JPSD Vol. 7 No. 1, Maret 2021
ISSN 2540-9093
E-ISSN 2503-0558

INFLUENCE *BELIEF* IN MATHEMATIC AND AUTONOMOUS LEARNING TO MATHEMATIC *PROBLEM SOLVING* ABILITY OF GRADE 5 STUDENT SDN IN BATANGHARI

Fahrudin[1], Yoma Hatima[2]

[1]Universitas Nahdlatul Ulama Lampung, [2]Universitas Sultan Ageng Tirtayasa

fahrudinvivo@gmail.com[1],

Article Info

History:
Submitted
October 18th, 2020

Revised
December 7th, 2020

Accepted
March 10th, 2021

Abstract

The purpose in this research is to learn the influence of belief in mathematic and autonomous learning toward ability in mathematics problem solving. This research was conducted by survey method and analyzed by using path analysis. The research used multi stage random sampling by the amount of samples are 76 students. The data collection was done by using the instrument in the form of a test for mathematics ability in problem-solving and a questionnaire for belief mathematic and autonomous learning. The results showed that the indirect effect is the effect of the mathematical belief variable (X1) on mathematics problem solving ability (Y) through the learning independence variable (X2). So based on the direct effect of X1 on Y, the indirect effect of X1 to Y through X2 can be calculated by multiplying the path coefficients p21 and py2 = 0.378 x 0.273 = 0.103. So that the path coefficient of the indirect effect of the mathematical belief variable on the mathematical problem solving ability is obtained by 0.103. From these results it can be concluded that: (1) There is a positive direct effect of mathematical belief on mathematical problem solving ability; (2) There is a positive direct effect of independent learning on mathematical problem solving ability; and (3) There is a positive direct effect of mathematical belief on learning independence. The results of this research indicate that belief in mathematics and independent learning can improve mathematical problem solving skills.

Keywords: Belief, Autonomous Learning, Problem Solving

A. Introduction

Mathematic has some characteristics, it has the object of abstract study, depending on the agreement, deductive paradigm, has the mean of empty symbol, and consistent system (Soedjadi, 1999). Based on some characteristics mentioned before, it has the object of abstract study that closest is the mathematics subject. This abstract characteristic caused difficulties for student to understand about the mathematical concept. Actually, mathematics is one of important thing in science and technology mastery. Because of that fact, mathematics was learned by students in every education level started from Elementary School until university/college. Mathematics learning in Elementary School requires serious attention because it is the premise to be next level base subject.

Besides, the factor that influences mathematics learning process quality is the autonomous learning. Students who have autonomous learning would have the willingness and self-consciousness to learn for reaching the goal. Because of autonomous learning, students do not depend on the teacher because the teacher only roled as a facilitator, so the teacher is not the one and only source of knowledge. This act lived on students gradually lined with the growth and environment. It should be started since early as student age.

Based on research result by Widya with the tittle "Efforts to Improve Learning Independence and Concept Mastery Mathematic Student Grade 5I Negeri Cepagan" showed that there are still students who seem passive and no will of learning mathematics subject. Students tend to do other activities that more interesting. When the teacher gave homework on the previous meeting for a learned subject that day, the student seemed did not learn that chapter. There are still some students who have difficulty to express their opinion and be shy to ask the teacher in the class. And based on the research by Nurhayati in jurnal Universitas Sebelas Maret with tittle "The Influence of Children's Learning Independence on Mathematics Learning Outcomes of Fifth Grade Primary School Students", seemed that student who has not consciousness to do the autonomous learning. The student still asks for people's help to complete a task. The student will stop doing the mathematics exercise when they thought that questions could not be done by themself.

