

ANALYSIS OF STUDENTS' MATHEMATICAL PROBLEM SOLVING ABILITY IN IX GRADE AT JUNIOR HIGH SCHOOL AR-RAHMAN PERCUT

¹Ihsan Fuadi, ²Ani Minarni, ³Humuntal Banjarnahor

State University of Medan, North Sumatera, Indonesia

Abstract: This study aims to determine what are the difficulties faced by students and to determine the completeness of each indicator of students' problem-solving abilities. This research is qualitative descriptive study. The study was conducted on students of class IX-A junior Ar-Rahman Percut by totaling 29 people. The research result shows that the number of students who achieve completely at problem solving ability in first indicator is 48.28% (14 of 29 students), the second indicator is 17.24% (5 of 29 students), the third indicator is 6.9% (2 of 29 students) and the fourth indicator was 6.9% (2 of 29 students). Based on analysis of the responses of the students then obtained one of the difficulties faced by students is that students are still difficult to understand the problem in the form of a story or words that are hard to mention the information given to the question and it is hard in changing the form of matter into a mathematical model.

Keywords: Analysis, Mathematical Problem Solving Ability.

I. PRELIMINARY

Every human being will always be faced with a problem. According Baykul (in Aydogdu, 2014) [1], the problem is a creation, in which an individual who faces it felt the need to solve or want to solve. Therefore, it is very important that we as human beings have the ability to solve the problem. Likewise with the students, each student must have a particular problem-solving abilities in solving problems or questions given by the teacher.

One of the lessons that require problem solving ability of students is math. According Sumarmo (1994) [2], problem-solving ability is one of the learning outcomes that will be achieved in mathematics teaching in any school level. Department of Education (in Hasratuddin, 2015) [3], also explained that one purpose of learning mathematics in school is that the students may have the ability to solve problems that include the ability to understand the problem, devised a mathematical model, complete the mathematical model that and be able to interpret the solution already obtained them. According to Sajadi et al (2013) [4], "Problem solving is a key subject in Standards and Focal Points". According Reys et al (in Zhu, 2007) [5], Problem solving is the basis of many mathematical activities. Mean while, according to the Posamentier and Krulik (2009) [6] "Problem solving must be the focus of the curriculum". Problem solving is very important because in the learning process and student completion is possible to gain experience using the knowledge and skills already possessed to be applied to problem solving.

The important of problem solving ability for student in mathematics is clearly by Branca (1980) [7] are: (i) problem solving ability is the purpose of learning mathematic, (ii) problem solving contains by method, procedure, and strategy as main process in mathematics curriculum, (iii) problem solving is base ability in learning mathematic. Besides Holmes (in Wahyuni et al, 2010) [8] say that the reason a person learns mathematical problem solving is the fact in the twenty-first century is that people are able to solve the problem would be to live productively.

II. DISCUSSION

A. Problem Solving Ability:

In general, the problem is the gap between expectations with reality, between what they want or what is intended with what is happening or facts. Problems are subjective to each person, it means that a question is a problem for someone, but not be a problem for others.

According to Kantowski (in Pehkonen, 2013) [9]: A situation is said to be a problem when an individual must combine (for him/her) new information in a (for him/her) new way in order to solve the problem. If the individual can immediately recognise the procedures needed, the situation is a standard task (or a routine task or exercise). The term non-standard task is often used in reference to a task that one cannot usually find in mathematics books.

There is many interpreted about problem solving. Polya (1973) [10] defined problem solving as one as the effort to find out from difficulty to achieved one aim which is not easy to achieve. While Uno (in Meidawati, 2014) [11], say that problem solving is answering the question which it need a method to find the solution from unknown question before.

Ruseffendi (1991b) [12] say that, one called by problem solving if the people have knowledge and ability to solve it, but he don't know how to solve when he get the problem. In another chance, Ruseffendi (1991a) [13] also say that, one called bay problem if: first, the unknown problem. Second, student need to solve it, even mental and knowledge immediacy; regardless of find or un-find the solving problem. Third, one called problem by himself, if he plans to solve the problem.

