PROFILE OF STUDENTS' MATHEMATICAL PROBLEM SOLVING ABILITY REVIEWED FROM STUDENTS' SELF EFFICACY

By:

Rasmin[1], Muhammad Sudia[2] and Kadir[3]

[1] Postgraduate Student of Mathematical Education Study Program
[2] & [3] Postgraduate Lecturers of Mathematical Education Study Program
Postgraduate Program
Halu Oleo University, Kendari-Indonesia
e-mail: muhammad_matematika@yahoo.co.id

Abstract: The objectives of this study are: (1) to describe self efficacy of Grade VII students of SMPN 1 Kulisusu Utara: (2) to describe the mathematical problem solving ability of students in SMPN 1 Kulisusu Utara; (3) to describe factors causing low ability of students' mathematical problem solving of SMPN 1 Kulisusu Utara. This study is an explorative study using quantitative-qualitative descriptive approach. The conclusions of this study are: (1) the description of self efficacy level of grade VII students of SMPN 1 Kulisusu Utara is: 12 students have high self efficacy, 24 students have medium self efficacy and 12 students have low self efficacy; (2) students' mathematical problem solving ability with high self efficacy are: maximum score is 46.24; minimum score is 28.36; average score is 37.45; standard deviation is 2.62; students with medium self efficacy are: maximal score is 39.25; minimum score is 26.30; average score is 29.40; standard deviation is 2.23; students with low self efficacy are: maximal score is 30.12; minimum score is 21.47; average score is 25.65 and standard deviation is 2.15; (3) the cause of the low ability of students; mathematical problem solving is the lack of practicing matters relating to mathematical problem solving ability and teacher has not used learning approach and model yet that can improve mathematical problem solving ability.

Keywords: *Mathematical problem solving ability, Students' self efficacy*

INTRODUCTION

Developing the ability of high-level mathematical thinking is one of the objectives of mathematics learning, as set forth in the Attachment of Regulation of the Minister of National Education Number 22 Year 2006, it was mentioned that mathematics subjects should be given to all students starting from elementary school to equip learners with logical, analytical, systematic, critical and creative thinking ability, and problem solving ability (MoNE, 2006). This is in line with that proposed in NCTM (2000) that the purpose of learning mathematics has changed, no longer only emphasize on improving learning outcomes, but is expected to improve the ability of high-level mathematical thinking, namely: (1) the ability to think mathematical creatively; (2) the ability of mathematical reasoning, (3) the ability to solve mathematical problems; (4) the ability of mathematical representation; (5) the ability of mathematical communication; (6) mathematical connection capabilities and (7) mathematical literacy capabilities. The ability of high-level mathematical thinking should be developed in the learning process of mathematics.

One of the high-level mathematical thinking ability that must be developed is the ability to solve mathematical problems. The problem-solving approach is implemented to provide sufficient supplies to students in order to have the ability to solve various forms of mathematical problems. It will also be useful for acquiring knowledge and the formation of ways of thinking and attitude in solving problems encountered.

To obtain optimal results and benefits in solving mathematical problems, must be done through well-organized splitting steps. One form of organizing mathematics problem solving is as proposed by Polya (in Sudia, 2013) which includes 4 steps, namely: (1) understanding the problem; (2) determining the problem-solving plan; (3) doing as planned; (4) looking back at the results obtained. Through the troubleshooting

steps mentioned by Polya above enables the implementation of systematic problem solving and the result is not only a true solution, but also the formation of a well-structured mindset in a person in the face of problems to be solved.

Solving problems is a high level mental activity, so the development of problem solving skills in learning mathematics is not easy. Suherman (2001) mentions that problem solving is still considered as the most difficult thing for students to learn it and for teachers to teach it. For example non-routine issues that the presentation relates to real situations or daily life. This is reinforced by Siswono (2006) that one of the problems in learning mathematics is the low ability of students in solving problems not routine. This resulted in low students' mathematical problem solving ability.

The problem of low students' mathematical problem solving ability which is expressed above is also the case in SMPN 1 Kulisusu Utara. Understanding the exact ability of students 'mathematical problem solving in SMPN 1 Kulisusu Utara should be given a test of students' mathematical problem solving ability and trace the factors causing the low ability of students' mathematical problem solving as a preliminary study in order to find the solution.