Another research was also conducted by Ermawati and Zuliana (2020) in the journal of Elementary School Education (JPsd) of Sultan Ageng Tirtayasa University (UNTIRTA) entitled “Implementation of Open-Ended Problems on Mathematical Problem-Solving Skills of Elementary School Students”. The results of this research indicate a significant role in open questions as a research instrument. Open questions can significantly improve the mathematical problem solving skills. The results of other research were also conducted by Takaria and Talakua (2018) in the JPsd Journal with the title “The Effectiveness of the Collaborative Problem Solving (Cps) Model in Increasing the Mathematical Representation Ability of Prospective Elementary School Teacher Students” from this results it can be concluded that the Collaborative Problem Solving (Cps) Model can improve the Mathematical Representation ability of Elementary School Teacher Candidates compared to the Expository Model.

In line with this research conducted by Yustitia (2017) in JPsd Journal with the title "Profile of PGSD UNIPA Surabaya Students' Reasoning Ability in Solving School Mathematics Problems" The results of this study are (1) high-ability subjects achieve six indicators of reasoning ability, namely presenting statements mathematics orally and in writing, proposes conjectures, performs mathematical manipulation, provides reasons for the correctness of solutions, checks the validity of arguments, and draws conclusions or generalizations. (2) medium-capable subjects achieve four indicators of reasoning ability, namely presenting mathematical tools orally and in writing, proposing conjectures, performing mathematical manipulations, and providing reasons for the correctness of solutions. (3) low-ability subjects in solving school math problems have not reached the indicator of reasoning ability.

But the autonomy skill is not suddenly a skill but should be taught to students. Without being taught, students will never know how to help themselves. In the learning process, the student should be roled as subject and object, thus mathematic learning process is not centered on the teacher. Learning process should be changed from teacher-centered to student-centered, because of that, student required to be active in the learning process.

Base on National Research Council in Santrock (2008), most people assumed that mathematics is an accounting field, but he regards it as the only tools in real mathematic

that involve math questions solving and structure understanding include mathematic pattern. Mathematics is necessary for every student since Elementary School level to supply them with a logical, analytical, systematic, critical, creative, and cooperative ability (Daryanto, 2012).

Based on Goldin, et al (2009), "essence of mathematics resides in inventing methods, tools, strategies, and concepts for problem solving". Similar with that, based on Marcou and Lerman (2007) Problem Solving is an important aspect in the mathematics subject that required varied skills, one of them is motivation and belief. Because in problem-solving was required cognitive and metacognitive ability application.

In line with the previous statement, John (2005) stated that "a problem means a situation where we need to find a solution from a set of initial conditions". While, based on Polya (1973), there are four steps in problem-solving that were used to solve the mathematics questions. Those steps are: (1) apprehend problems, (2) arrange the solving plan, (3) do the solving plan, and (4) recheck about proces and results.

Based on the explanations above, the problem solving mathematics ability is students' ability in solving mathematics narration through steps of: (1) apprehend problems, (2) arrange solving plan, (3) do solving plan, and (4) recheck about process and result.

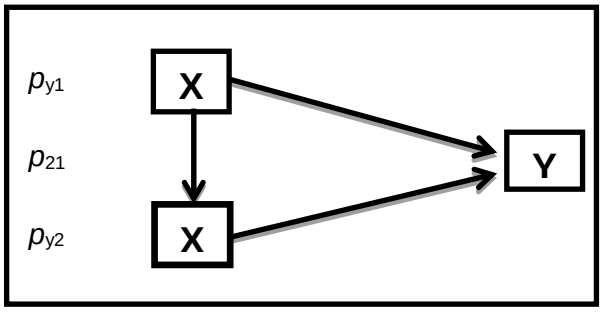
Based on Chapman in Widjajanti (2009), belief indicated on something that regard as the right thing by someone, from real experience or imagination. In line with that opinion, Pehkonen in Moscucci (2007) defined belief as, "an individual subjective knowledge and emotions concerning objects and their relationship, and they are based usually on his personal experience". Cooper and Gaugh in Sugiman (2009) said that belief as someone belief as deeply to an object that includes some cognitive structures.