Problem solving is one of intellectual creativity type, according to Gagne (1992) [14] more higher the degree and more complex than other intellectual creativity types. Gagne (1992) [14] says that, problem solving needed a complex rules and can achieve higher rules after mastering rules and define concepts. Also rules and define concept can mastering if supporting by concrete understood concepts. After that to understanding the concrete concepts need a skill and differentiated. Gagne classify the intellectual skill based on complexity levels and arrange from most simple mental operation until most complexity levels. Therefore, with reference to the opinions of the above, then solving the problem can be seen from the various terms that an attempt to find a way out which is made in achieving the objectives. Also requires readiness, creativity, knowledge and skills and their application in everyday life.

B. Problem Solving Indicators:

Step-known mathematical problem solving proposed by G. Polya (1973) [9], in his book *"How to Solve It"*. Four-step mathematical problem solving by G. Polya are: "(1) Understanding the problem, (2) Devising a plan, (3) Carrying out the plan, (4) Looking Back".

The guiding steps Polya said by before, called by heuristic strategies. The strategy becomes reference for peoples to solving the problem. Start from expert consideration, to solving the problem needed a conceptual understanding ability as a precondition and connecting concepts ability, and mental preparing. Also according to Ibrahim (Tarzimah et al, 2010) [15], there are two main procedural steps in problem solving: i) converting the problem into a mathematical sentence; and ii) operational calculations involved in mathematical sentence. Difficulties encountered among students more noticeable during the first procedural step in solving a problem than others.

According to NCTM (1989) [16], some mathematical problem solving indicators are: (1) identifying known elements, which is asked, and elements needed, (2) planning mathematical problem and ranging mathematical model, (3) applying strategy for solving the various problem, (of a kind or new problem) in or out of mathematics problem, (4) explaining or interpreting result of problem, (5) using mathematics meaningfully. Same opinion by Sumarno (in Isrok'atun, 2006) [17] that indicators of problem solving ability are: (1) identifying completely data to solving the problem, (2) making mathematics model from one situation or daily live problem and solve it, (3) choosing and applying strategy to solving mathematics problem or un-mathematics problem, (4) explaining or interpreting result of problem and checking the rightness of the result. (5) applying mathematics meaningfully.

Based on the above it is an indicator of mathematical problem solving in this research are:

1. Identifying the asking known elements and complete the needed elements.

2. Formulating mathematic problem or arranging mathematics model.
3. Choosing and applying strategy to solving mathematical problem.
4. Explaining or interpreting the solving problem

C. Relevant Research:

There is a lot of research on mathematical problem solving abilities and difficulties of students in solving mathematical problems. According to Bell et al (in Bergeson translated by Karnasih, 2015) [18], students avoid reading text about the story, try to solve the problem by focusing only on the numbers in the problem.

According to M. Brown (in Bergeson translated by Karnasih, 2015) [18], Students experiencing significant difficulty with word problems if the numbers involved referring continuous measurement unit (eg, 7 inches) and not discrete units (eg 7 marbles). Unfortunately most of the standard text matter involves the context of discrete mathematics. Decimal presence in about the story also makes students is significantly more difficult to determine the correct operation to do.

According Chaiklin (in Bergeson translated by Karnasih, 2015) [18], students have difficulty representing and solving algebraic word problems because they depend on syntax approach directly involving a "phase-by-phase" translation of the problem into the equation variables. In addition, age and grade levels also affect students in solving mathematical problems. According to Lester (in Bergeson translated by Karnasih, 2015) [18], young students (grades 1-3) relied on a strategy *trial-and-error* when faced with a mathematical problem. This tendency decreases when students get into higher grade (grades 6-12). Also, the older students benefit more from the mistakes observed in an experiment when formulating a better strategy or a new trial.