Mathematical problem solving is a process of applying previously acquired knowledge to new and different situations (NCTM, 2000). In addition, in NCTM it is also revealed that the purpose of teaching mathematical problem solving is to: (1) build new mathematical knowledge; (2) solve problems that arise in mathematics and in other contexts; (3) apply and adapt various appropriate strategies to solve problems and (4) monitor and reflect on the process of solving mathematical problems. Taking note of the purpose of mathematical problem solving mentioned above, then how important is the mathematical problem solving ability to be developed in the learning of mathematics. By developing problem solving skills in mathematics learning, students will be better able to solve various forms of mathematical problems, as well as issues related to everyday life.

Problem solving is a human activity that combines the concepts and rules that have been obtained before, and not as a generic skill (Dahar, 1989). This sense implies that when a person has been able to solve a problem, then that person already has a new ability. This ability can be used to solve relevant problems. The more problems a person can solve, the more he has the ability to help him navigate his daily life. Another opinion explains that problem solving is a process to overcome difficulties encountered to achieve a desired goal (Sumarmo, 2000). Montague (2007) says that mathematical problem solving is a complex cognitive activity accompanied by a number of processes and strategies. From some of these opinions, mathematical problem solving is a complex cognitive activity, as a process to overcome a problem encountered and to solve it required a number of strategies.

In addition to cognitive aspects in improving mathematical problem solving ability, affective aspects also play an important role in learning mathematics. One such affective aspect is self efficacy, as Kusuma (2013) points out that belief in inner abilities is necessary to compete in the era of globalization and the world of work. According to Suharsono and Istiqomah (2014) that selfefficacy plays a major role in how a person achieves goals, tasks and challenges.

Suharsono and Istiqomah (2014) say that self efficacy is a person's belief in the ability to succeed in certain situations. The theory of self efficacy exists in Bandura's cognitive social theory, which emphasizes on the role of observational learning and social experience in the development of personality. The main concept in social cognitive theory is that individual actions and reactions, including social behavior in cognitive processes, in almost all situations are affected by actions that have been observed in other individuals. Self efficacy developed in external experience and self-perception is influential in the outcomes of many events which are important aspects of social cognitive theory including in solving mathematical problems.

Eagly & Chaiken (1993) say that self efficacy is a person's belief that the person has the ability to display a recommended message with quiet behavior. Woolfolk (2007) says that self efficacy is concerned with the knowledge of one's ability to successfully complete certain tasks without comparing with the abilities of others. From the above opinion it can be concluded that self efficacy is a person's belief that he has the ability to produce something positive by overcoming a situation with quiet behavior, which affects the choice and how much effort is made to organize and execute an action by choosing what to do, how much effort and how we survive without comparing with others. Self efficacy plays an important role in everyday life. A person will be able to use his potential optimally if confidence supports it. One aspect of life that is affected by self efficacy is learning achievement and in it includes the ability to solve mathematical problems (Bandura, 1997).

The increase of self efficacy is also one of the teachers methods in teaching to improve students' achievement, with high self efficacy students will achieve satisfactory high achievement (Palmer in Suharsono and Istiqomah, 2014). According to Zimmerman (in Noer, 2012) says that self efficacy will make students motivated to learn through the use of self-regulation as goal-setting, self-monitoring, self-evaluation and strategy. Bandura (in Noer, 2012) says that self efficacy is a central contribution that will influence a person in making decisions and influencing the actions he or she will take. A person tends to run something when the person feels composed and confident, otherwise it will determine how far he or she is doing, how long he or she endures when it gets into trouble and how flexible it is in a less favorable situation.

The above description shows that the importance of a student's self efficacy and teacher should know the self efficacy of their students. A student who has high self efficacy, it is possible to solve mathematical problems well, as well as a teacher who knows the self efficacy of his students, then the teacher can motivate students to improve students self efficacy and will have an impact on improving problem-solving ability for the students concerned.

The objectives of this study are: (1) to describe self efficacy of Grade VII students of SMPN 1 Kulisusu Utara: (2) to describe the mathematical problem solving ability of students in SMPN 1 Kulisusu Utara; (3) to describe factors causing low ability of students' mathematical problem solving of SMPN 1 Kulisusu Utara.

METHOD

This study is an explorative research using quantitative-qualitative descriptive approach. The subjects in the study were Grade VII students of SMPN 1 Kulisusu Utara consisting of two parallel classes, namely class VII-A and class VII-B and each class consists of 24 students, so the subject in this study amounted to 48 students. Instruments in this study there are two kinds, namely questionnaires of students' self efficacy and tests of mathematical problem solving ability. The self efficacy questionnaire consists of 40 items, while the mathematical problem solving test consists of 4 test items.

