



## Exploration of Self-Efficacy Based on Students' Mathematical Representation Ability In Problem Solving SPLDV

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**Abstract :** Aim for know ability representation mathematical in finish questions on the material system linear equations of two variables (SPLDV) are reviewed of student self-efficacy class VIII SMPN 1 Praya Timur. As for Sujek in study This consists of 3 of 28 students class VIII which has categories of high self-efficacy, medium self-efficacy and low self-efficacy. Types of research This is study qualitative descriptive. Instruments used in study This is questionnaire, question test ability representation mathematics and guidelines interview. Procedure data collection used in study This that is documentation and interviews. Data analysis techniques were carried out with method reducing data, presenting data, and interesting conclusion. Checking validity of the data used triangulation technique. Research result show that ability representation mathematical student class VIII SMPN 1 Praya Timur is divided into 3 (three) categories, namely student with high self-efficacy category capable shows 3 aspects ability representation mathematical that is visual representation, representation equality or expression mathematics, and representation of words or text written, whereas student with moderate self-efficacy category only capable shows 2 aspects ability representation mathematical that is representation equality or expression mathematics, and representation of words or text written. Temporary That student with low self-efficacy category only Can shows 1 aspect ability representation mathematical that is representation equality or expression mathematical.

**Keywords :** Exploration of Self-Efficacy, Representation Mathematics, Solving Problem

### INTRODUCTION

Mathematics is one of knowledge mandatory knowledge studied in all level formal education. Learning mathematics the student given chance For develop ability think systematic, logical and critical in communicate idea in solution problem. Learning mathematics teachers are required pay attention to five standards main competency in implementation learning mathematics at school that is ability solution problem ability communication, ability connection, ability reasoning, and ability representation (Lestari Nina, Deka Anjariyah, 2019) .

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Based on statement the Study mathematics need ability which is foundation, students can understand and use mathematical ideas. The ability in question that is ability representation mathematics.

Representation mathematical is a model or form replacement from something situation problem in use For find solution. As for example in something problem can represented with objects, pictures, words, or symbol mathematics (Sabirin, 2014) . Representation mathematics used in study This that is representation according to Ahmad Nizar Rangkuti who grouped them representation become three namely: 1) visual representation in the form of diagrams, graphs, or tables, and figures; 2) Eq or expression mathematics; 3) words or text written Because can seen and measured use indicators. So mathematical representation is very important as a depiction, translation, delivery, re-designation, symbolization or even modeling of mathematical ideas, ideas, concepts and relationships between them which are contained in one particular configuration, construction, problem situation which is presented by students in various forms as an effort to gain understanding. meaning, show understanding, or find a solution to the problem they face (Muthmainnah, 2014).

Mathematical representation ability is a process in mental development that a person already has, which is expressed and visualized in various mathematical models, such as: verbal, images, concrete objects, tables, manipulative models or a combination of these. Meanwhile, according to Goldin, in his research on representation in mathematics learning, representation is an approach that makes the connection between something abstract become something real by creating various types of configurations that are representative of the nature of the connection (Sabirin, 2014). Ability representation mathematical student can be measured with question solution problem. Problem solving problem is starting question with presentation problem or situation contextual, however in the solution No only own One answers and questions solution very close problem connection with symbols that create student difficult in link problem mathematics with reality life and represents it to in mathematical models (Huda et al., 2019).

Solution problem is a cognitive process in look for solution or method the right solution For reach objective. In learning to solve mathematical problems, it will be easier for students to understand if the problem is presented in a more real form. One of the subjects related to problem solving is systems of linear equations in two variables (SPLDV). this material is material studied in class VIII actually No material new Again for middle school students, because basics material the has studied in class VII. Problem in material This can form related

issues with life everyday, so need representation mathematical in finish the question given (Lestari Nina, Deka Anjariyah, 2019).

Based on the results of an interview with Mrs. Sri Astuti Iriani M.Pd., she is a class VIII mathematics teacher at SMPN 1 Praya Timur who stated that: "when students are given questions in the form of stories, students find it difficult to solve them, interpret the mathematical ideas contained in the questions, describe them. into visual form and students also still have difficulty understanding what is known, what is being asked and finding solutions to problems in the form of stories." This shows that the mathematical representation abilities of students at SMPN 1 Praya Timur are still relatively low. Based on the data display, it can be stated that representational skills are very important to apply during the mathematics learning process to help understand thinking with more abstract, logical and more idealistic methods. Lunenburg stated that apart from representational abilities, students' confidence in their ability to express the ideas involved also contributes to a person's success in solving a problem. A person's self-confidence in coordinating and directing their abilities in changing and dealing with situations is called self-efficacy (Lestari Nina, Deka Anjariyah, 2019). That matter reinforced by Bandura's statement that students who have low Self Efficacy experience difficulty in solve tasks and assumes task the as threat to himself. Students who have aspiration low and weak commitment to goals tend give up. On the contrary individuals who have high Self Efficacy, aspirations high, and high commitment to the goal, a difficult task considered as challenge For solved rather than considered as a mandatory threat avoided (Pratiwi et al., 2019).