If observe by problem solving steps based on Polya, students have difficulty to checking process and result (*looking back*). There is a data that showing the statement below:

Analysis of Students' Mathematical Problem Solving Ability in IX Grade at Junior High School Ar-Rahman Percut

NO	POBLEM SOLVING STEPS	QUEST	TKPM			
			STUDENT SCORE	TOTAL SCORE	PERCENTAGE	CRITERIA
1	Understanding problem ability	1,2,3	239	306	78,1 %	Good
2	Planning problem solving ability	1,2,3	301	612	49,2 %	Good enough
3	Implement the planning problem solving ability	1,2,3	316	918	34,4 %	Very Bad
4	Looking back the result ability	1,2,3	78	204	38,2 %	Very Bad

Based on the results obtained TKPM the description of the student's ability to solving problems. the percentage of Understanding problem ability reached 78.1%, and classified in good category, the percentage of Planning problem solving ability 49.2% and classified in the good enough category, the percentage of s Implement the planning problem solving ability 34.4% and classified in the category of very bad, the percentage of students' Looking back the result ability obtained 38.2% and classified in the category of very bad. This indicates that the class was not finished in solving problems (Mona, 2015) [19].

Analysis of Students' Mathematical Problem Solving In IX Grade at Junior High School 61 Langsa

NO	POBLEM SOLVING STEPS	QUEST	STUDENT SCORE	TOTAL SCORE	PERCENTAGE	CRITERIA
1	Understanding problem ability	1	38	46	82,60 %	Good
2	Planning problem solving ability	1	31,5	69	45.65 %	Not Good
3	Implement the planning problem solving ability	1	44	69	63,77 %	Good Enough
4	Looking back the result ability	1	18,5	46	40,22 %	Good Enough

International Journal of Novel Research in Education and Learning

 Vol. 4, Issue 2, pp: (153-159), Month: March – April 2017, Available at: www.noveltyjournals.com

the results of students' ability to solve problems that the percentage of Understanding problem ability reached 82.60% and classified in good category, the percentage of Planning problem solving ability 45.65% and classified in the Not Good category, the percentage of Implement the planning problem solving ability 63,77% quite well, classified in the good enough category, and the percentage of Looking back the result ability obtained 40.22% and classified in the good enough category, while the percentage of the average - average reached 58.06% and classified in the category Good enough (Eviyanti, 2015) [20].

III. RESEARCH METHOD

This research is qualitative descriptive study. The study was conducted on students of class IX-A junior Ar-Rahman Percut totaling 29 people on October 28, 2015 and the object of this research is the analysis of indicators of student difficulties in mathematical problem solving ability. Each student is given a sheet of test problem-solving ability that has been validated by a third person about the validator, amounting to 5.

Furthermore, researchers supervise students so there's nothing to cooperate in solving the given problem. The time given to solve the problem is 45 minutes.

The scoring technique used in this study using the following guidelines;

Guidelines Score of Mathematical Problem Solving Ability

Indicators of Mathematical Problem Solving Ability	Scoring Indicators	Score	Question Number
Understanding problems	Write down the things that are known and explain correct and complete.	5	1,2,3,4,5
	Write down the things that are known and explain correct and incomplete.	3	
	Write down the things that are known and explain incorrect.	1	
	Do not write down the things that are known and explain at all.	0	
Planning for solving problem	Write down the problem solving strategies correct and complete.	5	1,2,3,4,5
	Write down the problem solving strategies correct and incomplete.	3	
	Write down the problem solving strategies incorrect.	1	
	Do not write down the problem solving strategies at all.	0	
Solving problems	Write down the problem solving process correct and complete.	5	1,2,3,4,5
	Write down the problem solving process correct and incomplete.	3	
	Write down the problem solving process correct and incomplete.	2	
	Write down the problem solving process incorrect and incomplete..	1	
	Do not write down the problem solving process at all.	0	
Looking back the problem solving result	Write down the checking problem solving result correctly and completely.	5	1,2,3,4,5
	Write down the checking problem solving result correctly and incompletely	3	
	Write down the checking problem solving result incorrectly	1	
	Do not write down the checking problem solving result at all	0	

To determine the problem solving ability through by indicators, the researchers used this following formula:

$$K = \frac{\text{students indicator score}}{\text{indicator maximum score}} \times 100\%$$

Description: K = Complete of problem solving ability

Criteria:

0% ≤ K < 65% Problem solving ability are not complete

65% ≤ K < 100% Problem solving ability are complete

Adapted from Trianto (2008) [21]

