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Students' Pseudo-Thinking Process in Solving SPLDV Problems Based on Polya's Stages

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Abstrak

Proses berpikir *pseudo* siswa terdiri dari *pseudo benar* dan *pseudo* salah, dapat dilihat dari cara menyelesaikan soal SPLDV berdasarkan tahapan Polya. Masalah yang akan dikaji adalah proses berpikir *pseudo* siswa saat menyelesaikan soal SPLDV dengan tahapan Polya. Penelitian ini bertujuan mendeskripsikan proses berpikir *pseudo* siswa dalam memecahkan masalah berdasarkan Tahapan Polya. Penelitian ini dilakukan di salah satu SMP Kota Jambi, Provinsi Jambi, dengan subjek penelitian 2 siswa kelas 8 untuk materi Sistem Persamaan Linear Dua Variabel. Metode yang diguanakan dalam penelitian ini adalah penelitian kualitatif. Pengumpulan data dilakukan dengan triangulasi data, adapun instrumen penelitian menggunakan tes pemecahan masalah dan pedoman wawancara. Analisis data yang dilakukan terdiri dari reduksi data penyajian data dan penarikan kesimpulan. Temuan dari penelitian ini adalah: 1) Pada proses pemecahan masalah matematis, terdapat siswa yang menjawab benar akan tetapi saat di wawancara ternyata siswa hanya hafal rumus dan tidak memahami konsep, ini dinamakan *pseudo* benar. 2) Pada proses pemecahan masalah matematis, terdapat siswa yang menjawab salah tetapi setelah diwawancara siswa dapat merefleksikan sehingga mampu memperbaiki jawaban, ini dinamakan *pseudo* salah. Berdasarkan hasil penelitian, saat mengajar guru dapat mengetahui mana siswa yang benar-benar berpikir dan mana yang berpikir *pseudo*.

Kata kunci: Berpikir *Pseudo,* Pemecahan Masalah Polya, SPLDV

Abstract

The student's pseudo thought process consists of pseudo-true and pseudo-false, it can be seen from how to solve SPLDV problems based on Polya's stages. The problem to be studied is the pseudo thought process of students when solving SPLDV problems with Polya's stages. This study aims to describe the pseudo thought process of students in solving problems based on Polya's stages. This research was conducted at one of the Jambi City Junior High Schools, Jambi Province, with the research subject 2 students of 8th grade students for the material of the System of Linear Equations of Two Variables. The method used in this research is qualitative research. Data collection was carried out by triangulating data, while the research instruments used problem solving tests and interview guidelines. The data analysis consisted of data reduction, data display and conclucing drawing/verification. The findings of this study are: 1) In the process of solving mathematical problems, there are students who answer correctly but when interviewed it turns out that students only memorize formulas and do not understand concepts, this is called pseudo correct. 2) In the process of solving mathematical problems, there are students who answer incorrectly but after being interviewed students can reflect so that they can improve their answers, this is called pseudo-false. Based on

the results of the study, when teaching teachers can find out which students are really thinking and which ones are pseudo thinking.

Keywords: *Pseudo Thinking, Polya Problem Solving, SPLDV*

1. INTRODUCTION

In mathematics learning, problem solving problem solving can be viewed from two sides, namely: problem solving as a mathematical ability, and problem solving as a learning model. Problem solving as a mathematical ability in this paper is referred to as Ability Mathematical Problem Solving Ability (AMPSA). AMPSA is the core of the goal of learning mathematics, because mathematics is learned as a tool to solve problems in various fields (Maryono & Saputri, 2019). In line The National Council of Teachers of Mathematics (NCTM, 2000) states that there are five standards of mathematical ability, namely problem-solving ability, reasoning ability, communication ability, connection ability, and representation ability.

