Ilkogretim Online - Elementary Education Online, 2020; 19 (4): pp. 1902-1910
http://ilkogretim-online.org.tr
doi:10.17051/ilkonline.2020.762541

Pre-service teacher's ability in solving mathematics problem viewed from numeracy literacy skills

Dede Salim Nahdi, *Universitas Majalengka,* Indonesia, *salimnahdi@unma.ac.id* ORCID: 0000-0001-7080-1821
Mohamad Gilar Jatisunda, *Universitas Majalengka,* Indonesia, *g.jatisunda@unma.ac.id* ORCID: 0000-0001-8860-0462
Ujiati Cahyaningsih, *Universitas Majalengka,* Indonesia, *ujiaticahyaningsih@unma.ac.id* ORCID: 0000-0003-0239-7550
Vici Suciawati, *Universitas Majalengka,* Indonesia, *vicisuciawati@unma.ac.id* ORCID: 0000-0002-1287-3162

Abstract. Problem-solving is one of the important aspects in learning mathematics. However, some study results illustrate the problem-solving ability of students in Indonesia is still low. One step that is thought able to improve problem-solving abilities is enhancing numeracy literacy skills. This study aims to analyze the proportion of problem-solving abilities of Pre-service Teacher in terms of numerical literacy. This study uses a Quasi Experiment method with type Nonequivalent Pretest-Posttest Control Group. The population was all pre-service teachers at Majalengka University, Indonesia, with 60 participants as sample. The results of study is a significant difference in improvement of students' problem-solving abilities of prospective teachers in terms of numerical literacy. From these results, it can be concluded that students who have high numerical literacy make the best contribution to mathematical problem-solving ability than they who have medium and low numeracy literacy.

Keywords: Mathematical problem-solving ability, numeracy literacy, problem-based learning (pbl) models

Received: 13.02.2020	Accepted: 15.04.2020	Published: 15.09.2020

INTRODUCTION

Mathematics is a central component of human intelligence and a core component of the current technological revolution (Ernest, 2015). When Learning Mathematics emerged the process of "construction" of an "operator" in the brain that manifestly transforms one set of formulas into another such set of formulas (Gromov, 2017). Mathematics encourages the development of science and technology and plays a role in advancing the power of human thought. Mathematics can reveal hidden patterns that can help mankind in understanding the phenomena around them (Fatima, 2012). In the activities of life, humans will never be separated from mathematics. Many human activities are carried out using mathematical concepts. Likewise, many problems are faced using mathematical models as a method of solving them. On mathematics education connections as something that happens within the pupils' physical world (and would, therefore, be commonplace to them), at that point, real-life connections and mathematics in the standard of living have the same meaning (Mosvold, 2006). When it comes to choosing to use practical activities in mathematics teaching, the teacher needs to know the pupils' everyday life experiences (Haara, 2015). Students learn according to their lives will strengthen their consciousness when learning mathematics, it means they learn meaningfully.

The improvement of students' control to utilize mathematics includes learning the signs, symbols, and mathematical terms (Sfard, Nesher, Streefland, Cobb, & Mason, 1998). All life is problem-solving (Greiff, Holt, & Funke, 2013). The specific main goal of learning mathematics is to develop problem-solving skills (Wilson, Fernandez, & Hadaway, 1993). Problem-solving is important for intellectual development (Lester & Charles, 1982) (Brown, 2003) Mathematical problem solving has long been seen as an important aspect of learning mathematics (Bahar & Maker, 2015) (Liljedahl, Santos-Trigo, Malaspina, & Bruder, 2016) (Prabawanto, 2017). The difference between non-routine and routine problems appears to be a key element in problem-solving (Laterell, 2013). Modeling learning activities that can prepare and develop students'