To collect data in this study used the technique of giving questionnaire and giving test. The questionnaire is used to determine the students' level of self efficacy, while the the test is given to determine students' mathematical problem solving ability.

The collected data was analyzed by quantitative-qualitative descriptive analysis. Quantitative descriptive analysis is used to analyze the categories of self efficacy level and students' mathematical problem solving ability, while qualitative descriptive analysis is used to analyze factors causing of low ability of students' mathematical problem solving ability.

RESEARCH RESULT AND DISCUSSION
Research Result

After the data were collected, quantitative descriptive analysis was conducted on the students' self efficacy questionnaire. After analyzing, obtained 12 students have high self efficacy, 24 students have medium self efficacy and 12 students have low self efficacy.

After a quantitative-descriptive analysis, the result of mathematical problem solving ability of Grade VII SMPN 1 Kulisusu Utara from each level of student self efficacy as presented in Table 1 below.

Table 1. Score of Students' Mathematical Problem Solving Ability Grade VII of SMPN 1 Kulisusu Utara Based on Self Efficacy

Score of Mathematical Problem Solving Ability	Category of Students' Self Efficacy		
	High	Medium	Low
Maximum	46,24	39,25	30,12
Minimum	28,36	26,30	21,47
Average	37,45	29,40	25,65
Standard Deviation	2,62	2,23	2,15

The acquisition of students' mathematical problem solving ability from the three levels of self efficacy in Table 1 above is different, but they are still low category, because of the total score of 100, only a maximum score of 46.24 is obtained.

From the results of preliminary observations obtained information that the cause of low ability mathematical problem solving of students in Grade VII SMPN 1 Kulisusu Utara is because they are not used to practice problems related to the ability of solving mathematical problems. It is also because teachers have not used a learning approach yet that can improve students' mathematical problem solving ability.

Discussion

The results of this study show that 10 students have high self efficacy, 24 students have medium self efficacy and 12 students have low self efficacy. Of the three levels of self efficacy looks different mathematical problem-solving ability, but all the scores obtained are still low.

Self efficacy is an important variable that helps to determine the success of one's learning, including in learning mathematics. This is in accordance with the opinion of Pajares and Kranzler (1995) that the influence of self efficacy on the performance of mathematics as much as the influence of mental ability in general. At the skill level, students with higher self efficacy exhibit sharpness in mathematical calculations and show greater persistence in the work of difficult mathematical problems than students with low self efficacy. This is also in accordance with the results of the study of Bandura (1997), Pajares & Miller (1995) and Schunk (1991) which have shown that self efficacy is a predictor of mathematical achievement. Usually, self efficacy is used to predict mathematical achievement to see greater influence from previous mathematical experiences.

It has been mentioned above that one of the causal factors causing low ability of mathematical problem solving of students is that students are not often or even never practiced on issues related to mathematical problem solving ability. In addition, the low ability to solve mathematical problems caused by learning approaches used by teachers have not been able to improve students' mathematical problem solving ability. Therefore, the students must be practiced problems related to the ability to solve mathematical problems.

To improve students' mathematical problem solving ability, problem posing approach should be used. This is in accordance with the results of research by Guntara et al. (2014), the results concluded that:

there are differences in the ability to solve a significant mathematical problems between groups of students who were taught by the model of problem posing problems with groups of students who were taught by direct teaching model with t_{count} value = 60.5> t_{table} = 2.021 for α = 0.05, so it can be said that the group of students who are taught by problem posing approach is better than the group of students who are taught by direct teaching model. Similarly, the results of Herawati's research, et al., (2010), show that there is a difference in mathematical problem solving ability among students who gain learning posing problems with students who gain conventional learning.

CONCLUSION

Based on the results of the study and discussion can be concluded: (1) the description of self efficacy level of grade VII students of SMPN 1 Kulisusu Utara is: 12 students have high self efficacy, 24 students have medium self efficacy and 12 students have low self efficacy; (2) students' mathematical problem solving ability with high self efficacy are: maximum score is 46.24; minimum score is 28.36; average score is 37.45; standard deviation is 2.62; students with medium self efficacy are: maximal score is 39.25; minimum score is 26.30; average score is 29.40; standard deviation is 2.23; students with low self efficacy are: maximal score is 30.12; minimum score is 21.47; average score is 25.65 and standard deviation is 2.15; (3) the cause of the low ability of students; mathematical problem solving is the lack of practicing matters relating to mathematical problem solving ability and teacher has not used learning approach and model yet that can improve mathematical problem solving ability.