The process of learning mathematics will occur smoothly if the learning itself is carried out continuously. Learning mathematics provides opportunities for students to develop their potential and improve their ability to construct knowledge (Puadah et al., 2022). Mathematical problem-solving is important to study because, in addition to being one of the abilities needed to face the era of the industrial revolution 4.0 in 2020 based on a survey conducted by the World Economic Forum (WEF), problem-solving can (1) help students improve their analytical power so that they can apply that power to various situations (2) help all students who not only explore or study mathematics but also for those who will apply it in other fields of study and in daily life (Hendriana et al., 2017; Law et al., 2016; Ruseffendi, 2006; Widjajanti, 2009). From these various problems, mathematics learning is experiencing change of view. Mathematics that used to be given with a pattern that tends to students to memorize and solve problems based on examples. Currently, mathematics learning must be given to students refers to the various abilities that are achieved (Turmudi et al., 2018). In line with Mashlihah & Hasyim (2019), the ability to solve mathematical problems is the ability of students to find answers to questions contained in a story, text, tasks, and situations in everyday life.

Limbach & Waugh (2010) say "Thinking is the cognitive process used to make sense of the world; questioning everyday assumptions will direct students to new solutions that can positively impact the quality of their lives". Thus, thinking is a process that occurs in the human brain, including students. The thinking process experienced by students is closely related to problem-solving where the thinking process in problem-solving that occurs in students' minds will end until they find the answer (Khasanah, Usodo & Subanti, 2018). The relationship between problem-solving especially in mathematics learning can not only be represented as a skill, method, or learning strategy but as a thinking process (Ali et al., 2010; Isoda, 2010; Sanjaya et al., 2018; Tarim, 2009).

The thinking process cannot be observed because it is a process that naturally occurs in the brain. Thinking is a way for someone to gain knowledge especially to solve problems (Marzano, 1988). However, in finding knowledge, sometimes a person is trapped in confusion between the condition of real knowledge or just belief. not infrequently, a person can believe in certain truths even though there is no evidence and basis (Lacewing, 2015).If this is the case, then the definition of belief is very different from knowledge. In this study, what is seen is the state of students' pseudo-thinking in the final condition, because by looking at the final condition, the process is also seen, namely by using the Polya stage problem-solving test. The final result of solving math problems is the correct answer or the wrong answer. However, the truth of an answer is sometimes pseudo. Pseudo is pretend or pseudo. In solving a mathematical problem two possibilities be obtained, namely the correct answer or the wrong answer. The correct answer is not necessarily the result of a correct thinking process, while the wrong answer is not necessarily the result of a wrong thinking process.(Karlina, 2019; Mufida, 2018; Wibawa dkk., 2018).

The pseudo-process in question is when the process of belief or error that occurs is still confusing. Therefore, their right or wrong answer is still uncertain whether it is a representation of their thinking or not (Ciosek & Samborska, 2016). This vague condition is called pseudo-thinking (Subanji, 2016). Furthermore (Subanji, 2013) explains that there are two pseudo conditions, namely pseudo true and pseudo false. Based on the conditions of pseudo-thinking put forward by Subanji, the researcher summarizes the possible state of pseudo-thinking of students into two possibilities as presented in Table 1.

Table 1. Recapitulation of Pseudo-Thinking Conditions

Conditions	Descriptions
Pseudo True	The student can give/guess the answer correctly but he/she is unable or there is no explanation regarding the answer.
Pseudo False	The student answers incorrectly but the process is carried out conceptually and procedurally and allows for the improvement process

2. METHOD

This type of research is descriptive research with a Qualitative approach which aims to describe the pseudo-thought process of students in problem-solving using Polya's stages on SPLDV material. This research was conducted at one of the Jambi Province Junior High Schools. This research was conducted in the even semester of the 2022/2023 school year. Precisely carried out in March 2023. The subjects in this study were grade VIII students. The data collection technique used is the data triangulation technique. The data collection instruments used are problem-solving tests and interviews to corroborate the pseudo-right or pseudo-wrong thinking process that occurs in these students. The questions tested to students:

1) Mrs. Nur went to the fruit shop to buy Anin's favorite fruits, namely watermelon 3 kg and melon 3 kg for a total price of Rp. 33,000. After arriving home, Anin also bought 6 kg watermelon and 4 kg melon for a total price of Rp. 50,000. What is the price of 1 kg watermelon and 1 kg melon?

   a. What do you understand from the problem?
   b. What are the steps you can take to answer the question?
   c. How did you use the steps to solve the problem?
   d. Check your answer again! Are you sure about your answer?
      (i) If sure, why?
      (ii) If not, why?