problem-solving experiences is very important for the challenges and demands of the 21st Century (English & Gainsburg, 2015). We have to prepare children with planning and problem-solving aptitudes so that they are prepared to confront the progressively troublesome and complex issues they will confront (Keen, 2011). According to Polya in solving a problem, several stages must be passed, among others (1) Understanding the problem; (2) Planning a settlement strategy; (3) Carry out a settlement; (4) Re-checking the results obtained (Polya, 2004). These four stages are interconnected links. Learning to solve problems is long-term teaching and learning process which includes four phases (Bruder & Collet, 2011), namely 1) Getting used to using heuristic methods and techniques intuitively; 2) Focus on special heurism through prominent examples; 3) do the exercises briefly and consciously to use new heurism with tasks that have different difficulties. 4) Broaden the context of the strategy being applied. When students have difficulty at one stage it will be difficult to do the next stage. By teaching problem-solving skills, students can develop and apply their mathematical abilities in dealing with problems in real life (Gurat, 2018).

However, several studies have shown that the ability to solve mathematical problems of Indonesian students is still low. The ability of students to solve mathematics, science, reading and their implementation in daily life is seen as a strong example of special education for children the barometer of quality education (Johar, 2012). TIMSS AND PISA Is an independent institution that measures the quality of education. A study conducted by the results of the PISA test and TIMSS shows that Indonesia ranks low. Indonesia's rank is almost as the lowest among countries year to year (Stacey, 2011)(Argina, Mitra, Ijabah, & Setiawan, 2017). The results of the mathematics tests conducted by PISA Indonesia scored 387. Meanwhile, the results of TIMMS, Indonesia scored 395 out of an average value of 500 (PISA, 2013) (Mullis, Martin, Foy, Arora, & others, 2012). Depending on the findings of TIMSS for the last four years, Indonesia has been lying below the top five rankings (Utomo, Yuana, Narulita, Fikri, & Wahono, 2018). Indonesia still needs to be evaluated, especially thinking competency (Fauziah, Marmoah, Murwaningsih, & Saddhono, 2020).

The ability to solve mathematical problems is still a problem for most students in Indonesia, both at the level of basic education, secondary education and even higher education. In secondary school student has difficulty in completing ideas, difficulty in completing them, and difficulty in solving problems (Jatisunda, 2016) (Dintarini, 2018). In college, the students are still having difficulties when faced with non-routine math problems. Non-routine problems allow solvers to use facts and techniques in an unfamiliar situation (Nancarrow, 2004). This situation occurs in students majoring in Primary School Teacher Education (PGSD) Majalengka University, Indonesia. In the course of the basic mathematical concepts of 138 PGSD students, it was found that 94 (68%) students had a value category below B, these results indicate that students have difficulty (Amir, 2018). The low ability of students in dealing with mathematical problems causes them to have a phobia towards mathematics that has an impact on their results and achievement in mathematics which is still low. Feeling nervous, stressed, or anxious to deal with mathematical problems (Ruff & Boes, 2014) (Saputra, 2017) (Sokolowski & Ansari, 2017) (Carey et al., 2019). Based on observations, it was identified that one of the problems for students was the lack of knowledge about the notations and symbols associated with mathematical models. These conditions make it difficult to solve the contextual problems they experience in everyday life related to mathematical concepts. Besides, they also still have difficulty in understanding the information presented in tables and graphs so that the impact on the ability to conclude is low. These activities are closely related to numeracy literacy skills.

Education has multidimensional goals, and school systems around the world are judged, at least in part, on their ability to provide students with basic literacy, numeracy and analytical skills (Green & Riddell, 2012). Poor literacy and numeracy teaching practices is a common problem that affects primary education (Mmasa & Anney, 2016). Reading, writing, and mathematics are not only fundamental learning skills, but are associated with higher life quality, individual well-being, public safety, and growth (Bynner & Parsons, 2006) (Ball, Paris, & Govinda, 2014). Mathematics requires specific accuracy and expression, which generally are not displayed in the ordinary spoken language so numeracy literacy needs to be developed in