Based on the results of research conducted by Pratiwi in "Mathematical representation ability to solve quadrilateral problems in terms of self-efficacy in Tsanawiyah madrasas" states that students who have relatively high self-efficacy have relatively high representation abilities, while students who have moderate self-efficacy have moderate representation ability, and students who have low self-efficacy have low representation ability. Thus, students' high, medium and low self-efficacy greatly influences their representational abilities in solving mathematics problems (Pratiwi et al., 2019). Also, research conducted by M. Syahid and Kurnia Noviartati in "Cognitive Visualizer-Verbalizer Style Mathematical Representation of Students in Solving TIMSS Mathematics Problems" shows that cognitive visualizer style mathematical representation is able to work on questions in the form of pictures or illustrations well through the following stages. stages that have been determined by researchers, namely; interest in questions according to their cognitive style, understand the questions more than students who

have a cognitive verbalizer style, use better solutions to approach perfection in their answers (Syahid, 2019).

Through several studies above, it can be seen that there has been no research on mathematical representation abilities that focuses on exploring self-efficacy in solving SPLDV problems. So researchers are interested in conducting research related to "Exploration of Self-Efficacy Based on Students' Mathematical Representation Ability in Solving Spldv Problems". This research was based on problems found in the field, through interviews with one of the mathematics teachers at SMPN 1 Praya Timur, who stated that: "Students are not sure about their own answers, this is shown by students' lack of self-confidence when students are given questions to work on in blackboard, sometimes students refuse because they feel afraid and embarrassed when the answer is wrong. This shows that the self-efficacy of students at SMPN 1 Praya Timur school is still relatively low.

## **RESEARCH METHODS**

The approach used in this research is a descriptive qualitative approach. The researcher used a descriptive qualitative approach, because the researcher attempted to obtain descriptive data in the form of students' written answers in answering questions, such as students' daily conversations related to mathematics, especially on SPLDV material. Subject selection was carried out by dividing students into three self-efficacy categories. The division of students was carried out based on the results of the questionnaire scores. The questionnaire was given to 28 class VIII students with the aim of finding out students in the high self-efficacy category, students in the medium self-efficacy category, and low self-efficacy category. Researchers chose 3 (three) students as representatives of each self-efficacy category. Meanwhile, the data analysis technique used in this research refers to the adaptation of Miles and Huberman which consists of reducing data, presenting data, and drawing conclusions (Sugiyono, 2019).

The instruments used in this research are questionnaire guide sheets, test guide sheets and interview guide sheets. 1) Questionnaire: The questionnaire used in this research consisted of 13 questions presented on a Likert scale, where the statements submitted were in the form of positive statements and negative statements which were rated by students as strongly agree, agree, disagree and strongly disagree (Jumroh et al., 2018). 2). Test Questions: The test questions used in this research are questions that can trigger students' thinking processes which are taken from problems solving mathematical representations based on the level of ability in solving systems of two-variable linear equations (SPLDV) problems. 3). interview guidelines:

The interview guide in this research contains questions with the aim of clarifying the results of the research subjects' answers on the assignment sheet for the mathematical representation ability test.

## RESULTS AND DISCUSSION

Following This discussed about ability representation finish questions on the material system linear equations of two variables (SPLDV) are reviewed of self- efficacy high, self - efficacy moderate, and self- efficacy low. The documentation for the MA subject test results sheet for the mathematical representation ability test can be seen based on the picture below:

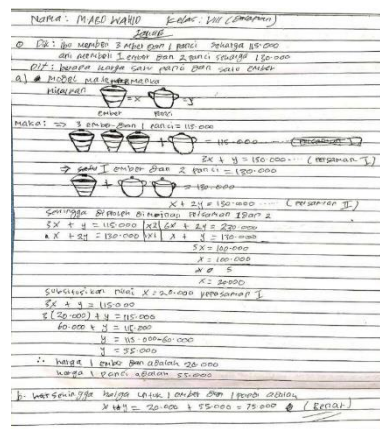


Figure 1. Student worksheet on the mathematical representation ability test

The results of the interview for the mathematical representation ability of MA subjects can be seen as follows:

P	: Can you please explain what is meant by question number 1?
MA	: We were told to make a mathematical model after that determine the price of 1 bucket and 1 pan, sis.
P	: So how do you create the mathematical model?
MA	: For example, I made a bucket with the letter "x" and a pan with the letter "y", then I made a mathematical model like this, sis. (pointing to the answer sheet)
P	: So what is known and asked about this question?
MA	: Mother bought 3 buckets and 1 pan at a price 115,000 at the same shop, I bought 1 bucket and 2 pans for 130,000, then if asked how much it costs for 1 bucket and 1 pan.
P	: OK, there's a picture on your answer sheet, bro. What's this picture?
MA	: That's a picture of a bucket and a pan, sis
P	: Why did you make a picture of a bucket and pan?
MA	: To make it look more real and easier for us to determine the mathematical model, sis, that's why I made the mathematical model first using pictures.
P	: OK, let's try to pay attention to the mathematical model that you created
MA	: Yes sis (nodding his head)
p	: Well, here, for example, a bucket with the letter x and a pan with the letter y, can we use letters other than the letters x and y?
MA	: Yes, sis, it's up to us to use whatever letters we want.

P : OK, after you get the model  
MA : I made a mathematical model, for example a bucket with the letter "x" and a pan with the letter "y", then I first looked for the price of 1 bucket by eliminating equations 1 and 2, sis. So I get the x value, which is 20,000.  
P : So what?  
MA : Then I looked for the "y" value or the price of 1 pot by substituting the "x" value, namely 20,000 to equation 1, namely  $3x + y = 115,000$  like this sis (pointing to the answer sheet).  
p : So is there anything else to look for?  
MA : Yes, there is, sis  
p : What else should I look for?  
MA : The total price of 1 bucket and 1 pan, then I add up  $20,000 + 55,000 = 75,000$   
P : So what conclusion did you come to?  
MA : In conclusion, the total price for 1 bucket and 1 pan that I got was 75,000  
P : Are you sure your answer is correct  
MA : Very sure sis  
P : How can you be sure?  
MA : Because I checked my answer, sis  
P : How do you check it?  
MA : I substituted the values  $x + y = 20,000 + 55,000 = 75,000$ .



Figure 2. Process of Working on Questions and Interviewing Subjects 1

Ability Representation Mathematical MA Subjects who have High Self-Efficacy in Solving System Problems Linear Equation of Two Variables (SPLDV). MA subject with with high self-efficacy category can finish second question with good and correct. Based on results tests and results interview seen that MA subject already capable involve ability representation image, representation symbols, and verbal representations in finish question. This matter can seen from sheet it works that MA subjects can make picture For create a mathematical model with objective For clarify problem so that can obtain correct result. MA subject in finish question Already correct and smooth to use representation equality or expression mathematical. In addition to those 94, MA subjects are capable compile appropriate story with something presented representation, with make what is known and what is asked, as well make situation problem based on data or given representation, write down steps solution problem mathematical

with the words or text written although Not yet seen perfect. Circumstances This show that, the MA subject already capable reach indicator words or text written. This matter similar with results research conducted by Ni Ketut A. Ariutari, and Edy Yusmin that student with high self-efficacy category, has relative ability capable understand context question in serve come back information obtained from question into the form visual representation, representation symbols, and verbal representations. Student with high self-efficacy category own ability representation tall (Pratiwi et al., 2019). Study the next one is similar carried out by Nadia, Lana Najiha with results study that is student with high self-efficacy can use all indicator representation mathematical with maximum compared to with student with moderate and low self-efficacy (Nadia et al., 2017).

The documentation for the SL subject test results sheet for the mathematical representation ability test can be seen based on the picture below:



Figure 3. Student Worksheet on The Mathematical Representation Ability Test

The results of the interview for the mathematical representation ability of SL subjects can be seen as follows:

- P : Please pay attention to question number 1, what do you understand from this question?  
 SL : What I understand from this problem is that we are told to find the price of 1 bucket and 1 pan, sis  
 P : So what do you know about question number 1?  
 SL : What is known in this question is the price of 3 buckets and 1 pan = 115,000 and the price of 1 bucket and 2 pans = 130,000.  
 P : So what do you ask?  
 SL : How much does 1 bucket and 1 pan cost?  
 P : How many ways do you know to solve this problem? Can you mention it?  
 SL : Three ways, sis, elimination, substitution and graph  
 P : So what methods do you use?  
 SL : I use the elimination and substitution method, sis  
 P : Why did you choose the elimination and substitution method?  
 SL : Because it's easy and simple, sis  
 P : If you told your sister to use graphic methods or pictures, could you or not?  
 SL : I don't know, sis, because I haven't tried it.