2) Mr. Salim is a parking attendant at Zaira Pharmacy. He gets Rp. 25,000 for 4 motorcycles and 7 cars. While for 6 motorcycles and 8 cars Mr. Salim gets Rp. 30,000. How much money will Mr. Salim get if there are currently 8 motorcycles and 10 cars leaving the Zaira Pharmacy parking lot?

   a. What information do you get from the question?
   b. Based on the information you understand, what steps can you take to answer the question?
   c. How do you use these steps to solve the problem?
   d. Check your answer again! Are you sure about your answer?
      (i) If sure, why?
      (ii) If not, why?

3. RESULT AND DISCUSSION

The research began with an observation process to the math teacher with unstructured interviews related to the teaching of SPLDV material in class VIII. The math teacher mentioned that students experience problems when solving complete SPLDV problems. This statement made the researcher decide to conduct research at the school. The research was continued by giving the problem solving test instrument to 41 VIII grade students and students answered on their respective answer sheets.

The problem solving test instrument consists of 2 problems with Polya's stages, which include 4 stages including understanding the problem, planning the solution, implementing the solution, and re-examining the overall results. Student answer sheets that have been completed are then collected. The student answer sheets were then analyzed with the aim of classifying student answers in the form of correct answers, student answers in the form of pseudo answers and incorrect student answers. Answers that are grouped into correct answers are answers given by students by completing the 4 stages of Polya correctly and correctly. Then the answers grouped in pseudo-answers are answers given by students with false steps of completion or final results. While the answers grouped in the wrong answers are the answers given by students with the wrong solution steps and final results. There were 21 students who gave correct and pseudo answers. While students who gave wrong answers in this context were ignored because there was nothing to analyze regarding this research. After that, the 21 student answer sheets were analyzed and taking into account the observation data from the teacher which was useful for determining the number of subjects to be interviewed. There were communication limitations in this study which caused interviews to only be conducted with 2 students who gave correct answers and pseudo answers. Interview guidelines based on pseudo thinking include interview guidelines based on process and interview guidelines based on final results.

The criteria for categorizing the score of mathematical problem solving ability can be seen in Table 2 as follows:

Table 2. Categories of Mathematical Problem Solving Ability

Interval Value	Category
65 – 100	High
55 – 64	Medium
0 - 54	Low

(*Sourcer: Fatmawati, F., & Murtafiah, M., 2018*)

This study examines the results of student answers based on the SPLDV material problem-solving test. Students are considered to have difficulty if they are not correct in each stage. The following are the results of the problem-solving test based on the difficulties experienced by students:

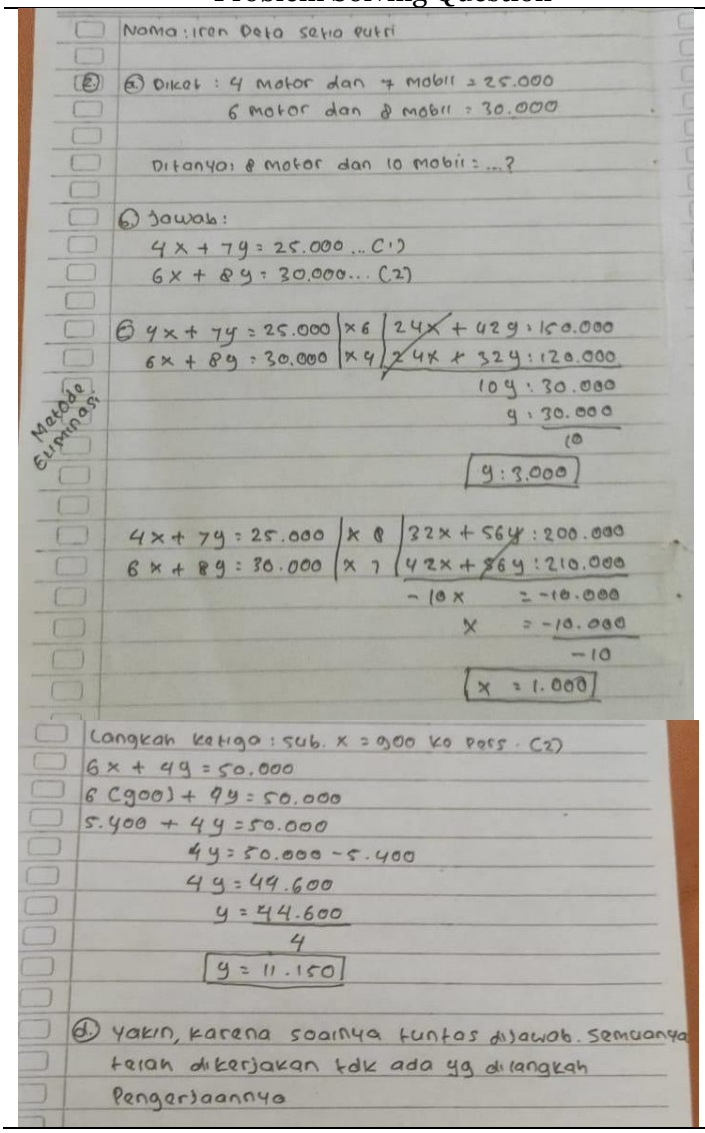
Table 3. Problem-Solving Test Score

No.	Name	Question number								Total score	Value
		1				2					
		a	b	c	d	a	b	c	d		
1	AFA	1	3	3	0	1	4	3	1	17	71
2	IDSP	2	4	3	1	2	4	3	1	20	83

Based on Table 3, it is obtained that from AFA's answer, the pseudo thought process is wrong because each of the Polya stages that AFA has done is not totally correct except for question number 2 point

b. Meanwhile, IDSP's data shows that the pseudo thought process is correct, because in questions 1 and 2 points c and d can be done but incomplete and without explanation regarding the answer. Data showing student answers that are classified as totally correct or wrong in this context can be ignored because it is not a research theme. Pseudo-thinking conditions occur in each material context with varying amounts. For example, students tend to pseudo-correct in the context of SPLDV material but pseudo-incorrect in other material contexts. Even what happened to AFA at the stage of understanding the problem still experienced false pseudo. This happens because there are different types of problem-solving concepts in each material context. Although different, one thing that can be concluded is that the majority of students' overall thinking conditions when working on problem-solving problems in each problem experience pseudo thinking conditions. This shows that the majority of students' mindsets are not in line with what students do on the answer sheet.
The first discussion is related to the true pseudo of students with the initials IDSP. It can be seen in the following table:

Table 4. Correct Pseudo Thinking Analysis Process

Problem Solving Question	Interview
	P: Are you sure about your answer no. 2? IDSP: I am, I don't think I've missed anything. P: okay, if you are sure, in question 2 (b) why did you immediately make a math sentence? Why didn't you explain where you got 4x, 7y, 6x, and 8y from? IDSP: I usually do it like that, ma'am. P: Then, why did you take 3 steps? Did you already find the x and y in the elimination method? IDSP: I thought I would use substitution too, ma'am. P: oh, you actually want to use the mixed method? IDSP: Yes ma'am P: For point d, if you are sure, is there any proof for the x and y variables that you have done? IDSP: I don't know how to prove it.

