ISSN 2715-7458
E-ISSN 2715-7466

Journal of Mathematical Pedagogy
Volume 3, No. 1, December 2021, pp. 33-44

Problem-Solving Ability of Female Students with Moderate Cognitive Level in Function Relation

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Abstract

This study aims to determine the problem-solving abilities of female students with moderate cognitive levels in function relations. The subjects of this study were students in grade 8 of junior high school who were taken purposively. Two female students with moderate cognitive levels were obtained. Data collection techniques using written methods and interviews. The data analysis technique uses three stages: data reduction, data presentation, and conclusions drawing. Checking the validity of the data using the triangulation method by comparing the written test data and interviews. In this study, management and data analysis used the NVivo software. This study shows that female students with a moderate cognitive level can carry out systematic problem-solving procedures, including understanding problems, planning, implementing plans, and checking back properly. However, these students have not been able to solve the problem correctly. Therefore, teachers need to train female students to be more thorough so that they are right in solving problems.

Keywords: problem-solving, female student, moderate cognitive level.

Abstrak

Penelitian ini bertujuan untuk mengetahui kemampuan pemecahan masalah siswa berjenis kelamin perempuan dengan level kognitif moderat pada materi relasi fungsi. Subjek penelitian ini adalah siswa SMP kelas 8 yang diambil secara purposif. Diperoleh dua siswa perempuan dengan level kognitif moderat. Teknik pengumpulan data menggunakan metode tertulis dan wawancara. Teknik analisis data menggunakan tiga tahapan yaitu: reduksi data, penyajian data, dan penarikan kesimpulan. Pemeriksaan keabsahan data menggunakan triangulasi metode, dengan membandingkan data tes tertulis dan wawancara. Pada penelitian ini dalam manajemen dan analisis data menggunakan bantuan software NVivo. Penelitian ini menunjukkan bahwa siswa perempuan dengan dengan level kognitif moderat mampu melaksanakan prosedur pemecahan masalah secara sistematis yang meliputi kemampuan memahami masalah, perencanaan, melaksanakan rencana, dan memeriksa kembali dengan baik. Namun demikian, siswa tersebut belum mampu menyelesaikan permasalahan dengan benar. Oleh karena itu, guru perlu melatih siswa perempuan agar lebih teliti sehingga tepat dalam memecahkan masalah.

Kata kunci: pemecahan masalah, siswa perempuan, level kognitif moderat.

How to Cite: Nugroho, M. Setyawati, R.D & Sutrisno (2021). Problem-Solving Ability of Female Students with Moderate Cognitive Level in Function Relation. *Journal of Mathematical Pedagogy*, 3 (1), 33-44.

Introduction

Some students consider mathematics difficult and can be a scourge. According to Baroody et al. (2019) and Li & Schoenfeld (2019), mathematics education in schools has not adequately benefitted children in both developed and developing nations resulting in difficulties for students (Reddy & Panacharoensawad, 2017; Siniguian, 2017; Tambychik & Meerah, 2010). Tambychik & Meerah (2010) also say that students' problem-solving skills in mathematics are weak. Mathematics is vital for enhancing students' problem-solving skills. Meanwhile, problem-solving skills are beneficial for conquering obstacles and reaching goals (Reddy & Panacharoensawad, 2017). Students must link knowledge, skills, and understanding to solve problems effectively.

Problem-solving in mathematics develops essential abilities like applying rules to non-routine problems, finding patterns, generalizing, and mathematical communication. Setiyani et al. (2020)

suggest that students must have basic problem-solving skills to solve mathematics problems. Nursyahidah et al. (2018) state that students must possess problem-solving skills in mathematics and daily life. Students need to learn mathematics for clear and logical thinking, solving everyday problems, relate patterns and experiences, and develop creativity and cultural awareness (Cresswell & Speelman, 2020; Ellis, 2007; Hunter et al., 1993; Mann, 2006). NCTM (2000) suggests four crucial mathematical problem-solving abilities for students: (1) creating new mathematical knowledge, (2) solving diverse problems, (3) employing proper strategies, and (4) monitoring and reflecting on the problem-solving process. Problem-solving is crucial for students to solve mathematics problems. Aydoğdu & Ayaz (2008) argue that problem-solving is crucial in mathematics education as humans cannot avoid problems in daily life. Solving problems is an essential human activity. Men must solve problems themselves to avoid defeat in life. A problem is a situation or question without a clear resolution, according to Siniguian (2017). Students must plan procedures when dealing with mathematics problems. Proctor (2018) claims that problems should be eliminated as they create difficulties. Problem-solving abilities need development in students who may be able to solve problems with routine or non-routine procedures. Palmér & Bommel (2018) explain that a question becomes a problem only if it presents a challenge beyond a routine solution. Therefore, a situation may be problematic for an individual but not for others. It may only be his problem, not in other situations. Problem-solving is accepting a challenge to solve issues (Doorman et al., 2007; Shodikin et al., 2021). Setiyani et al. (2020) suggest that solving mathematics problems develops mathematical power for students. Problem-solving involves more than just applying learned rules. It is an unusual activity that aims to find a solution. Polya identifies four stages in mathematical problem-solving: state that Polya's four steps of problem-solving: (1) understanding the problem, (2) devising the plan, (3) carrying out the plan, and (4) looking back (Muhtarom et al., 2017; Nursyahidah et al., 2018). Students should identify what is known, make alternative solutions, try out possibilities, and complete their steps or make alternative answers.