Based on practicians above, belief in mathematics could be defined as students' belief to mathematics. Indicators of belief in mathematics are students' belief about mathematical characteristics, students' belief about self-ability in mathematics, students' belief about mathematics learning, and students' belief about mathematics function.

B. Research Methodology

This research used a quantitative method, a kind of associative with the survey method. The data were analyzed using path analysis. It was chosen with consideration that data examined has the relationship between variable, directly influence did between every autonomous variable (exogen), that is Belief in mathematic (X1) and The Autonomous Learning (X2) to dependent variable (endogen), it was Mathematics Problem Solving Ability (Y).

The influence of the autonomous variable to dependent variable described in constellation research of the following picture:



Picture 1. Research Constelation

Information:

p_{y1} = Influence variable X_1 to Y
p_{y2} = Influence variable X_2 to Y
p_{21} = Influence variable X_1 toX_2

This research was done on two Public Elementary School (SDN) in Batanghari Subdistrict, Lampung Timur, there were SDN 01 Rejoagung and SDN 03 Buana Sakti. The research was done in September 2019. Based on Sugiyono (2010), the population is a generalization area that consists of an object or subject who has certain qualities and characteristics that determined by the researcher to be learned and be concluded. In line with the opinion above, Gulo (2005) said that population consist of the collected object as cynosure contains various information.

A population is a group of individuals determined by the researchers as the research data. The population of this research was 5th-grade students of SDN 01 Rejoagung and SDN 03 Buana Sakti with a total of 151 students.

Based on Gulo (2005), a sample is the proportion of a population that gives a real description. Kadir (2010) stated that the sample is the proportion of the population who really explored characteristics. Sampling was done with the Multi-Stage Random Sampling technique, it is gradually sampling randomly. Sampling was done through (1) determined the research location, namely SDN 01 Rejoagung and SDN 03 Buana Sakti; (2) determined the amount of 5th-grade students in the existing school as research class specifically that was chosen with random sampling, 120 student. Based on Arikunto (2006), in the case of a population

which less than 100 subjects, it is better to take all of them as the population research. If the total subject is large can be chosen about 10-15% or 20-55%. Based on that standpoint, the sample of this research is 50% of 120, there were 60 students who chosen randomly.

The Collecting data activity of this research done using test and questionnaire instrument contained a list of specially prepared questions. Variable of belief in the mathematics ability and the autonomous learning measured with questionnaire formed of Likert's scale. Likert;s Scale used to read demeanor, view, and perception of someone or people about social phenomenon. The answer of each instrument that used the Likert scale has very positive to very negative gradation. On the other side, the mathematics problem-solving variable test form of essay. Besides, before doing the research, a tryout of the instrument was held to find out about validity and reliability of each question for students.

