 = 150 \text{ meter / Rumah}$
 ADI - Demas = $150 \times 3 = 450 \text{ meter / Sepeda}$

Because Adi went to Cyndi's house by bicycle, Adi will also go to Demas's house riding a bicycle

Fig. 6. S6's Answer

To confirm the student's answer, an interview was conducted with the subject. The results of the interview can be seen as follows.

R : Can you explain your answer to this problem?

S6 : Adi's house to Cyndi's house, miss, the distance is 300m. Meanwhile, Budi's house is between Adi and Cyndi's houses. That's why the distance between Adi and Budi is 150m, and the distance between Budi and Cyndi is 150m. This means that the distance from Cyndi's house to Demas is also 150m. Therefore, the distance from Adi's house to Demas is $150 + 150 + 150$, which is 450m miss.

R : Are you confident with your method of work?

S6 : Is my answer wrong miss?

- R : *How do you know that the distance from Cyndi's house to Demas is 150m?*
- S6 : *Because the distance from Adi's house to Budi is 150m and the distance from Budi's house to Cyndi is 150m.*
- R : *Has anyone been told that the distance from Adi's house to Budi, the distance from Budi's house to Cyndi, and the distance from Cyndi's house to Demas are the same?*
- S6 : *No, miss.*

From the results of answers and interviews with S6, students were unable to connect meaning between the information provided in solving problems. The causal factors are the lack of understanding of basic concepts possessed by students. This difficulty is often caused by a lack of understanding of basic mathematical concepts. Before someone can connect meaning in a math problem, they must have a solid understanding of basic concepts such as numbers, operations, comparisons, and so on. Another causal factor is the lack of problem-solving strategies possessed by students. Students do not have effective strategies to solve the questions given. Students don't know where to start or how to connect the steps to reach a solution.

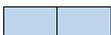
3.4 Factors Affecting Students' Difficulties in Making Mathematical Problems

Making a pictorial mathematical model.

Problem 7

Indonesia is one of the largest coffee-producing countries in the world. It is known that the ratio of coffee exports to Algeria and Romania in 2021 was 1:2. In 2022, Indonesia increased its coffee exports to Algeria by 15 tons more than in 2021, resulting in a new ratio of 2:1. To determine the amount of coffee tons exported to Algeria in 2021, express the situation above in a diagram!

The following is the expected answer from the students.

Year/Country	Algeria	Romania	Ratio
2021			1:2
2022			2:1

$$\frac{15}{3} = 5$$

So, the coffee exported to Algeria in 2021 was 5 tons.

This is the real of a student's answer:

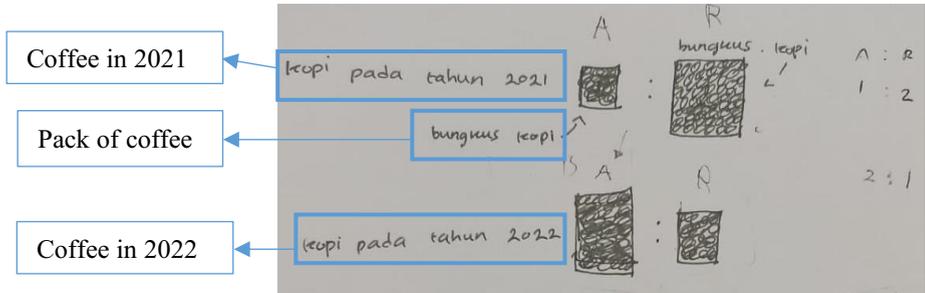


Fig. 7. S7's Answer

Based on the answer above, it can be seen that the student has not yet been able to make a mathematical pictorial model well. In the answer above, the student only understands the meaning of the word "comparison," but the student has not been able to apply the concept of comparison in solving the given problems.

To confirm the student's answer, an interview was conducted with the subject. The results of the interview can be seen as follows.

- R : Can you explain your answer to this problem?
 S7 : Actually, I can explain my answer, miss. But I'm still a bit unsure about my answer.
 R : So, how did you answer the question?
 S7 : So, I assumed that this picture (pointing to the square picture for 2021) represents a ratio of 1 to 2 in the question. Then, for the next picture, it represents a ratio of 2 to 1.
 R : How did you conclude that the pictures represent 1 to 2 and 2 to 1?
 S7 : Based on the pictures, there is one that is smaller and the other is larger.
 R : So, do you think the ratios you've created are suitable for the context of the question?
 S7 : I'm not sure, miss. It's difficult to represent the situation in the form of a diagram.
 R : But you do understand the meaning of the question, right?
 S7 : Yes, I understand the question, miss. But I'm confused about how to represent it.