Gender differences impact physical and cognitive development. Wüstenberg et al. (2014) found gender differences in problem-solving thought processes. Gender differences affect students' ability to represent and solve problems. Men tend to be spatial, and women tend to be verbal, resulting in different approaches to representation (Ertl et al., 2017). Upadhayay (2014) found that girls excel in verbal abilities while boys perform better in visual-spatial and mathematics skills. According to Rusminati (2018), female students have good verbal abilities as they read and write down their plans quickly without using pictures when solving problems, indicating coherent problem-solving skills. Women are often considered emotional and submissive caregivers who lack mathematics knowledge (Gerstenberg et al., 2012). However, their communicative personalities can help compensate for this weakness. Differences in student profiles affect problem-solving abilities with functionality. Lestari & Juniati (2018) claim gender differences in mathematics problem-solving are crucial for mathematics performance. Reilly et al. (2019) 's study results state that boys excel in reasoning, while girls excel in accuracy and thorough thinking. Boys excel in mathematics and mechanics more than girls, especially at higher levels. From this opinion, it can be concluded that female students have good verbal skills; in this case, women are coherent in solving a problem. This research aims to determine the problem-solving abilities of female students with moderate cognitive abilities in function relations. Students in this category need to be examined because usually in a class dominated by these students. In addition, these students can also explain their learning experience quite well, and it is possible to find exciting things during research, for example misconceptions, learning difficulties, etc.

Method

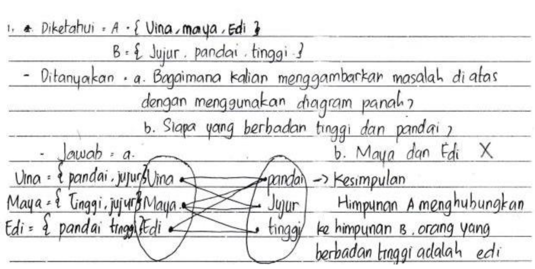
This study used a qualitative research method, with the subject being junior high school students in grade 8. Two female students were taken purposively as research subjects: S-AS and S-SZ. Technique collection data using tests and interviews. The test measures mathematical problem-solving ability according to Polya's indicators related to function relations and consists of three questions. Meanwhile, the interview was conducted to determine the steps students took in completing the test, and later it will be juxtaposed with test results. An interview guide containing aspects to be explored and studied in depth was prepared for the interview. The test and interview guide were prepared with experts, namely lecturers who are experts in their fields and mathematics teachers who know the level of the questions. This validation is so that the questions given to students can measure the construct under study. All test and interview guide items were declared to have fulfilled content validity based on expert judgments.

This test was given to two female students; this subject aims to represent the gender of students. The results of the problem-solving ability tests were analyzed and continued with interviews with students to cross-check the data. Data analysis techniques were carried out in three stages: data reduction, data presentation, and conclusions drawing. Data credibility is measured with the methods triangulation by comparing tests and interviews data and sources triangulation by comparing research subjects. Data management and analysis in this study used the NVivo software because of its various advantages (Khanifah et al., 2019; Sutrisno et al., 2019).

Results and Discussion

S-AS Subject

In the first question, S-AS subjects can perform problem-solving skills well; subjects can systematically carry out problem-solving abilities from the initial to the final stage. Even though she could carry it out systematically, the subject could not solve the problem correctly. There are points where the subject is unable to solve the problem correctly. The subject could not understand what was asked of the problem. The test results on the first item on the S-AS subject can be seen in Figure 1.

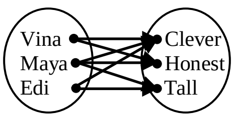


Given: A = {Vina, Maya, Edi}
B = {Honest, Clever, Tall}

Asked: a. How would you describe the problem above using arrow diagrams?
b. Who is tall and clever?

Answer:

a. Vina = {Clever, Honest}
Maya = {Tall, Honest}
Edi = {Clever, Tall}



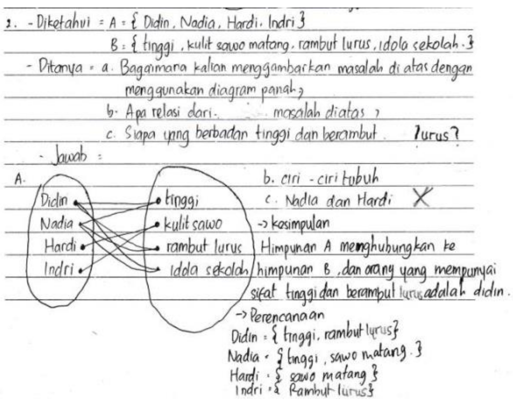
b. Maya and Eddie
Conclusion: Set A connects to set B. The tallest person is Edi.

Figure 1. Answer S-AS on the first question

In Figure 1, it can be seen the S-AS subjects encountered an error at the stage of executing the plan. There is a point where the subject cannot substitute data from the problem correctly; at the first point, the subject can substitute data correctly, but at the second point, the subject cannot solve the problem correctly. At the second point, the subject could not answer the problem correctly because the subject misunderstood what was asked in the first question. From the subject's answer to the first question, the subject interprets what was asked, namely, who is tall and who is smart, so the subject's answers to the first question were Maya and Edi because Maya was also tall.