learning mathematics (Lee & Lawson, 1996). Numeracy is the ability to use mathematics to solve problems and meet the demands of everyday life (Quinn, 2011). Numeracy literacy is defined as a person's ability to use reasoning. Reasoning means analyzing and understanding a statement, through activities in manipulating mathematical symbols or language found in daily life, and expressing these statements through writing and orally (Abidin, Mulyati, & Yunansah, 2017). Numeration is the ability to access, use, interpret, and communicate mathematical information and ideas to engage in and manage the mathematical demands of various situations in real life (Levels, Dronkers, & Jencks, 2017). Numeracy literacy is part of mathematics so that the components in the implementation of numeracy literacy cannot be separated from the material covered that exists in mathematics (Ekowati, Astuti, Utami, Mukhlishina, & Suwandayani, 2019). Numeracy literacy is an important ability to predict one's educational attainment and employment (Hanushek & Woessmann, 2008). To be relevant and practical in the classroom, literacy and numeracy learning, the issue must be the same for their life. It must be grounded in inquiry and reflection, it must be collaborative, it must be ongoing, intensive and supported by modeling, coaching and the collective solving of specific problems, and It must be connected to their life (Fullan, Hill, & Crévola, 2011).

Teachers should understand mathematics which they teach in-depth, consider the growth of students to understand how they learn mathematics and select activities and methods that allow them to learn efficiently (Yenmez & Gökçe, 2020). Another effort that can be done to improve problem-solving skills is to determine a learning model that can facilitate these abilities. This learning model must help students construct their knowledge to be able to solve real-life problems so that the ability to solve problems and activities following what is expected in the learning objectives. Given the developing complexity within the instructing, learning and circumstances in mathematics, both the show differing qualities within the number of modern speculations in mathematics from areas such as cognitive science, humanism, human studies, and neurosciences is normal and basic (Sriraman & English, 2010). Problem-Based Learning has an important role to play in solving the complexity of learning. Because of the characteristics of Problem Based Learning can facilitate it (Arends, 2014). Problem Based Learning (PBL) was developed based on modeling of the process of how we learn every day during our lives (Adiga & Adiga, 2015). PBL is a learning model that is based on constructivism theory. These aptitudes are seen as instrumental in problem-centric instructive approaches that recognize that knowledge isn't transmitted and point to support understudies within the mathematics building (Gravemeijer, Stephan, Julie, Lin, & Ohtani, 2017). PBL is seen as a method that is quite effective in helping students improve their problem-solving abilities (Celik, Onder, & Silay, 2011). In constructivism, learning will occur through the process of building knowledge in the minds of students (Bodner, 1986)(Bhowmik, 2015)(Diaz, 2017). The PBL model is characterized by presenting daily problems to train students to think critically and skillfully solve problems, and gain knowledge about important concepts from what is learned (Duch & others, 1996). In PBL, the contextual issues given must be relevant to the teaching material to be delivered. It aims to motivate students for learning carried out (Prince, 2004).

METHODS

This study uses a Quasi-Experiment method with a posttest-only control group design. Quasi-experimental designs define a reference group that is as similar as possible to the treatment population in terms of specific (pre-intervention) characteristics (White & Sabarwal, 2014). Since either, we cannot selectively assign subjects to treatment conditions for practical reasons or it would be unethical to do so (Fife-Schaw, 2006)(Fraenkel, Wallen, & Hyun, 2011) (Campbell & Stanley, 2015). This is the foundation for quasi-experimentation. In this research design, the experimental group obtained learning with the Problem Based Learning model and the control group used expository learning models.

Table 1. *Research design*

Numeracy Literacy Level	Learning Models	
	PBL (M_1)	Exp. (M_2)
High (L_1)	L_1M_1	L_1M_2
Medium (L_2)	L_2M_1	L_2M_2
Low (L_3)	L_3M_1	L_3M_2

Information:
L_i : students who have Numeracy Literacy at the i level, for (i = 1, 2, 3) with 1 = high, 2 = medium, 3 = low
M_i : students who obtain the jth learning model, for j = 1, 2 with 1 = PBL, 2 = Expository Model
L_iM_i : students who have i-level Numeracy Literacy and get j models.