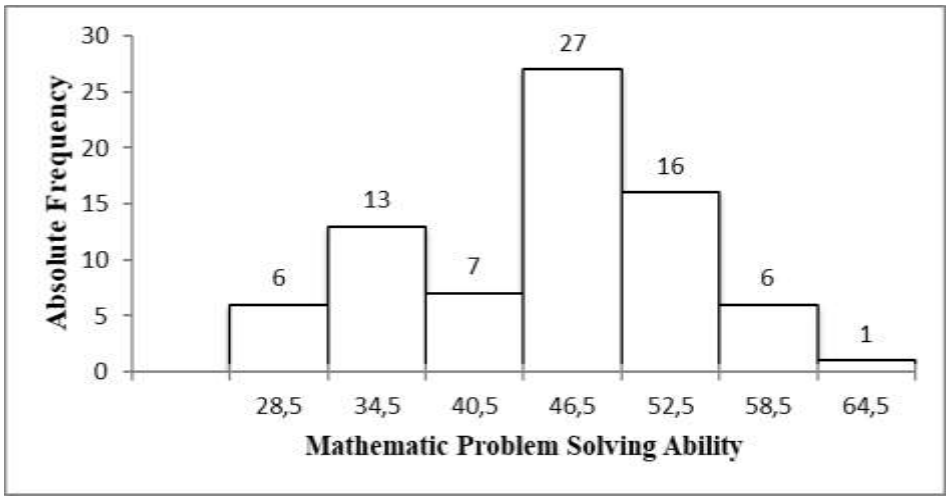
C. Result and Discussion

Based on data from the field that processed statistically, the scores of each individual classified in seven classes used the Sturges rule. The minimum score was 29 and the maximum score was 66 resulted in the score range amount was 37. Based on the calculation of descriptive statistic results, the instrument of problem-solving mathematics ability has a mean score of 47,97, a standard deviation score of 8,642, and a variance score of 74,693. The data classification are presented on the table of frequency distribution as follow:

Table 1. Frequency Distribution of Mathematics Problem-Solving Ability Score (Y)

Interval Class	Range		Frequency		
	Lowest	Highest	Absolute	Cumulative	Relative
29 – 34	28,5	34,5	6	6	8%
35 – 40	34,5	40,5	13	19	17%
41 – 46	40,5	46,5	7	26	9%
47 – 52	46,5	52,5	27	53	36%
53 – 58	52,5	58,5	16	69	21%
59 – 64	58,5	64,5	6	75	8%
65 – 70	64,5	70,5	1	76	1%
			76		100%

Based on the table above, presented the score of problem-solving mathematics ability that spread on some interval class group, score with the highest percentage was interval class of 47-52 amount of 36% and score with the lowest percentage was interval class of 65-70 amount of 1%. Generally, concluded that most of the score of problem-solving mathematics ability accumulated on less than 53. Based on table 1 above, the data spreading of the mathematics problem-solving ability instrument presented in the following histogram graphic:



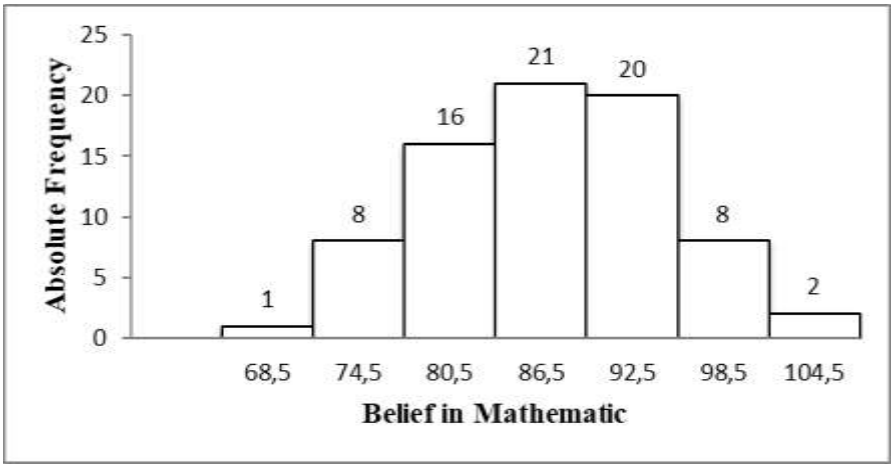
Picture 2.
Histogram of Mathematics Problem Solving Ability Score (Y)

Based on data of the field then processed statistically, the score of each individual classified into seven classes using Sturges rule. The minimum score of 69 and the maximum score of 107 resulted in a score range amount of 38. Based on the calculation of descriptive statistics, the instrument of belief in mathematic has a mean score amount 90,20, a deviation standard score of 7,833, and a variance score amount of 61,361. Data classification presented on the following table of frequency distribution:

Table 2. Frequency Distribution of Belief in Mathematic (X_1)

Interval Class	Range		Frequency		
	Lowest	Highest	Absolute	Cumulative	Relative
69 – 74	68,5	74,5	1	1	1%
75 – 80	74,5	80,5	8	9	11%
81 – 86	80,5	86,5	16	25	21%
87 – 92	86,5	92,5	21	46	28%
93 – 98	92,5	98,5	20	66	26%
99 – 104	98,5	104,5	8	74	10%
105 – 110	104,5	110,5	2	76	3%
			76		100%