Like the first question, the S-AS subjects in the second question could perform problem-solving skills well. The subject could systematically develop problem-solving abilities from the initial to the final stage. Even though she could carry it out systematically, the subject in the second question could still not solve the problem correctly. There are points where the subject is unable to solve the problem correctly. The subject could not understand what was asked of the problem. The test results for the two S-AS subjects can be seen in Figure 2.

Figure 2 shows that the S-AS subjects still experienced errors when implementing the plan on the second question. There is a point where the subject in substituting data from the problem cannot carry it out correctly; on the first and second points, the subject can substitute data correctly, but on the third point, the subject cannot solve the problem correctly. At the third point, the subject could not answer the problem correctly because the subject misunderstood what was being asked and substituted the answer in the first question. From the subject's answer to the second question, the subject interprets the thing being asked, namely, who is tall and who has straight hair. So that the subject's answers to the first question were Nadia and Hardi because Nadia was tall.

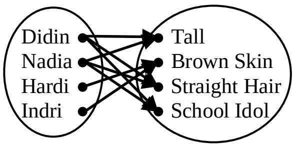

2. - Diketahui = A = { Didin, Nadia, Hardi, Indri }
B = { tinggi, kulit sawo matang, rambut lurus, idola sekolah. }
- Ditanya = a. Bagaimana kalian menggambarkan masalah di atas dengan menggunakan diagram panah?
b. Apa relasi dari masalah diatas?
c. Siapa yang berbadan tinggi dan berambut lurus?
- Jawab :
A.
Didin
Nadia
Hardi
Indri
tinggi
kulit sawo
rambut lurus
idola sekolah
b. ciri - ciri tubuh
c. Nadia dan Hardi
-> kesimpulan
Himpunan A menghubungkan ke himpunan B, dan orang yang mempunyai sifat tinggi dan berambut lurus adalah didin.
-> Perencanaan
Didin = { tinggi, rambut lurus }
Nadia = { tinggi, sawo matang. }
Hardi = { sawo matang }
Indri = { Rambut lurus }

Given: A = {Didin, Nadia, Hardi, Indri}
B = {Tall, Brown Skin, Straight Hair, School Idol}

Asked: a. How would you describe the problem above using arrow diagrams?
b. What is the relation of the problems above?
b. Who is tall and has straight hair?

Answer:

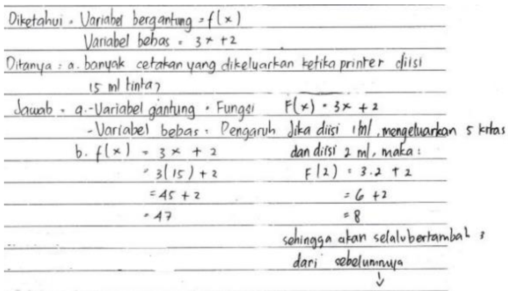
a. Planning
Didin = {Tall, Straight Hair}
Nadia = {Tall, Brown Skin}
Hardi = {Brown Skin}
Indri = {Straight Hair}



b. Body characteristics
c. Nadia and Hardi
Conclusion: Set A connects to set B, and the person who is tall and has straight hair is Didin.

Figure 2. Answer S-AS on the second question

Like the first and second questions, the S-AS subject could perform problem-solving skills well; the subject could carry out problem-solving abilities systematically from the initial to the final stage. However, in the third question, the subject could substitute the data into the concept she knew. The subject was able to solve the problem in the third question correctly. The test results for the three S-AS subjects can be seen in Figure 3.


Diketahui . Variabel bergantung = f(x)
Variabel bebas = 3x + 2
Ditanya : a. banyak cetakan yang dikeluarkan ketika printer diisi 15 ml tinta?
Jawab . a. - Variabel gantung . Fungsi F(x) = 3x + 2
- Variabel bebas : Pengaruh Jika diisi 1 ml, mengeluarkan 5 kertas dan diisi 2 ml, maka :
F(2) = 3.2 + 2
= 6 + 2
= 8
sehingga akan selalu bertambah 3 dari sebelumnya
kesimpulan
b. f(x) = 3x + 2
= 3(15) + 2
= 45 + 2
= 47
Disimpulkan bahwa jika 15 ml tinta dimasukkan, cetakan yang dikeluarkan mesin printer sebanyak 47.

Given: Dependent variable = $f(x)$
Independent variable = $3x + 2$

Asked: How many prints are issued when the printer is filled with 15 ml of ink?

Answer:

a. Dependent variable = Function $f(x) = 3x + 2$
Independent variable = Effect if filled 1 ml, took out 5 paper, and filled 2 ml, then:
$f(2) = 3(2) + 2 = 6 + 2 = 8$
So it will increase by 3 from before.

b. $f(x) = 3x + 2$
$= 3(15) + 2 = 45 + 2 = 47$
Conclusion: It is concluded that if 15 ml of ink is put in, 47 prints are issued by the printer machine.

Figure 3. Answer S-AS on the third question

In Figure 3, it can be seen that the S-AS subjects could carry out problem-solving skills at the stage of carrying out the plan well in the third question. The subject can substitute the data into a concept she knows; the subject can solve the problem in the third question correctly. The subject can carry out the settlement coherently and correctly, as seen from the subject being able to answer each point of the problem. On the first point, the subject was able to interpret the dependent variable and the independent variable; on the second point, the subject was able to answer correctly, namely a printer with the function formula $f(x) = 3x + 2$, if 15 ml of ink is added, it will issue 47 sheets of paper.