The population of this study was all students of prospective elementary school teachers at Majalengka University, Indonesia, with a sample of 60 participants selected by purposive sampling technique. Data collection techniques in this study were tests and questionnaires. Tests are used to collect data on mathematical problem-solving abilities, questionnaires are used to collect data on student numeracy literacy. The instrument used in this research is a description test and Numeracy Literacy questionnaire to distinguish Numeration Literacy in the high, medium and low categories. Data analysis techniques in this study used two-way ANOVA to test hypotheses.

RESULTS

Data from the results of this study were obtained from scores on the results of tests of problem-solving abilities through the provision of questions after being given treatment (posttest). Problem-solving ability test questions are designed using contextual problems to measure students' ability to solve non-routine problems.

Based on the results of data processing on the score of the mathematical problem-solving ability, the minimum, maximum, average scores, and standard deviation scores are obtained in the following table.

Table 2. *Results of mathematical problem-solving abilities*

Student groups	N	Minimum	Maximum	Mean	Std. Deviation
Experiment	30	68	92	81,00	5,71
Control	30	68	88	77,87	5,15

Based on the table above for mathematical problem-solving abilities can be seen the comparison of test results between the experimental class and the control class. The average value of the experimental class is 81.00 better than the control class which is an average value of 77.87. From the average student final grade, it can be concluded that descriptively the mathematical problem-solving ability of students in the experimental class is better than the control class.

In the next step, students in both classes are distributed based on the level of Numeracy Literacy (high, medium, low). Numeracy Literacy levels distributed techniques using the following classification table.

Table 3. *Criteria of N-gain*

N-gain (g)	Classification
$g \geq 0,70$	High
$0,30 \leq g < 0,70$	Medium
$g < 0,30$	Low

Based on the results of the Numeracy Literacy test, students are grouped according to the Numeracy Literacy level as follows

Table 4. *Classification of numeracy literacy*

Levels	Group		Total
	Experiment	Control	
High	9	8	17
Medium	13	14	27
Low	8	8	16
Total	30	30	60

The results of tests of mathematical problem-solving abilities, both based on the level of Numeracy Literacy and as a whole, descriptively are presented in the table below.

Table 5. *The results of mathematical problem-solving abilities*

Models	Numeracy	Mean	Std. Deviation	N
Experiment	High	87,8889	2,84800	9
	Medium	78,6154	3,01492	13
	Low	77,1250	4,61171	8
	Total	81,0000	5,70541	30
Control	High	80,7500	3,37004	8
	Medium	79,0714	3,75119	14
	Low	72,8750	5,61726	8
	Total	77,8667	5,15105	30
Total	High	84,5294	4,74497	17
	Medium	78,8519	3,35930	27
	Low	75,0000	5.42832	16
	Total	79,4333	5.61586	60

From the results table of the mathematical problem-solving ability above, students with a high level of Numeracy Literacy and getting a problem-based learning model get the highest average test results compared to other groups.

The results of data processing through two-way variant analysis are presented in the following table.

Table 6. *Analysis of variance*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Models	188,391	1	188,391	12,619	0,001
Numeracy	728,034	2	364,017	24,384	0,000
Models * Numeracy	159,276	2	79,638	5,335	0,008

Based on the table above obtained:

a. Through probability techniques, for students' mathematical problem-solving abilities in both experimental and control classes p-values (sig) of 0,001<0.05 are obtained so that there are differences in mathematical problem-solving abilities between experiment class and control class. Thus, the application of the PBL model, when compared to expository models, is better at improving mathematical problem-solving abilities.
b. For the mathematical problem-solving ability of students with high, medium and low Numeracy Literacy, a p-value (sig) of 0,000<0.05 is obtained, so that there are differences in problem-solving abilities between groups of students who have high, medium and low numeracy literacy. Based on the results of the descriptive statistical calculations for each group, the average score of the problem-solving ability of students who have high Numeracy Literacy is better than students who have medium and low Numeracy Literacy. Thus, high numeracy literacy has a significant effect on students' problem-solving abilities compared to medium and low numeracy literacy.

c. To see the interaction between learning models with student numeracy literacy on mathematical problem-solving abilities obtained p-value (sig) of 0,008<0.05. Thus, it can be concluded that there is an interaction between the learning models applied with the Numeration Literacy of pre-service teacher to the mathematical problem-solving ability. Interaction means the learning model and Numeracy Literacy together have a significant influence on mathematical problem-solving abilities. In other words, the learning model gives a different effect on the ability to solve mathematical problems when applied to students who have different numeracy literacy skills.