Based on the table above, the score belief in mathematics is spread out on some interval class group, score with the highest percentage was on interval class 87-92 amount of 28% and the score with the lowest percentage was on interval class 69-74 amount 1%. It was concluded that most of the score belief in mathematics collected on less than 93. Based on table 2 above, the instrument belief in mathematics presented in the following histogram graphic:



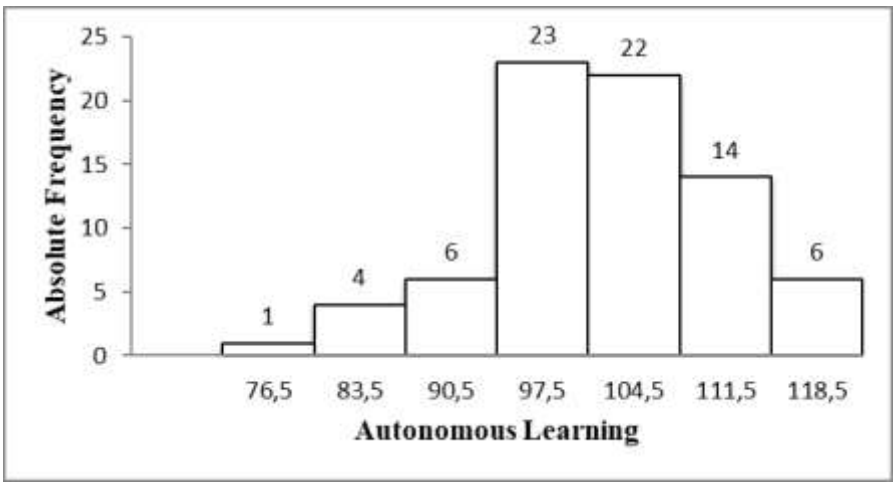
Picture 3. Histogram of Belief in Mathematic Ability Score (X_1)

Based on data in the field that processed statistically, the score of each individual classified into seven classes used the Sturges rule. The minimum score is 77 and the maximum score is 122 resulted in the score range amount of 45. Based on the calculation of descriptive statistics, the instrument of the autonomous learning has a mean amount of 105,78, a deviation standard scores 8,682, and a variance score amount of 75,376. Data classification presented on the following table of frequency distribution:

Tabel 3. Frequency Distribution of The autonomous learning Score (X_2)

Interval Class	Range		Frequency		
	Lowest	Highest	Absolute	Cumulative	Relative
77 – 83	76,5	83,5	1	1	1%
84 – 90	83,5	90,5	4	5	6%
91 – 97	90,5	97,5	6	11	8%
98 – 104	97,5	104,5	23	34	30%
105 – 111	104,5	111,5	22	56	29%
112 – 118	111,5	118,5	14	70	18%
119 – 125	118,5	125,5	6	76	8%
			76		100%