Data analysis in this study using the help of NVivo software due to the rich qualitative research data coming from various sources with varied data collection techniques (Khanifah et al., 2019; Muhtarom et al., 2017). Coding was carried out on the software, which aims to describe the problem-solving ability of the S-AS subject. The results of the S-AS subject coding can be seen in Figure 4. The S-AS subjects differ in carrying out each step of the solving ability. Overall, the S-AS subject's coding in completing the planning step is five times; a lot of coding is in understanding the problem and re-examining it six times. Meanwhile, in implementing the plan, the overall S-AS subject has explained it well. Figure 4 shows a lot of coding of the S-AS subjects in implementing the plan seven times. They are good at carrying out the problem-solving abilities of the S-AS subjects. The subject could explain well at the time of the interview, even though in the test results, there were several points the subject could not answer correctly.

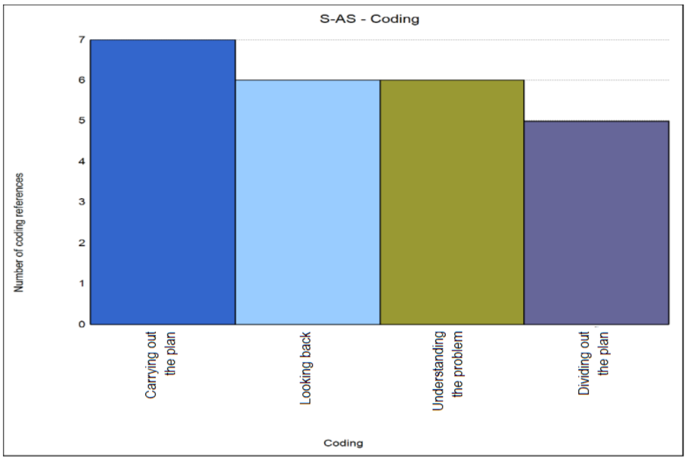


Figure 4. S-AS Subject problem-solving ability

Table 1. The problem-solving ability of S-AS subjects

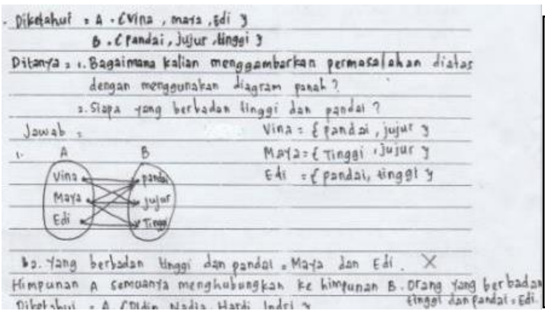
Problem-solving ability	First question	Second question	Third question	Conclusion
Understanding the problem	In the first question, the subject can carry out problem-solving ability at the stage of understanding *the problem* well. However, the subject has not understood the things being appropriately asked.	In the second question, the subject can carry out problem-solving ability at the stage of understanding *the problem* well. However, the subject has not understood the things being appropriately asked.	In the third question, the subject can carry out problem-solving ability at the stage of understanding *the* problem well.	Of the three questions, the subject is consistent or the same in problem-solving ability at the step of understanding the problem.
Dividing out the plan	The subject can solve problems in the first question by organizing the plan well.	In the second question, the subject can solve problems by organizing the plan well.	In the third question, the subject can solve problems by organizing the plan well.	Of the three questions, the subject is consistent or the same in problem-solving abilities in the planning step of solving.
Carrying out the plan	In the first question, the subject has not been able to carry out the ability to solve	In the second question, the subject has not been able to carry out the ability to solve	In the third question, the subject has been able to carry out the	Of the three questions, the subject is consistent or the

Problem-solving ability	First question	Second question	Third question	Conclusion
	problems at the stage of carrying out *the plan* well; there are problem points that cannot be adequately solved. However, the subject can carry out the solution coherently.	problems at the stage of carrying out *the plan* well, and there are problem points that cannot be adequately solved. However, the subject can carry out the solution coherently.	ability to solve problems at the stage of carrying *out the plan* well; the subject can substitute data into concepts that she knows. The subject can carry out the settlement coherently and correctly.	same in carrying out problem-solving abilities at the step of carrying out the plan.
Looking back	In the first question, the subject is capable of executing problem-solving at the stage *of looking back* well, but the subject has not been able to re-check the completion of the answer.	In the second question, the subject is capable of executing problem-solving at the stage *of looking back* well, but the subject has not been able to re-check the completion of the answer.	In the third question, the subject can execute problem-solving when looking back correctly.	Of the three questions, the subject is consistent or the same in problem-solving abilities in the re-examining step.

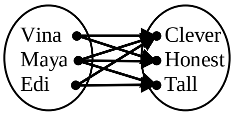
AS subject problem-solving ability to solve material problems of function relations in the first, second, and third instruments was declared credible because there are many similarities. From the data in Table 1, the conclusion is that S-AS can carry out problem-solving abilities well. S-AS subjects systematically carry out mathematical solving abilities from the initial to the final stage. Even though she could carry it out systematically, the subject could not solve the problem correctly. There are points where the subject is unable to solve the problem correctly. S-AS subjects have not been thorough in solving the problems given. The conclusion of S-AS subjects' problem-solving abilities can be seen in Table 1.