Based on the calculation results of the analysis of variance of two paths with unequal cell sizes, it is concluded that there is an interaction between the learning models applied with student numeracy literacy on mathematical problem-solving abilities. Thus, because of the interaction of the two variables, it is continued with the Tukey Post Hoc test to see differences between groups of students who obtained the Problem Based Learning model with groups who obtained expository models based on high, medium, and low numeracy literacy. The results of the Tukey Post Hoc test are presented in the discussion below.

Table 7. *Tukey post hoc test*

(I) Numeracy	(J) Numeracy	Mean Difference (I-J)	Sig.
High	Medium	5,6776*	0,000
	Low	9,5294*	0,000
Medium	High	-5,6776*	0,000
	Low	3,8519*	0,007
Low	High	-9,5294*	0,000
	Medium	-3,8519*	0,007

Based on the results of the Post Hoc Tukey Test above, for comparisons between groups of students based on the level of Numeracy Literacy and learning models all have p-values (sig) <0.05. Thus, the problem-solving ability between students who have high, medium, and low Numeracy Literacy levels for each learning model used is significantly different. The average score of students' problem-solving abilities with high Numeracy Literacy and using the highest problem-based learning model compared to other student groups. Thus, the problem-solving ability of students who have high numeracy literacy and obtain problem-based learning models is better than other student groups.

DISCUSSION and CONCLUSIONS

The instrument used in this study is a matter of solving unstructured problems relating to numbers. The results showed that some students were able to solve unstructured problems related to daily life. Based on observations on student work obtained several findings that some students are able to solve problems in order. The results are also communicated by students in writing and their explanations.

This Result of Study is understandable because Numeracy Literacy is very supportive of problem-solving abilities. People who have the ability to Literate Numeration will make it easy for him to understand the problems at hand. Numeracy literacy will assist students in understanding information conveyed in questions, whether in the form of narration, tables, graphics or other graphic info. Understanding the data and information presented in the questions will facilitate students in understanding the problem. Understanding problems is a basic foundation in solving mathematical problems. With a good understanding of the problem, the problem-solving process becomes easier. Numeracy literacy also helps students make mathematical models of the problems encountered, and making mathematical models is a very important first step in solving problems. Besides, the problem-based learning model is also able to provide facilities to students in improving problem-solving skills. With this learning model, students are given contextual mathematical problems to solve. This method makes them

required to develop their thinking ability to be able to use mathematics as a medium of resolution. They will get used to life problems that can be solved by mathematics.

Based on the research results, several conclusions are obtained:

1. The problem-solving ability of pre-service teachers who got the Problem Based Learning (PBL) model is better than pre-service teachers who got the Expository Learning model.
2. There are differences in mathematical problem-solving abilities between groups of pre-service teachers who have high, medium, and low numeracy literacy. High Numeracy Literacy has a better effect on mathematical problem-solving abilities than medium and low Numeracy Literacy.
3. There is an interaction between the learning models applied with the Numeration Literacy of pre-service teachers to the mathematical problem-solving ability.
4. Problem-solving abilities of pre-service teachers who have high Numeracy Literacy and obtain problem-based learning models better than other groups.

REFERENCES

Abidin, Y., Mulyati, T., & Yunansah, H. (2017). Pembelajaran Literasi Strategi Meningkatkan Kemampuan Literasi Matematika, Sains, Membaca, dan Menulis. *Jakarta: Bumi Aksara*.

Adiga, U., & Adiga, S. (2015). Problem based learning. *International Journal of Current Research*, *7*(6), 17181–17187.

Amir, M. F. (2018). *Identifikasi kesulitan mahasiswa dalam memecahkan masalah open ended materi nilai mutlak*.

Arends, R. (2014). *Learning to teach*. McGraw-Hill Higher Education.