Based on the results of the answers and interviews with the student, the student experiences difficulty in visualizing information and identifying the relationships between elements in the pictures. The factors causing the student's difficulty are the student's inability to apply the concept of comparison and the lack of practical experience in creating pictorial mathematical models.

Making abstract mathematical model.

Problem 8

Ari's height is 52 cm taller than Sani's height. Meanwhile, if Sani's and Ari's heights are added together, it is 218 cm. Determine the respective heights of Sani and Ari!

Sani + Ari = 218 cm
 tinggi Ari = 109 + 52 = 161 cm
 tinggi Sani = 109 - 52 = 57 cm

Sani's height
 Ari's height

Fig. 8. S8's Answer

Based on the students' answers above, S8 created a concrete mathematical model. S8's error in this problem was dividing 218 by 2 and then operating each with 52 cm, the tallest plus 52 cm, and the shorter minus 52 cm. The researcher asked students to check their answers again.

R : "Why did you divide it by 2?"

S8 : "Because Sani and Ari's height when added together is 218 cm, so later we just have to subtract something. 52 cm, and add 52 cm because Sani is 52 cm taller than Ari."

R : "Sani's height is 161 cm and Ari's height is 57 cm; is the difference between their heights correct at 52 cm?"

S8 : "Oh yes, miss, I was wrong, miss."

S8 in this problem does not do "looking back" like the Polya heuristic. S8 failed to recheck the solution it had found so it got incorrect results. S8 made a mistake in determining height when the sum and difference were known, this student succeeded in finding the correct number but failed in the difference. Apart from S8 students, there are still many who answer questions like this, so the average participant in this study experiences the same problem. The factor that causes S8 to not be able to model mathematics well is the lack of ability to represent abstractly. This is because students do not have a good concept of the meaning of height difference.

4 Conclusion

The difficulties faced by students in understanding problems are difficulties in understanding language, difficulties in capturing implied and explicit meanings, difficulties in identifying the information needed, and difficulties in connecting meanings. The difficulties faced by students in making mathematical models are difficulties in

making pictorial models and difficulties in making abstraction models. The difficulty most students face in understanding problems is difficulty in connecting meaning. The most difficult thing students face in making mathematical models is making pictorial models. The main factors causing students not to understand problems and create mathematical models are students not being careful in reading the problem and students' lack of understanding of the concepts.

5 References

1. Abdullah, A. H., Abidin, N. L. Z., & Ali, M. (2015). Analysis of students' errors in solving Higher Order Thinking Skills (HOTS) problems for the topic of fraction. *Asian Social Science*, 11(21), 133–142. <https://doi.org/10.5539/ass.v11n21p133>
2. Ariyani, W. (2019). Analisis Kesalahan Matematika Siswa dalam Menyelesaikan Soal Cerita Luas Permukaan dan Volume Bangun Ruang (Kubus dan Balok) Berdasarkan Newman's Error Analysis (NEA). *Journal of Mathematical Science and Mathematical Education*, 01(01), 55–64.
3. Bernardo, A. B. I. (1999). Overcoming obstacles to understanding and solving word problems in mathematics. *International Journal of Phytoremediation*, 19(2), 149–163. <https://doi.org/10.1080/0144341990190203>
4. Blum, W. (2015). Quality Teaching of Mathematical Modelling: What Do We Know, What Can We Do? *The Proceedings of the 12th International Congress on Mathematical Education*, 73–96. https://doi.org/https://doi.org/10.1007/978-3-319-12688-3_9
5. Bransford, J. D., & Stein, B. S. (1993). *The IDEAL Problem Solver : A Guide for Improving Thinking, Learning, and Creativity*.
6. Cahyanovianty, A. D. (2020). Analisis Kemampuan Numerasi Peserta Didik Kelas VIII dalam Menyelesaikan Soal Asesmen Kompetensi Minimum. 05(02), 1439–1448.
7. Creswell, J. W. (2014). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*.
8. Emanuel, E. P. L., Kirana, A., & Chamidah, A. (2021). Enhancing students' ability to solve word problems in Mathematics. *Journal of Physics: Conference Series*, 1832(1). <https://doi.org/10.1088/1742-6596/1832/1/012056>
9. Farid, H. (2018). Pendekatan Fenomenologi (Suatu Ranah Penelitian Kualitatif). *Pendekatan Fenomenologi*, 1–9.
10. Fauziah, N., Roza, Y., & Maimunah, M. (2022). Kemampuan Matematis Pemecahan Masalah Siswa dalam Penyelesaian Soal Tipe Numerasi AKM. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 6(3), 3241–3250. <https://doi.org/10.31004/cendekia.v6i3.1471>
11. Febrianti, P., & Nurjanah, N. (2022). Kesulitan Siswa Smp Dalam Menyelesaikan Soal Pisa 2021. *Transformasi : Jurnal Pendidikan Matematika Dan Matematika*, 6(1), 13–24. <https://doi.org/10.36526/tr.v6i1.1664>
12. Haji, S., Yumiati, & Zamzaili. (2018). Analisis Kesulitan Siswa dalam Menyelesaikan Soal-Soal PISA (Programme for International Student Assessment) di SMP Kota Bengkulu. *Jurnal Pendidikan Matematika Raflesia*, 03(02), 177–183.
13. Herman, T., Rahmi, K., & Utami, N. S. (2022). Student Learning Obstacles in Solving Contextual Mathematical Problems. *AIP Conference Proceedings*, 2659. <https://doi.org/10.1063/5.0113653>