IV. RESEARCH RESULT

From the research data showed the test results of mathematical problem solving ability of students as follows:

- ✓ The number of student who achieve to completing the first indicator of problem solving ability is 48,28 % or 14 of 29 people
- ✓ The number of student who achieve to completing the second indicator of problem solving ability is 17,24 % or 5 of 29 people
- ✓ The number of student who achieve to completing the third indicator of problem solving ability is 6,9 % or 2 of 29 people
- ✓ The number of student who achieve to completing the fourth indicator of problem solving ability is 6,9 % or 2 of 29 people

Based on analysis of the responses of the students then obtained the difficulties students as follows:

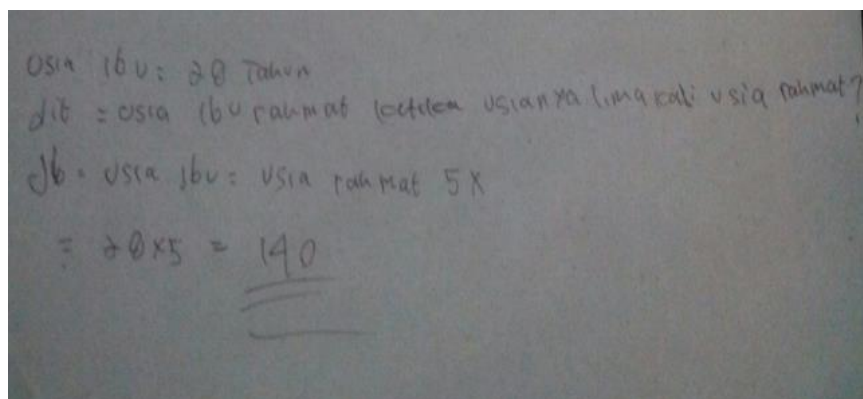
- ✓ Students are still difficult to understand the story problems model or words that are hard to mention the information given to the question
- ✓ Students are still not familiar with the non-routine subject matter.
- ✓ Students are still experiencing difficulties in interpreting the story problems model into or mathematical models.
- ✓ Students are still difficult to plan and solve problems given at the same time check the results of the settlement that has been made and assured that the answer is right or wrong.

Here is examples of students' answers on problem-solving abilities test:

Problem:

When Grace was born, his mother has 28 years old. What is the age of the mother when she was five times Rahmat age? Recheck your answers and Prove that the correct answer!

Students' answer sheet:



Picture 1. Students' answer sheet

International Journal of Novel Research in Education and Learning

Vol. 4, Issue 2, pp: (153-159), Month: March – April 2017, Available at: www.noveltyjournals.com

From the picture above, can be obtained as:

- ✓ Students do not understand the problem well
- ✓ Students are not able to interpreted the question into mathematical models
- ✓ Students are not able to plan and solve problems at the same time in checking result from the answer, students just multiply the number contained in the problem.

V. CONSLUSION

How important it is for us as humans to have the ability to solve a problem, as well as students are required to be able to have a problem-solving ability, especially the ability of mathematical problem solving. But based on the research showed that the students mathematical problem solving ability in terms of the indicators were not completely or very far from the expectation.

VI. SUGGESTIONS

- For teachers, especially for junior high school teacher Percut Ar-Rahman should give learning about problem solving to students and familiarize the student in the story questions or words that are not routine.
- For students should always practice problem-solving ability and always discuss matters relating to problem-solving ability test
- For other researchers can make this as background issues in order to enhance students' problem-solving abilities.