Argina, A. W., Mitra, D., Ijabah, N., & Setiawan, R. (2017). Indonesian Pisa Result: What Factors And What Should Be Fixed? *Proceedings Education and Language International Conference*, *1*(1).

Bahar, A., & Maker, C. J. (2015). Cognitive backgrounds of problem solving: A comparison of open-ended vs. closed mathematics problems. *Eurasia Journal of Mathematics, Science and Technology Education*, *11*(6), 1531–1546.

Ball, J., Paris, S. G., & Govinda, R. (2014). Literacy and numeracy skills among children in developing countries. In *Learning and education in developing countries: Research and policy for the post-2015 UN development goals* (pp. 26–41). Springer.

Bhowmik, M. (2015). Constructivism approach in mathematics teaching and assessment of mathematical understanding. *Basic Research Journal of Education Research and Review*, *4*(1), 8–12.

Bodner, G. M. (1986). Constructivism: A theory of knowledge. *Journal of Chemical Education*, *63*(10), 873.

Brown, N. M. (2003). *A study of elementary teachers' abilities, attitudes, and beliefs about problem solving*.

Bruder, R., & Collet, C. (2011). *Problemlösen lernen im Mathematikunterricht*. Cornelsen Scriptor Berlin.

Bynner, J., & Parsons, S. (2006). *New light on literacy and numeracy: Full report*. National Research and Development Centre for adult literacy and numeracy~….

Campbell, D. T., & Stanley, J. C. (2015). *Experimental and quasi-experimental designs for research*. Ravenio Books.

Carey, E., Devine, A., Hill, F., Dowker, A., McLellan, R., & Szucs, D. (2019). *Understanding Mathematics Anxiety: Investigating the experiences of UK primary and secondary school students*.

Celik, P., Onder, F., & Silay, I. (2011). The effects of problem-based learning on the students' success in physics course. *Procedia-Social and Behavioral Sciences*, *28*, 656–660.

Diaz, L. D. E. (2017). The teaching and learning process of mathematics in the primary education stage: A constructivist proposal within the framework of key competences. *International Electronic Journal of Mathematics Education*, *12*(3), 709–713.

Dintarini, M. (2018). Analisis Kesulitan Mahasiswa Dalam Memecahkan Masalah Matematika Pada Matakuliah Kalkulus Diferensial Berdasarkan Teori Polya. *Jurnal Pendidik Indonesia (JPIn)*, *1*(2), 42–46.

Duch, B., & others. (1996). Problems: A key factor in PBL. *About Teaching*, *50*, 7–8.

Ekowati, D. W., Astuti, Y. P., Utami, I. W. P., Mukhlishina, I., & Suwandayani, B. I. (2019). Literasi Numerasi di SD Muhammadiyah. *ELSE (Elementary School Education Journal)*, *3*(1), 93–103.

English, L. D., & Gainsburg, J. (2015). 12 Problem Solving in a 21st-Century Mathematics Curriculum. *Handbook of International Research in Mathematics Education*, 313.

Ernest, P. (2015). The social outcomes of learning mathematics: Standard, unintended or visionary? *International Journal of Education in Mathematics Science and Technology*, *3*(3), 187–192.