S-SZ Subject

Subjects -SZ can perform problem-solving abilities well; subjects can systematically carry out problem-solving abilities from the initial to the final stage. Even though she could carry it out systematically, the subject could not solve the problem correctly. There are points where the subject is unable to solve the problem correctly. The subject could not understand what was asked of the problem. The test results on the first item of subject S-SZ can be seen in Figure 5. From this, it can be seen that subject S-SZ experienced an error when implementing the plan. There is a point where the subject cannot substitute data from the problem correctly; at the first point, the subject can substitute data correctly, but at the second point, the subject cannot solve the problem correctly. At the second point, the subject could not answer the problem correctly because the subject misunderstood what was asked in the first question. From the subject's answer to the first question, the subject interprets what was asked, namely, who is tall and who is smart. So that the subject's answers to the first question were Maya and Edi because Maya was also tall.


Diketahui : A : {Vina, maya, Edi}
B : {pandai, Jujur, tinggi}
Ditanya : 1. Bagaimana kalian menggambarkan permasalahan diatas dengan menggunakan diagram panah ?
2. Siapa yang berbadan tinggi dan pandai ?
Jawab :
1. A B
Vina = {pandai, jujur}
Maya = {Tinggi, Jujur}
Edi = {pandai, tinggi}
b2. Yang berbadan tinggi dan pandai = Maya dan Edi. X
Himpunan A semuanya menghubungkan ke himpunan B. Orang yang berbadan tinggi dan pandai = Edi

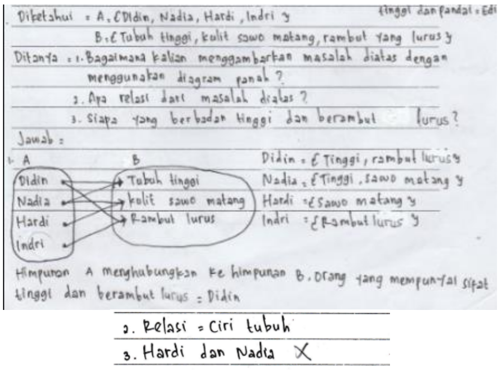
Given: A = {Vina, Maya, Edi}
B = {Honest, Clever, Tall}
Asked: a. How would you describe the problem above using arrow diagrams?
b. Who is tall and clever?
Answer:
a. Vina = {Clever, Honest}
Maya = {Tall, Honest}
Edi = {Clever, Tall}



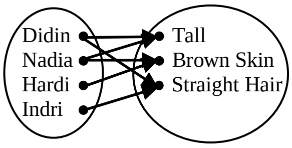
b. Tall and smart = Maya and Edi.
Set A all connects to set B. People who are tall and clever = Edi.

Figure 5. Answers S-SZ on the first question

Same as in the first question, the S-SZ subject in the second question got to do good problem-solving ability; the subject can carry out problem-solving abilities systematically, from the initial to the final stage. Even though she could carry it out systematically, the subject in the second question could still not solve the problem correctly. There are points where the subject is unable to solve the problem correctly. The subject could not understand what was asked of the problem. The test results on the two S-SZ subject matter can be seen in Figure 6.


Diketahui : A : {Didin, Nadia, Hardi, Indri}
B : {Tubuh tinggi, kulit sawo matang, rambut yang lurus}
Ditanya : 1. Bagaimana kalian menggambarkan masalah diatas dengan menggunakan diagram panah ?
2. Apa relasi dari masalah diatas ?
3. Siapa yang berbadan tinggi dan berambut lurus ?
Jawab :
1. A B
Didin = {Tinggi, rambut lurus}
Nadia = {Tinggi, sawo matang}
Hardi = {Sawo matang}
Indri = {Rambut lurus}
Himpunan A menghubungkan ke himpunan B. Orang yang mempunyai sifat tinggi dan berambut lurus = Didin
2. Relasi = Ciri tubuh
3. Hardi dan Nadia X

Given: A = {Didin, Nadia, Hardi, Indri}
B = {Tall, Brown Skin, Straight Hair, School Idol}
Asked: a. How would you describe the problem above using arrow diagrams?
b. What is the relation of the problems above?
b. Who is tall and has straight hair?
Answer:
1. Planning
Didin = {Tall, Straight Hair}
Nadia = {Tall, Brown Skin}
Hardi = {Brown Skin}
Indri = {Straight Hair}

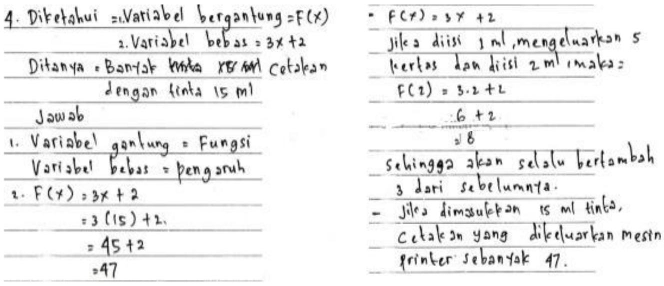


2. Relation = Body characteristics
3. Hardi and Nadia

Figure 6. Answer S-SZ on the second question

Figure 6 shows that the S-SZ subjects are still experiencing errors when implementing the plan on the second question. There is a point where the subject in substituting data from the problem cannot carry it out correctly; on the first and second points, the subject can substitute data correctly, but on the third point, the subject cannot solve the problem correctly. At the third point, the subject could not answer the problem correctly because the subject misunderstood what was being asked and substituted the answer in the first question. From the subject's answer to the second question, the subject interprets the thing being asked, namely, who is tall and who has straight hair. So that the subject's answers to the first question were Nadia and Hardi because Nadia was tall.