REFERENCES

- [1] Aydogdu, at al. "A Research On Geometry Problem Solving Strategies Used By Elementary Mathematics Teacher Candidates". Journal of Educational and Instructional Studies in The World, February 2014, Volume: 4, Issue: 1, Article:07 ISSN:2146-7463. Turkey: WJEIS. 2014.
- [2] Sumarmo,U, Dedy, Edan Rahmat."Suatu Alternatif Pengajaran untuk Meningkatkan Pemecahan Masalah Matematika pada Guru dan Siswa SMA". Laporan Hasil Penelitian FPMIPA IKIP Bandung. 1994.
- [3] Hasratuddin. 2015. Mengapa Harus Belajar Matematika?. Medan :Perdana Publishing. 2015.
- [4] Sajadi, Maryam, at al. "The Examining Mathematical Word Problems Solving Ability under Efficient Representation Aspect". Mathematics Education Trends and Research 2013. Vol (2013) 1-11. Iran: ISPACS. 2013.
- [5] Zhu, Zheng. "Gender Differences in Mathematical Problem Solving Patterns : A Review of Literature". International Education Journal, 2007, 8(2): 187-203. 2007.
- [6] Posamentier, A.S dan Krulik. "Problem Solving In Mathematics, Grades 3-6 :Powerful Strategies to Deepen Understanding (Paperback)". Publisher : Corwin. 2009.
- [7] Branca, N.A. "Problem Solving as A Goal, Process and Basic Skill ". In Problem Solving in School Mathematics. 1980 Yearbook. Edited by Krulik and Reys, Reston, Virginia: NCTM Inc. 1980.
- [8] Wahyuni, Sri, at al. "Pembelajaran Kemampuan pemecahan masalah matematik di SD". Yogyakarta: Kementrian Pendidikan Nasional. 2010.
- [9] Pehkonen, E, Liisa Naveri, and Anu Laine. "On Teaching Problem Solving in School Mathematics". Journal Focus. Vol: 3 Nomor 4: 9-23. Finland: University of Helsinki. 2013.
- [10] Polya, G. 1973. "How to Solve It, Second Edition". Standford University, California, Princeton University Pres, United State, 1973.
- [11] Meidawati, Yenni. "Pengembangan Perangkat Pembelajaran Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Dan Self Efficacy Siswa". Jurnal Pendidikan dan Keguruan. Vol. 1 No. 2, 2014, artikel 1. 2014.

International Journal of Novel Research in Education and Learning

 Vol. 4, Issue 2, pp: (153-159), Month: March – April 2017, Available at: www.noveltyjournals.com

- [12] Ruseffendi, ET. “Pengantar Matematika Modern dan MasaKini untuk Guru dan PGSD D2 seri kelima”. Bandung: Tarsito. 1991b.
- [13] Ruseffendi, ET.. “Pengantar Matematika Modern dan MasaKini untuk Guru dan PGSD D2 seri kedua”. Bandung: Tarsito. 1991a.
- [14] Gagne,R.M. “The Condition of Learning and Theory of Instruction”.New York :Rinehart and Winston. 1992.
- [15] TarzimahTambychika, Tham by Subahan Mohd Meerahb. “Students’ Difficulties in Mathematics Problem-Solving: What do they Say?”. Journal International Conference on Mathematics Education Research 2010 (ICMER 2010). Malaysia: University Kebangsaan Malaysia. 2010.
- [16] NCTM. “Curriculum and Evaluation Standars for School Mathematics”. Reston, VA: NCTM. 1989.
- [17] Isrok’atun. “Pembelajaran Matematika dengan Strategi Kooperatif Tipe STAD Siswa SMP Negeri di Bandung melalui Pendekatan Pengajuan Masalah”.Bandung: TesisSPs UPI. 2006.
- [18] Bergeson, at al. *Teaching and Learning Mathematics Using Research to Shift From the “Yesterday” Mind to the “Tomorrow” Mind*. (diterjemahkan oleh: Karnasih, Ida. 2015. Medan : Unimed Press). 2000.
- [19] Mona, Adrina. “Analisis Kemampuan Pemecahan Masalah Matematis Siswa Kelas IX SMP N 3 Bilah Hulu Labuhan Batu”.T.A 2015 / 2016. Prosiding Seminar Nasional Pendidikan Matematika HIPPMI, Medan. 2015.
- [20] Eviyanti, Cut Yuniza. “Analisis Kemampuan Pemecahan Masalah Matematis SiswaKelas IX SMP N 61 Langsa”.Prosiding Seminar Nasional Pendidikan Matematika HIPPMI, Medan. 2015.
- [21] Trianto. “Mendesain Model Pembelajaran Inovatif-Progresif “. Jakarta. KencanaPrenada Media Group. 2009.