14. Kemendikbud, B. (2019). Pendidikan di Indonesia belajar dari hasil PISA 2018. *Pusat Penilaian Pendidikan Balitbang KEMENDIKBUD*, 021, 1–206.
15. Magaldi, D., & Berler, M. (2020). *Semi-structured Interviews BT - Encyclopedia of Personality and Individual Differences* (V. Zeigler-Hill & T. K. Shackelford (eds.); pp. 4825–4830). Springer International Publishing. https://doi.org/10.1007/978-3-319-24612-3_857
16. Mokhtar, M. A. M., Ayub, A. F. M., Said, R. R., & Mustakim, S. S. (2019). Analysis of Year Four Pupils' Difficulties in Solving Mathematical Problems Involving Fraction. *International Journal of Academic Research in Business and Social Sciences*, 9(11), 1560–1569. <https://doi.org/10.6007/ijarbss/v9-i11/6766>
17. OECD. (2019). Indonesia Education at a Glance. *OECD: Country Note*, 1–5.
18. Phonapichat, P., Wongwanich, S., & Sujiva, S. (2014). An Analysis of Elementary School Students' Difficulties in Mathematical Problem Solving. *Procedia - Social and Behavioral Sciences*, 116(October 2015), 3169–3174. <https://doi.org/10.1016/j.sbspro.2014.01.728>
19. Polya, G. (1957). How to solve it: a new aspect of mathematical method second edition. In *The Mathematical Gazette* (Vol. 30, p. 181).
20. Santoso, D. A., Farid, A., & Ulum, B. (2017). Error Analysis of Students Working about Word Problem of Linear Program with NEA Procedure. *Journal of Physics: Conference Series*, 855(1). <https://doi.org/10.1088/1742-6596/855/1/012043>
21. Sari, D. R., Lukman, E. N., & Muharram, M. R. W. (2021). Analisis Kemampuan Siswa dalam Menyelesaikan Soal Geometri pada Asesmen Kompetensi Minimum-Numerasi Sekolah Dasar. *Fondatia*, 5(2), 153–162. <https://doi.org/10.36088/fondatia.v5i2.1387>
22. Simega, B. (2013). *Hermeneutika Sebagai Interpretasi Makna Dalam Kajian Sastra*. 24–48.
23. Suhita, R., Sjahrudin, R., & Aunillah. (2013). Analisis-Kesalahan-Dalam-Menyelesaikan-Soal-Cerita-Pada-Materi--Persamaan-Dan-Pertidaksamaan-Linear-Satu-Variabel-(Studi-Kasus--Peserta-Didik-Kelas-VII-SMP-Negeri-3-Candi-Sidoarjo). *Jurnal Pendidikan Matematika STKIP PGRI Sidoarjo*, 1(2), 37–46.
24. Sulistiowati, D. L., Herman, T., & Jupri, A. (2019). Student difficulties in solving geometry problem based on Van Hiele thinking level. *Journal of Physics: Conference Series*, 1157(4). <https://doi.org/10.1088/1742-6596/1157/4/042118>
25. Yin, R. K. (2015). *Qualitative Research from Start to Finish* (2nd ed., Vol. 4, Issue 1). The Guilford Press.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