Similarly to the first and second questions, S-SZ subjects can perform problem-solving well; subjects can systematically carry out problem-solving abilities from the initial to the final stage. However, in the third question, the subject could substitute the data into the concept she knew. The subject was able to solve the problem in the third question correctly. The test results for the three S-SZ subject items can be seen in Figure 7. It can be seen that the S-SZ subjects could carry out problem-solving abilities at the stage of carrying out the plan well in the third question. The subject can substitute the data into a concept she knows; the subject can solve the problem in the third question correctly.


4. Diketahui : Variabel bergantung = F(x)
2. Variabel bebas = 3x + 2
Ditanya : Banyak ~~kerta~~ ~~xx ml~~ cetakan dengan tinta 15 ml
Jawab
1. Variabel gantung = Fungsi
Variabel bebas = pengaruh
2. F(x) = 3x + 2
= 3 (15) + 2
= 45 + 2
= 47

- F(x) = 3x + 2
Jika diisi 1 ml, mengeluarkan 5 kertas dan diisi 2 ml, maka:
F(2) = 3.2 + 2
= 6 + 2
= 8
Sehingga akan selalu bertambah 3 dari sebelumnya.
- Jika dimasukkan 15 ml tinta, cetakan yang dikeluarkan mesin printer sebanyak 47.

Given: Dependent variable = $f(x)$
Independent variable = $3x + 2$
Asked: A lot of prints with 15 ml ink.
Answer:
1. Dependent variable = Function
Independent variable = Effect
$f(x) = 3x + 2$
If filled 1 ml, took out 5 paper and filled 2 ml, then:
$f(2) = 3(2) + 2 = 6 + 2 = 8$
So it will always increase by 3 from before.
2. $f(x) = 3x + 2$
$= 3(15) + 2 = 45 + 2 = 47$
If 15 ml of ink is added, 47 prints will be issued by the

Figure 7. Answer S-SZ on the third question

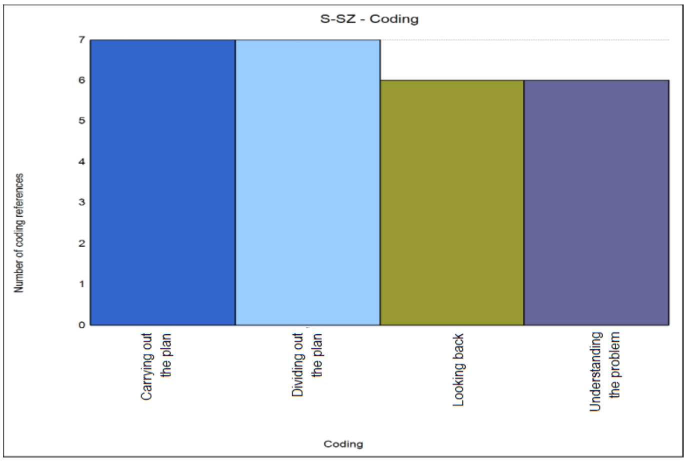


Figure 8. S-SZ subject problem-solving ability

Table 2. The problem-solving ability of S-SZ subject

Problem-solving ability	First question	Second question	Third question	Conclusion
Understanding the problem	In the first question, the subject problem-solving ability can be carried out at the stage of understanding the problem well. However, the subject has not understood the things being appropriately asked.	In the second question, the subject can carry out problem-solving ability at the stage of understanding *the problem* well. However, the subject has not understood the things being appropriately asked.	In the third question, the subject can carry out problem-solving ability at the stage of understanding *the problem* well.	Of the three questions, the subject is consistent or the same in problem-solving ability at the step of understanding the problem.
Dividing out the plan	In the first question, the subject can solve problems by properly dividing the plan.	In the second question, the subject can solve problems by properly dividing the plan.	The subject can solve the ability problem on the third question when properly dividing out the plan.	Of the three questions, the subject is consistent or the same in

Problem-solving ability	First question	Second question	Third question	Conclusion
				problem-solving abilities in the planning step of solving.
Carrying out the plan	In the first question, the subject has not been able to carry out the ability to solve problems at the stage of carrying out *the plan* well, and there are problem points that cannot be adequately solved. However, the subject can carry out the solution coherently.	In the second question, the subject has not been able to carry out the ability to solve problems at the stage of carrying out *the plan* well, and there are problem points that cannot be adequately solved. However, the subject can carry out the solution coherently.	In the third question, the subject has been able to carry out the ability to solve problems at the stage of carrying *out the plan* well; the subject can substitute data into concepts that she knows. The subject can carry out the settlement coherently and correctly.	Of the three questions, the subject is consistent or the same in carrying out problem-solving abilities at the step of carrying out the plan.
Looking back	In the first question, the subject can execute the solution to the problem at the stage of looking back correctly, but the subject has not been able to re-check the completion of the answer.	In the second question, the subject can solve the problem by looking back correctly, but the subject has not been able to re-check the completion of the answer.	The subject can solve the problem on the third question while looking back correctly.	Of the three questions, the subject is consistent or the same in problem-solving abilities in the re-examining step.