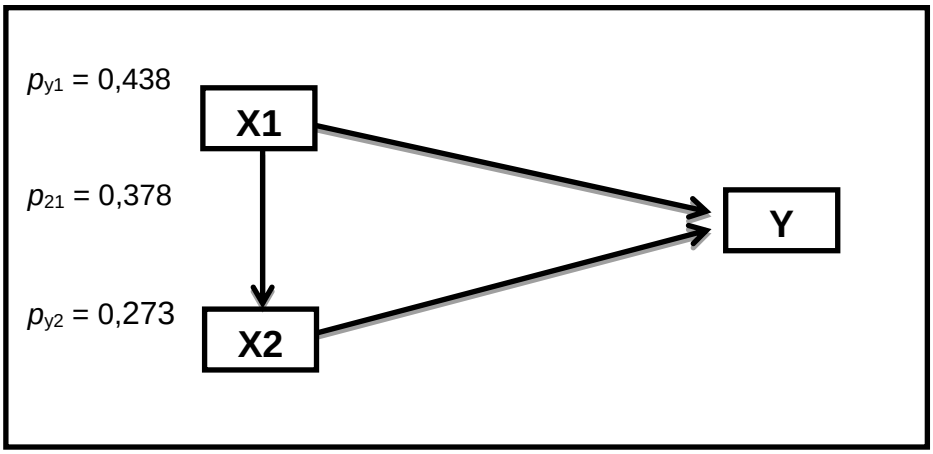
Based on the table above, the score of autonomous learning that being spread on some class interval group, score with the highest percentage was on interval class 98-104 amount 30% and score with the lowest percentage was on interval class 77-83 amount 1%. Generally concluded that most of the score the autonomous learning collected on less than 112. Based on table 3 above, after spreading the data instrument, autonomous learning presented in the following histogram graphic:



Picture 4. Histogram of The autonomous learning ability score (X_2)

Undirectly influence was the influence of belief in the mathematics variable (X1) to problem-solving mathematics ability (Y) through the autonomous learning variable (X2). Based on the direct influence X1 to Y, calculation of undirectly influence X1 to Y through X2 times with line coefficient p21 and py2 = 0,378 x 0,273 = 0,103. The calculation result was line coefficient undirectly influence of belief in mathematics variable to problem-solving mathematics ability amount of 0,103.

Based on the whole analysis result of the line coefficient above, could be described the final mode of this research line analyses:



Picture 5. Final Mode of Hypothetical Path Analysis

The belief of students about mathematics can influence the way to participate in mathematics subjects. When the student has a positive belief in mathematic will be believed in all aspects of mathematics subject, as its characteristics of mathematics, its ability in mathematics learning, the mathematics learning process, and function of mathematic itself. The student who has a positive belief in mathematics will be easier in mathematic problem solvingIt in line with the statement of Schoenfeld in Schommer (2005) that, "Part of the problem-solving process is influenced by student's beliefs about the nature of mathematical knowledge and learning". It means that problem-solving ability influenced by belief in knowledge and mathematic learning.

Based on the research and explanation above, seemed that belief in mathematics is a directly positive

influence on the problem-solving mathematics ability.

One of the primary problems of students' triumph on the mathematics subject is the inability to complete a task that requires higher-level thinking ability. Ability can be developed with autonomous learning. Finally, the students do not have the ability to think creatively when found new problem mathematic or unusual problem around. Fennema and Peterson in Karp (1991) said that "in order to perform higher-level mathematical tasks, someone should be autonomous. Someone should choose to work on such tasks and persist until the task is satisfactorily completed".

Problem-solving is an ability that should be mastered by students, especially ins the mathematic subject. Students required to have the ability in delivering information on problem-solving in the mathematics subject. Doyle in Tery (2008) said more that, "When students have the ability to learn on their own, they will know how to generate questions and how to tell the difference between information that will help them complete a task and information that will not". It proves that students who have autonomous learning tend to have a better problem-solving mathematic ability because with autonomous learning students will be more assisted in mathematical problem-solving.

Based on the research and explanation above, seemed that autonomous learning have a directly positive influence on the problem-solving mathematics ability.

D. Conclusion

Based on analysis of hypotetical test result and its discussion, this research concluded that:

1. There was a direct positive influence belief in mathematics problem-solving ability. It means that when belief be more positive to mathematics, will increase the problem-solving mathematics ability of the students in 5th-grade of SDN in the Batanghari Subdistrict.
2. There was a direct positive influence of autonomous learning on problem-solving mathematics ability. It means that the higher increase of autonomous learning will increase the problem-solving mathematics ability of 5th-grade students of SDN in the Batanghari Subdistrict.

References

Arikunto Suharsimi. 2006. *Metodelogi Penelitian*. Yogyakarta: Bina Aksara.