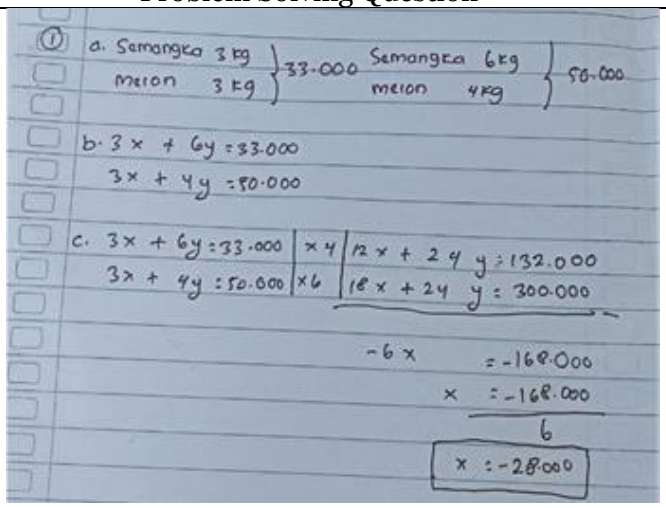
In Table 4, IDSP experienced pseudo-correct because the thinking process was still pseudo but the work was incomplete, as for the pseudo-correct thinking conditions experienced by IDSP, the first is that IDSP has correctly written the math sentence in answer 2 (b) but still does not understand the basic concept of where to get the x and y variables. Furthermore, in problem 2 (c) IDSP in the calculation process is correct but does not understand the method to be used, as a result, it unwittingly has 2 y variables. Then IDSP did not complete her answer in point c because her answer did not fulfill what was asked. In question 2 (d) IDSP was sure of the answer but when asked to prove whether the answer was correct or not IDSP could not prove it.

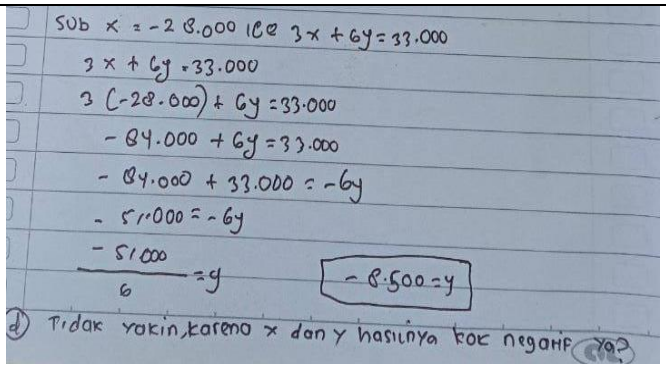
Errors at the stage of implementing the solution plan in high-ranking students are not much different from students who are in other ranks. Vague memories result in students making mistakes in the use of formulas. Based on the results of the interview, it is known that students rarely work on problems like those given in this study. Students tend to imitate the procedures given by the teacher so that if given a problem with a different type, students will have difficulty working on it. So that pseudo thinking is also caused because students are used to working on problems of the same type. This makes students when given a problem with a different type, students will think again which procedure to use and whether the procedure used is correct or not.

Student errors are not only at the stage of understanding the problem, but at all stages in solving problems also cause students to experience pseudo thinking. If all stages in solving problems are carried out properly, the pseudo thinking process can be avoided. Students do not realize that they have experienced a pseudo thinking process. Students who experience a pseudo thinking process are only concerned with finishing the answer quickly but do not care whether the answer they have done is correct or not. Students who experience a pseudo thinking process do not carry out the stages of checking back. (re-examining their answers) so that students do not realize that the answers they give are still wrong. given is still wrong.

This shallow understanding of concepts results from students' uncontrolled thought process called pseudoconceptual thinking. This is in accordance with Vinner (1997) explaining that pseudoconceptual thinking occurs because in solving problems, students are forced to study topics and solve certain problems but do not control what they think. That is what the subject did in solving the problem of a system of linear equations of two variables. The second discussion is pseudo-wrong. The pseudo-wrong thinking process of students with the initials AFA is:

Table 5. False Pseudo Thinking Analysis Process

Problem Solving Question	Interview
	**1. (a) Understanding the Problem** P: From the answer you wrote, is it true that that's all you know about the problem? AFA: yes ma'am, I see in the problem only that which is known. P: Look, from problem 1 (a) there is what is known and asked, try checking the question again, what is known and asked? AFA: oh yes ma'am, my answer only has what is known, I didn't write the question.



1. (b) Planning Problem Solving

P: If I may know where did you get 3x, 6y, 3x and 4y?
AFA: umm ... I remember doing it right away, ma'am.