Data analysis in this study used the help of NVivo software because the prosperous qualitative research data came from various sources with various data collection techniques (Khanifah et al., 2019; Muhtarom et al., 2017). Coding is done on the software to get an overview of the subject's problem-solving abilities S-SZ. The results of the S-SZ subject coding can be seen in Figure 8. Figure 8 shows that in understanding and re-examining the problem, the S-SZ subjects have the same problem-solving abilities. The subject explained pretty well in the interview and written test. Figure 8 shows that a lot of the subject's coding was carried out in the step of understanding the problem and re-checking, namely 6. Meanwhile, subject S-SZ explained the steps of planning, solving, and implementing the plan well. In Figure 8, there is a lot of subject coding in the steps of planning, solving, and implementing the plan seven times. In carrying out problem-solving abilities, the S-SZ subject is good. The subject could explain well at the time of the interview, even though in the test results, there were several points the subject could not answer correctly.

The problem-solving ability of the S-SZ subject in the first, second, and third questions was declared credible because of many similarities. From the data in Table 2, the conclusion is that S-SZ can carry out problem-solving abilities well. Like S-AS subjects, S-SZ subjects can systematically perform mathematical solving from the initial to the final stage. This is in line with research conducted by Rusminati (2018: 84) states that female students, when solving a problem, first read and then poured their plans on the answer sheet; these students immediately wrote down their plans. Even though they could carry them out systematically, the subject could not solve the problem correctly. There are points where the subject is unable to solve the problem correctly. The S-SZ subject has not been thorough in solving the problems given. This is in line with the research conducted by Mulyadi (2018: 85), where female subjects made mistakes in writing the formula for the surface area of a block and were wrong in substituting numbers. The subject has also concluded the results of the problem. The conclusion of the S-SZ subject's problem-solving abilities can be seen in Table 2.

From the results of the tests given to S-AS and S-SZ subjects, it can be seen that female students can carry out problem-solving abilities well, namely in understanding the problem, planning a solution, implementing the plan, and checking again. Female students are systematic in solving problems, even though there are several points where they have been unable to answer correctly. Female students with cognitive abilities can successfully carry out problem-solving abilities (understanding the problem, dividing out the plan, carrying out the plan, and looking back) from the initial stage to the final stage. Female students can systematically use problem-solving ability from the initial to the final stage. This is in line with the opinion of (Rusminati, 2018), which suggests that when solving the problem, female students read and then pour the plan on the answer sheet; the student immediately writes the plan without using pictures. Although able to implement it systematically, the subject cannot solve the problem correctly. Some points are subject unable to solve the problem correctly. Female students have not been thorough in solving the problems given. This matter is in line with the opinion of Upadhayay (2014), who says that female subjects make mistakes in writing the area formula the surface of the beam and are wrong in substituting numbers into the formula. Female students have good verbal ability, so it is systematic in solving something and can conclude the problem-solving results. Still, reasoning towards mathematics is not sound (Ertl et al., 2017; Gerstenberg et al., 2012; Reilly et al., 2019; Rusminati, 2018; Wüstenberg et al., 2014).

Conclusion

Grade VIII students with moderate cognitive ability have good problem-solving abilities. These students can perform problem-solving abilities systematically, from the initial to the final stage. However, the student was not able to solve the problem correctly. There is a point where the subject cannot solve the problem correctly. Therefore, the teacher needs to know the differences in the academic ability of each student to adjust the learning process. In addition, the teacher must also facilitate students to learn mathematical problems that do not only emphasize procedural abilities so that students practice more carefully in solving mathematical problems and determine many alternative solutions to problems other than those taught by the teacher.

References

Aydoğdu, M., & Ayaz, M. F. (2008). The Importance of Problem Solving in Mathematics Curriculum. *E-Journal of New World Sciences Academy*, *3*(4), 538–545.

Baroody, A. J., Clements, D. H., & Sarama, J. (2019). Teaching and Learning Mathematics in Early Childhood Programs. In *The Wiley Handbook of Early Childhood Care and Education* (pp. 329–353). John Wiley & Sons, Inc. https://doi.org/10.1002/9781119148104.ch15

Cresswell, C., & Speelman, C. P. (2020). Does mathematics training lead to better logical thinking and reasoning? A cross-sectional assessment from students to professors. *PLOS ONE*, *15*(7), e0236153. https://doi.org/10.1371/journal.pone.0236153

Doorman, M., Drijvers, P., Dekker, T., van den Heuvel-Panhuizen, M., de Lange, J., & Wijers, M. (2007). Problem solving as a challenge for mathematics education in The Netherlands. *ZDM Mathematics Education*, *39*, 405–418. https://doi.org/10.1007/s11858-007-0043-2

Ellis, A. B. (2007). Connections between Generalizing and Justifying: Students' Reasoning with Linear Relationships. *Journal for Research in Mathematics Education*, *38*(3), 194–229. http://www.jstor.org/stable/30034866

Ertl, B., Luttenberger, S., & Paechter, M. (2017). The Impact of Gender Stereotypes on the Self-