REFERENCES

Bandura, Albert, 1997, *Self efficacy,* New York: W. H. Freeman and Compeny.

Dahar, Ratna Wilis. (1989). *Teori-Teori Belajar.* Jakarta: Erlangga.

Depdiknas (2006). *Kurikulum 2006. Standar Kompetensi Mata Pelajaran Matematika Sekolah Menengah Pertama dan Madrasah Tsanawiyah.* Jakarta: Depdiknas.

Eagly, A. H & Chaiken, S., 1993, *The Psychology of Attitudes*, Fort Worth, TX: Harcourt Brace Jovanovich Collage Publishers.

Guntara, I Wayan, Murda, I Nyoman dan Rati, Ni Wayan, 2014, Pengaruh Model Pembelajaran Problem Posing Terhadap Hasil Belajar Matematika SDN Kalibukbuk, *e-Journal Mimbar PGSD Universitas Pendidikan Ganesha Jurusan PGSD (Vol: 2 No: 1 Tahun 2014*

Herawati, Oktiana Dwi Putra, Siroj, Rusdi dan Basir, Djahir, 2010. Pengaruh Model Pembelajaran *Problem Posing* Terhadap Kemampuan Pemahaman Matematis Siswa Kelas XI SMAN 6 Semarang, *Jurnal Pendidikan matematika Vol. 4 No. 1, Juni 2010*, PPS Unsri.

Kusuma, Farida Ari, 2013, *Peningkatan Self efficacy dan Kemampuan mengimplementasikan Konsep Matematika pada Siswa SMK Melalui Contextual Teaching and Learning,* Yogyakarta, Universitas Islam Sunan Kalijaga.

Montague, M. (2007). *Math Problem Solving for Middle School Students with Disabilities.* [online]. Avaliable: http://www.k8accesscenter.-org/training_resources/MathProblemSolving.asp. Retrieved on 26 May 2017.

National Council of Teacher of Mathematics. (2000). *Principles and Standards for School Mathematics.* Reston. VA: NCTM.

Noer, Sri Hastuti, 2012, *Self efficacy* Mahasiswa Terhadap Matematika, *Prosiding Aseminar Nasional matematika dan Pendidikan Matematika* FMIPA UNY Yogyakarta, UNY.

Pajares, F. & Miller, M.D., (1995). Mathematics self efficacy and mathematics outcomes: The need for specificity of assessment. *Journal of Counseling Psychology*, 42, 190-198, Diakses Tanggal 22 Agustus 2017.

Pajares, F. & Kranzler, J., (1995). Selfefficacy beliefs and general mental ability in mathematical problemsolving. *Contemporary Educational Psychology, 20*, 426-443.

Schunk, D.H., (1991). Self efficacy and academic motivation. *Educational Psychologist, 26*, 207- 231. Retrieved on 22 August 2017.

Siswono, Tatag Yuli Eko. 2006. Desain Tugas untuk Mengidentifikasi Kemampuan Berpikir Kreatif dalam Matematika*, Pancaran Pendidikan Tahun XIX No. 6 April 2006*, Jember, FKIP Universitas Jember.

Sudia, Muhammad, 2013, *Profil Metakognisi Siswa yang Bergaya Kognitif Impulsif-Reflektif dalam Memecahkan Masalah Terbuka Materi Geometri Bangun Datar ditinjau dari Perbedaan Gender*, (Unpublished Disertation), PPS-Unesa, Surabaya.

Suharsono, Yudi dan Istiqomah, 2014, Validitas dan Reliabilitas Skala *Self efficacy* Fakultas Psikologi Universitas Muhammadyah Malang, *Jurnal Ilmiah Psikologi Terapan Vol. 2, No. 1*

Suherman, Erman, 2001. *Strategi Pembelajaran Matematika Kontemporer.* Bandung: JICA.

Sumarmo, Utari. (2000). *Pengembangan Model Pembelajaran Matematika untuk Meningkatkan Kemampuan Inteleqtual Tingkat Tinggi Siswa Sekolah Dasar*. Bandung, FPMIPA IKIP Bandung.

Woolfolk, A., 2007, *Educational Psychology* (10th ed.), Boston, MA: Pearson Educational Inc.