Butterworth John. 2005. *Thinking Skills*. Cambridge: Cambridge University Press.

Daryanto. 2012. *Model Pembelajaran Inovatif*. Yogyakarta: Gava Media.

Ernawati Diana dan Zuliana Eka. 2020. Implementation of Open-Ended Problems on Mathematical Problem-Solving Skills of Elementary School Students. *Journal of Elementary School Education (JPsd)*. 6(2): 145-157.

Goldin Gerald dkk. 2009. *Beliefs – No Longer A Hidden Variable In Mathematical Teaching And Learning Processes.* Rotterdam: Sense Publishers.

Gulo. 2005. *Metodologi Penelitian*. Jakarta: PT Grasindo.

Iriani Widya. 2010. Upaya Meningkatkan Kemandirian belajar dan Penguasaan Konsep Matematika Siswa Kelas VI Negeri Cepagan 01 Batang Melalui *Problem Based Learning.Skripsi:* Universitas Negeri Yogyakarta.

Kadir. 2010. Statistika untuk Penelitian Ilmu-ilmu Sosial. Jakarta: Rosemata Sampurna.

Karp Silliman Karen. 1991. Elementary School Teachers Attitudes Toward Mathematics: The Impact on Students Autonomous Learning Skills. *School Science and Mathematics Journal*. 91(6): 265.

Marcou Andri dan Lerman Stephen. 2007. *Changes In Student's Motivational Beliefs And Performance In A Self-Regulated Mathematical Problem Solving Environment.* London: London South Bank University.

Moscucci Manuela. 2007. *About Mathematical Belief Systems Awareness*. Italy: University of Siena.

Nurhayati dkk. 2014. Pengaruh Keharmonisan Keluarga dan Kemandirian Belajar Anak Terhadap Hasil Belajar Matematika Siswa Kelas V SD.*Jurnal FKIP UNS PGSD Kebumen*. 2(1): 2.

Polya George. 1973. *How To Solve It A New Aspect of Mathematical Method*. Princeton: Princeton University Press.

Ruseffendi, E.T. 2006. Pengantar kepada Membantu Guru Mengembangkan Kompetensinya dalam Pengajaran Matematika untuk meningkatkan CBSA. Bandung: Tarsito,

Santrock. 2008. *Psikologi Pendidikan*. Jakarta: Prenada Media Group.

Schommer Marlene dkk. 2005. Epistimological Beliefs, Mathematical Problem Solving, And Academic Performance Of Middle School Students.*The Elementary School Journal*. 105(3): 289-304.

Soedjadi. 1999. *Kiat Pendidikan Matematika di Indonesia*. Jakarta: Direktorat Jenderal Pendidikan Tinggi Departemen Pendidikan Nasional.

Sugiman. 2012. Aspek Keyakinan Matematik Siswa dalam Pendidikan Matematika, *Jurnal Pendidikan Matematika FKIP UNY*. 4(1): 2-3

Sugiyono. 2010. *Statistika untuk Penelitian* Bandung: Alfabeta.

Takaria Johanis dan Talakua Melvie. 2018. The Effectiveness of the Collaborative Problem Solving (Cps) Model in Increasing the Mathematical Representation Ability of Prospective Elementary School Teacher Students. *Journal of Elementary School Education (JPsd)*. 4(2): 190-203.

Terry. 2008. Helping Students Learn In A Learner Centered Environment. Sterling: Stylush Publishing.

Widjajanti. 2009. Mengembangkan Keyakinan Siswa Sekolah Dasar Terhadap Matematika Melalui Pembelajaran Realistik.*Prosiding Seminar Nasional Penelitian, Pendidikan, dan Penerapan MIPA. FMIPA UNY*. 1: 5-7.

Yustitia Via. 2017. Profile of PGSD UNIPA Surabaya Students' Reasoning Ability in Solving School Mathematics Problems. *Journal of Elementary School Education (JPsd)*. 3(2): 117-128.