Concept of Female Students in STEM Subjects with an Under-Representation of Females. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00703

Gerstenberg, F. X. R., Imhoff, R., & Schmitt, M. (2012). 'Women Are Bad at Math, but I'M Not, Am I?' Fragile Mathematical Self–Concept Predicts Vulnerability to A Stereotype Threat Effect on Mathematical Performance. *European Journal of Personality*, *26*(6), 588–599. https://doi.org/10.1002/per.1836

Hunter, J., Turner, I., Russell, C., Trew, K., & Curry, C. (1993). Mathematics and the Real World. *British Educational Research Journal*, *19*(1), 17–26. http://www.jstor.org/stable/1500508

Khanifah, K., Sutrisno, S., & Purwosetiyono, F. D. (2019). Literasi Matematika Tahap Merumuskan Masalah Secara Matematis Siswa Kemampuan Tinggi dalam Memecahkan Masalah Matematika Kelas VIII. *JKPM (Jurnal Kajian Pendidikan Matematika)*, *5*(1), 37. https://doi.org/10.30998/jkpm.v5i1.4544

Lestari, N. D. S., & Juniati, D. (2018, April). Gender differences in prospective teachers' mathematical literacy: Problem solving of occupational context on shipping company. In *Journal of Physics: Conference Series* (Vol. 1008, No. 1, p. 012074). IOP Publishing.

Li, Y., & Schoenfeld, A. H. (2019). Problematizing teaching and learning mathematics as "given" in STEM education. *International Journal of STEM Education*, *6*(1), 44. https://doi.org/10.1186/s40594-019-0197-9

Mann, E. L. (2006). Creativity: The essence of mathematics. *Journal for the Education of the Gifted*, *30*(2), 236–260. https://doi.org/10.4219/jeg-2006-264

Muhtarom, M., Hery Murtianto, Y., & Sutrisno, S. (2017). Thinking Process of Students with High-Mathematics Ability (A Study on QSR NVivo 11-Assisted Data Analysis). *International Journal of Applied Engineering Research*, *12*(17), 6934–6940. http://www.ripublication.com

NCTM. (2000). *Principles and standards for school mathematics*. NCTM.

Nursyahidah, F., Saputro, B. A., & Rubowo, M. R. (2018). A Secondary Student's Problem Solving Ability in Learning Based on Realistic Mathematics with Ethnomathematics. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *3*(1), 13. https://doi.org/10.23917/jramathedu.v3i1.5607

Palmér, H., & Bommel, J. van. (2018). Problem Solving in Early Mathematics Teaching—A Way to Promote Creativity? *Creative Education*, *09*(12), 1775–1793. https://doi.org/10.4236/ce.2018.912129

Proctor, T. (2018). *Creative problem solving for managers: developing skills for decision making and innovation*. Routledge.

Reddy, M. V. B., & Panacharoensawad, B. (2017). Students Problem-Solving Difficulties and Implications in Physics: An Empirical Study on Influencing Factors. *Journal of Education and Practice*, *8*(14), 59–62.

Reilly, D., Neumann, D. L., & Andrews, G. (2019). Investigating Gender Differences in Mathematics and Science: Results from the 2011 Trends in Mathematics and Science Survey. *Research in Science Education*, *49*(1), 25–50. https://doi.org/10.1007/s11165-017-9630-6

Rusminati, S. H. (2018). Representasi Pemecahan Masalah Desimal Siswa SD Ditinjau dari Gender. *INVENTA*, *2*(1), 80–86. https://doi.org/10.36456/inventa.2.1.a1629

Setiyani, S., Fitriyani, N., & Sagita, L. (2020). Improving student's mathematical problem solving skills through Quizizz. *JRAMathEdu (Journal of Research and Advances in Mathematics*

Education), 5(3), 276–288. https://doi.org/10.23917/jramathedu.v5i3.10696

Shodikin, A., Purwanto, P., Subanji, S., & Sudirman, S. (2021). Students' thinking process when using abductive reasoning in problem solving. *Acta Scientiae. Revista de Ensino de Ciências e Matemática*, 23(2), 58-87.

Siniguian, M. T. (2017). Students Difficulty in Solving Mathematical Problems. *International Journal of Advanced Research in Engineering and Applied Sciences*, *6*(2), 1–12.

Sutrisno, S., Sudargo, S., & Titi, R. A. (2019). Analisis Kemampuan Representasi Matematis Siswa SMK Kimia Industri Theresiana Semarang. *JIPMat (Jurnal Ilmiah Pendidikan Matematika)*, *4*(1), 65–76. https://doi.org/10.26877/jipmat.v4i1.3626

Tambychik, T., & Meerah, T. S. M. (2010). Students' Difficulties in Mathematics Problem-Solving: What do they Say? *Procedia - Social and Behavioral Sciences*, *8,* 142–151. https://doi.org/10.1016/j.sbspro.2010.12.020

Upadhayay, N. (2014). Comparison of Cognitive Functions Between Male and Female Medical Students: A Pilot Study. *Journal of Clinical and Diagnostic Research*. https://doi.org/10.7860/JCDR/2014/7490.4449

Wüstenberg, S., Greiff, S., Molnár, G., & Funke, J. (2014). Cross-national gender differences in complex problem solving and their determinants. *Learning and Individual Differences*, *29*, 18–29. https://doi.org/10.1016/j.lindif.2013.10.006