P: right before, the mother wrote the first step to answer SPLDV, for example, the pen is normalized as x and the pencil as y. Now try to use that concept in problem 1 (b)!
AFA: Oh I know mom, 3x means 3 watermelons, 6y means 6 melons.

P: Check again, do you match the variables you wrote in the math sentence with the problem given?
AFA: No ma'am, it turns out I entered the wrong variable.

1. (c) Implementing Problem Solving

AFA: Mom, my answer 1 (c) is wrong because I entered the wrong variable earlier.

P: Well, next time be careful again when working on it.
AFA: okay mom.

1. (d) Rechecking

P: What method did you use to double check your answer?
AFA: I checked my answers to points a, b, and c.

P: Now that you know the concept, try to work on whether the result is positive or negative.
AFA: I have done it again mom, I am sure the result is 1 kg watermelon = 3,000 and 1 kg melon = 8,000.

In this condition, AFA only writes what is known, and what is asked is not written, it can be seen from his answer that AFA has done pseudo-false thinking where AFA was previously very sure that problem 1 point the information obtained was known only, after the interview it turned out that there was new information being added, because AFA was not careful when reading the problem and as a result, it would have an impact on point c because to answer point is to know what is asked in the problem, but when the interview was conducted, he realized that there was still something missing in his answer in point a. If at the stage of understanding the problem you have made a mistake, then at the next stage you can also make mistakes the next stage can also experience errors. The pseudo-

thinking experienced by students at the low also occurs because of their lack of control over the procedure used. Lack of a good understanding of the concept, errors in substituting what is known in the formula, poor memory, and pseudo-thinking. Known to the formula, vague memories of a formula used and its use resulted in students experiencing pseudo thinking use resulted in students experiencing pseudo thinking.

From these activities it can be seen that there is a pseudo-thinking processwrong thinking process in students. This is in line with research (Vinner, 1997) that thinking errors of mathematical concepts pseudo thinking is right or wrong. Pseudo correct when the student's answer answer is correct but gives the wrong the reason. Whereas pseudo-false occurs when the student's answer is wrong but after reflection students were able to give the correct answer. Actually students can solve the problem correctly but often done spontaneously, vaguely and uncontrolled so that when reflection, students can correct. This is then shows the process of thinking (Subanji & Nusantara, 2013).

This is in accordance with Vinner's (1997) opinion, most students think that they have done the thinking process in solving problems, even though they only imitate what the teacher does. This situation is expressed by Vinner as pseudo thinking, a situation where students do not really use their minds to solve a problem. The subject also did not control what was done, he only worked according to what was done before without having a complete understanding.

4. CONCLUSION

Based on the results and discussion above, the researcher conducted a problem solving test on 2 8th grade students and it can be concluded that when working on problems students experience different thinking processes, the thinking processes that occur are pseudo-correct thinking processes and pseudo-false thinking processes. Students who experience pseudo-correct when working on problems have the correct answer but the answer is not necessarily correct and vice versa, students who experience pseudo-false when working on problems and the answer is wrong do not necessarily not know the material as a whole but only lack understanding of the concept, which has an impact when solving student problem-solving problems as well.

References

Ali, R., Akhter, A., & Khan, A. (2010). Effect of using problem solving method in teaching mathematics on the achievement of mathematics students. *Asian Social Science*, *6*(2), 67.

Ciosek, M., & Samborska, M. (2016). A false belief about fractions–What is its source? *The Journal of Mathematical Behavior*, *42*, 20–32.

Evans, C. W., Leija, A. J., & Falkner, T. R. (2001). *Math links: Teaching the NCTM 2000 standards through children's literature*. Libraries Unlimited.

Hendriana, H., Rohaeti, E. E., & Sumarmo, U. (2017). Hard skills dan soft skills matematik siswa. *Bandung: Refika Aditama*, *7*.

Isoda, M. (2010). Lesson study: Problem solving approaches in mathematics education as a Japanese experience. *Procedia-Social and Behavioral Sciences*, *8*, 17–27.