P : OK, what are the first steps for you to answer question number 1?  
SL : I made the equation, sis  
P : So, what letters do you define the variables as?  
SL : I use the letter "a" for bucket and the letter "b" for pan  
P : Can it be compared to other letters?  
SL : Yes, bro  
P : What kind of equation did you get?  
SL : Like this sis,  $3a + b = 115,000$ , this is equation 1, bro, then  $a + 2b = 130,000$ , this is equation 2  
P : So after you make the equation, what do you do next?  
SL : I eliminated equations 1 and 2 to find the value "a" (bucket) then substituted the value "a" in equation 1 to find the value "b" (pan)  
P : How much did you get for "a" and "b" grades?  
SL : I got an "a" value of 20,000 and a "b" value of 55,000.  
P : Is there still something to look for after that?  
SL : Still, Sis, the total price for 1 bucket and 1 pan is what he asked  
P : So how do you find the amount?  
SL : Add up the price of the bucket and the price of the pan, ie  
 $20,000 + 55,000 = 75,000$   
P : Are you sure your answer is correct?  
SL : God willing, I'm sure it's true, sis  
P : How do you check that your answer is correct?  
SL : Mmm... I'm just guessing, but I double-checked my answer from the start, sis.



Figure 4. Process of Working on Questions and Interviewing Subjects 2

SL subject with moderate self-efficacy category, no capable involve visual representation in the form of picture in finish question. Whereas For representation symbol, subject SL already capable elaborate every stages lazy in make equality or mathematical model from other representations given, only just Not yet perfect finish problems involved expression mathematics. Circumstances This show that, that SL subject already capable reach indicator representation equality or expression mathematics. Then For representation of words or text written, subject SL yet fully the solution use the word or text written, still There is some were missed. This matter in line with results research conducted by Ni Ketut A. Ariutari, and Edy Yusmin,, that student with moderate level of self-efficacy own difficulty in finish questions



given, students No can serve come back information provided with complete and precise, like in verbal to visual form, visual to symbols, and verbal to symbols (Pratiwi et al., 2019).

The documentation for the JU subject test results sheet for the mathematical representation ability test can be seen based on the picture below:

nama: Jurnani  
Kis : VIII Delapan

1. d. misalkan 1 ember = e  
1 panci = p

makn :  
3 ember dan 1 panci = 115.000  
 $3e + p = 115.000$  ... Persamaan 1  
1 ember dan 2 panci = 130.000  
 $e + 2p = 130.000$  ... Persamaan 2

Eliminasi :  
 $3e + p = 115.000$  (\*)  
 $e + 2p = 130.000$  (x1)  
 $3e + p = 115.000$   
 $3e + 4p = 390.000$   
 $3e + p = 115.000$   
 $3p = 275.000$   
 $p = 91.666$   
 $e = 100.000$   
 $e = 20.000$

Substitusi ke Persamaan 1  
 $3e + p = 115.000$   
 $3(20.000) + p = 115.000$   
 $60.000 + p = 115.000$   
 $p = 115.000 - 60.000$   
 $p = 55.000$

B. = Harga 1 ember dan 2 panci  
 $= e + p$   
 $= 20.000 + 55.000$   
 $= 75.000$

Figure 5. Student Worksheet on The Mathematical Representation Ability Test

The results of the interview for the mathematical representation ability of JU subjects can be seen as follows:

P : What do you understand from question number 1?  
JU : Mmm...determine the price of 1 bucket and 1 pan  
P : So what is known about this problem?  
JU : 3 buckets and 1 pan = 115,000 and 1 bucket and 2 pans = 130,000  
P : So what do you ask?  
JU : The price is 1 bucket and 1 pan, sis  
P : Please look at your answer sheet, why didn't you write down and ask?  
JU : I don't think it's necessary, bro, it's already there in the question so.  
P : Does that mean without you asking or asking, do you understand what the question means?  
JU : Mmmm... God willing, I understand, sis  
P : So how many ways do you know to solve question number 1?  
JU : I think three, if I'm not mistaken  
P : What are the decks?  
JU : Elimination, substitution and graphs  
P : So of the three methods, which method do you use?  
JU : How to eliminate and substitute, sis  
P : To make it easier for you to answer this question, you think you can use pictures or graphs, why don't you try it that way?  
JU : Mmm... because I don't understand yet, sis  
P : Haven't you studied it?  
JU : Yes, bro, but it's difficult for me to understand  
P : OK, so what are your first steps in solving question number 1?  
JU : I made an example, for a bucket with letters "e" and pan with the letter "p"  
P : Why do you use the letters "e" and "p"?  
JU : I use the initials of the object's name, bro, the letter bucket initial "e" and pan "p"  
P : Do you think you can not use letters other than your initials?  
JU : Yes, that's possible, bro

P : So after you make the example, what's the next step?  
JU : I made equation 1 and equation 2



Figure 6. Process of Working on Questions and Interviewing Subjects 3

Ability Representation Mathematical JU Students Who Have Low Self-Efficacy in Solving System Problems Linear Equation of Two Variables (SPLDV). Subject JU with low self-efficacy category, Subject JU not yet capable finish problem with involve ability based visual representation problems that have solved the problem because subject JU does not capable create a mathematical model with use picture. However For representation equality or expression mathematical For question number 2 is visible subject JU, not yet capable make equality or mathematical model with appropriate so that results obtained in finish problems involved expression mathematics No in accordance. This matter can is known from results illuminating interview that subject JU is lacking understand Meaning from question number 2. Meanwhile For representation of words or text written, subject JU not yet capable finish question use the word or text written, yes seen from results it works that subject JU does not make what is known nor what he asked with use the words or text written. This matter in line with results research conducted by Ni Ketut A. Ariutari, and Edy Yusmin, that students with low self-efficacy category experience difficulty in finish questions given and not can understand context question (Pratiwi et al., 2019).

Based on results tests and interviews to third subject research that has categories of high self-efficacy, moderate self-efficacy, and low self-efficacy show that each subject own ability finish different questions. So that from results tests and interviews is obtained difference ability representation mathematical from every category of student self-efficacy. This matter in line with the theory stated by Albert Bandura in Rina Dwi Setyawati, states that “a person's self-efficacy will influence action, effort, persistence, flexibility in differences, and realization from objective individual”, so that self-efficacy is related with ability somebody often determine outcom before action happens, and also self-efficacy plays a role in level achievements obtained

somebody (Setyawati, 2020). Self-efficacy will without based on efforts made somebody through a certain process No formed with itself, there is a number of stages certain things that have to be done passed by individuals so that can like ability they to activity learning nor tasks certain ones will they do.

Next, based on results analysis of research data, researchers also found another thing viz in do question story material principal system linear equation of two variables (SPLDV), seen in Steps solution problem that is understand problem, arrange plan, implement plan, and check return. MA subject and SL subject, in step understand problem, already showing his abilities in understand draft mathematics Good draft mathematics concrete to abstract nor vice versa and use existing information in question numbers 1 and 2. Meanwhile For subject JU yet capable showing his abilities in understand draft mathematics Good draft mathematics concrete to abstract nor vice versa and use existing information in question numbers 1 and 2. In step compile plan, MA subject and SL subject, already capable translate Language daily into the Language mathematics, that is related matters with making mathematical models. whereas For subject JU is visible not enough capable capable translate Language daily into the Language mathematics. Meanwhile in step carry out plan Subject MA and subject SL answered the question given in a way complete and correct. Then For subject J is lacking capable answer the question given in a way complete and correct. As well as on steps inspect back, just MA subject only, which has been carry out stage this, though Not yet as expected by researchers, meanwhile SL subjects and JU subjects do not inspect return the answer due to stage This student No used to do question and check return the answer.

## **CONCLUSION**

Based on the data analysis presented in this research, it can be concluded that the mathematical representation abilities of class VIII students at SMPN 1 Praya Timur are divided into 3 (three) categories, namely students with the high self-efficacy category are able to demonstrate 3 (three) aspects of representation ability. mathematical representation, namely visual representation, representation of equations or mathematical expressions, and representation of words or written text, while students with moderate self-efficacy categories are only able to demonstrate 2 (two) aspects of mathematical representation ability, namely representation of mathematical equations or expressions, and representation of words. written words or text. Meanwhile, students in the low self-efficacy category can only demonstrate 1

(one) aspect of mathematical representation ability, namely the representation of mathematical equations or expressions.

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