KARLINA, E. (2019). *Berpikir pseudo peserta didik dalam menyelesaikan soal problem solving ditinjau dari self-efficacy*. Universitas Siliwangi.

Khasanah, V. N., Usodo, B., & Subanti, S. (2018). Student's thinking process in solving word problems in geometry. *Journal of Physics: Conference Series*, *1013*(1), 12133.

Lacewing, M. (2015). Expert moral intuition and its development: A guide to the debate. *Topoi*, *34*(2), 409–425.

Law, E., Fales, J., Beals-Erikson, S., Logan, D., Weiss, K., Randall, E., McTate, E., Gray, L., & Palermo, T. (2016). (496) Problem-solving therapy for parents of children receiving intensive pain rehabilitation. *The Journal of Pain*, *17*(4), S98–S99.

Limbach, B., & Waugh, W. (2010). Developing higher level thinking. *Journal of Instructional Pedagogies*, *3*.

Maryono, I., & Saputri, R. O. (2019). Pengembangan kemampuan pemecahan masalah dan habit of mind matematis mahasiswa melalui teknik self-explanation. *Jurnal Analisa*, *5*(2), 152–160.

Marzano, R. J. (1988). *Dimensions of thinking: A framework for curriculum and instruction*. ERIC.

Mashlihah, L. N., & Hasyim, M. (2019). Pengaruh self-esteem, self-regulation, dan self-confidence terhadap kemampuan pemecahan masalah matematika. *JP2M (Jurnal Pendidikan Dan Pembelajaran Matematika)*, *5*(2), 44–50.

Mufida, I. (2018). *Identifikasi faktor penyebab berpikir pseudo siswa dalam menyelesaiakan masalah pertidaksamaan eksponen*. UIN Sunan Ampel Surabaya.

Puadah, P. F., Nurlaelah, E., & Suhendra, S. (2022). Metacognitive ability of junior high school special intelligent students in solving mathematical problems. *Jurnal Analisa*, *8*(1), 67–80.

Ruseffendi, E. T. (2006). Pengantar kepada membantu guru mengembangkan kompetensinya dalam pengajaran matematika untuk meningkatkan CBSA. *Bandung: Tarsito*.

Sanjaya, A., Johar, R., Ikhsan, M., & Khairi, L. (2018). Students' thinking process in solving mathematical problems based on the levels of mathematical ability. *Journal of Physics: Conference Series*, *1088*(1), 12116.

Subanji, S. (2013). Proses berpikir pseudo siswa dalam menyelesaikan masalah proporsi. *J-Teqip*, *4*(2), 207–226.

Subanji, S. (2016). Teori berpikir pseudo penalaran kovariasional. *Malang: Penerbit Universitas Negeri Malang*.

Subanji, S., & Nusantara, T. (n.d.). Karakterisasi kesalahan berpikir siswa dalam mengonstruksi konsep matematika. *Jurnal Ilmu Pendidikan Universitas Negeri Malang*, *19*(2), 102613.

Tarim, K. (2009). The effects of cooperative learning on preschoolers' mathematics problem-solving ability. *Educational Studies in Mathematics*, *72*, 325–340.

Turmudi, T., Juandi, D., & Sugilar, H. (2018). Meningkatkan kemampuan berpikir kreatif dan pemecahan masalah matematis siswa madrasah aliyah. *Jurnal Analisa*, *4*(1), 33–42.

Vinner, S. (1997). The pseudo-conceptual and the pseudo-analytical thought processes in mathematics learning. *Educational Studies in Mathematics*, *34*(2), 97–129.

Wibawa, K. A., Nusantara, T., Subanji, S., & Parta, I. N. (2018). Defragmentasi pengaktifan skema mahasiswa untuk memperbaiki terjadinya berpikir pseudo dalam memecahkan masalah

matematis. *Prima: Jurnal Pendidikan Matematika*, *2*(2), 93–105.

Widjajanti, D. B. (2009). Kemampuan pemecahan masalah matematis mahasiswa calon guru matematika: apa dan bagaimana mengembangkannya. *Seminar Nasional FMIPA UNY*, *5*.