Fatima, R. (2012). Role of Mathematics in the Development of Society. *National Meet on Celebration of National Year of Mathematics. Organized by NCERT, New Delhi*.
Fauziah, M., Marmoah, S., Murwaningsih, T., & Saddhono, K. (2020). Profile of divergent thinking ability of elementary school student in thematic learning. *Elementary Education Online*, *19*(2), 624–640.
Fife-Schaw, C. (2006). Quasi-experimental designs. *Research Methods in Psychology*, 88–103.
Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2011). *How to design and evaluate research in education*. New York: McGraw-Hill Humanities/Social Sciences/Languages.
Fullan, M., Hill, P., & Crévola, C. (2011). *Improving student achievement in literacy and numeracy: Job-embedded professional learning*.
Gravemeijer, K., Stephan, M., Julie, C., Lin, F.-L., & Ohtani, M. (2017). What mathematics education may prepare students for the society of the future? *International Journal of Science and Mathematics Education*, *15*(1), 105–123.
Green, D. A., & Riddell, W. C. (2012). Understanding educational impacts: The role of literacy and numeracy skills. *11th IZA/SOLE Transatlantic Meeting of Labor Economists [Online.] Buch/Ammersee.[Cit. 21. 10. 2016.] Available from:< Http://Www. Iza. Org/Conference_files/TAM2012/Riddell_w5670. Pdf*.
Greiff, S., Holt, D. V, & Funke, J. (2013). Perspectives on problem solving in educational assessment: Analytical, interactive, and collaborative problem solving. *Journal of Problem Solving*, *5*(2).
Gromov, M. (2017). Math Currents in the Brain. In *Simplicity: Ideals of Practice in Mathematics and the Arts* (pp. 105–118). Springer.
Gurat, M. G. (2018). Mathematical Problem-Solving Strategies among Student Teachers. *Journal on Efficiency and Responsibility in Education and Science*, *11*(3), 53–64.
Haara, F. O. (2015). Teachers' Choice of Using Practical Activities--A Hierarchical Classification Attempt. *European Journal of Science and Mathematics Education*, *3*(4), 323–336.
Hanushek, E. A., & Woessmann, L. (2008). The role of cognitive skills in economic development. *Journal of Economic Literature*, *46*(3), 607–668.
Jatisunda, M. G. (2016). Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa SMP Melalui Pembelajaran dengan Pendekatan Kontekstual. *Jurnal THEOREMS (The Original Research of Mathematics)*, *1*(1).
Johar, R. (2012). Domain soal PISA untuk literasi matematika. *Jurnal Peluang*, *1*(1), 30.
Keen, R. (2011). The development of problem solving in young children: A critical cognitive skill. *Annual Review of Psychology*, *62*, 1–21.
Laterell, C. M. (2013). What is problem solving ability. *LATM Journal*, *1*(1).
Lee, C., & Lawson, C. (1996). Numeracy through literacy. *Educational Action Research*, *4*(1), 59–72.
Lester, F., & Charles, R. (1982). *Teaching problem solving: What, why & how*. Dale Seymour Publications.
Levels, M., Dronkers, J., & Jencks, C. (2017). Contextual explanations for numeracy and literacy skill disparities between native and foreign-born adults in western countries. *PloS One*, *12*(3).
Liljedahl, P., Santos-Trigo, M., Malaspina, U., & Bruder, R. (2016). Problem solving in mathematics education. In *Problem Solving in Mathematics Education* (pp. 1–39). Springer, Cham.
Mmasa, M., & Anney, V. N. (2016). Exploring Literacy and Numeracy Teaching in Tanzanian Classrooms: Insights from Teachers' Classroom Practices. *Journal of Education and Practice*, *7*(9), 137–154.
Mosvold, R. (2006). *Mathematics in everyday life A study of beliefs and actions*. The University of Bergen.
Mullis, I. V. S., Martin, M. O., Foy, P., Arora, A., & others. (2012). *TIMSS 2011 international results in mathematics*. TIMSS & PIRLS International Study Center Chestnut Hill, MA.
Nancarrow, M. (2004). *Exploration of metacognition and non-routine problem based mathematics instruction on undergraduate student problem solving success*.
PISA. (2013). *PISA 2012 results in focus: What 15-year-olds know and what they can do with what they know*. Author Paris, France.
Polya, G. (2004). *How to solve it: A new aspect of mathematical method*. Princeton university press.
Prabawanto, S. (2017). The enhancement of students' mathematical problem solving ability through teaching with metacognitive scaffolding approach. *AIP Conference Proceedings*, *1848*(1), 40014.
Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223–231.
Quinn, R. (2011). Literacy and Numeracy for Learning and Life. *Dublin: Department of Education and Skills. Https://Www. Education. Ie/En/Publications/Policy-Reports/Lit_num_strategy_full. Pdf Eri{\c{s}}im Tarihi*, *13*, 2018.
Ruff, S. E., & Boes, S. R. (2014). The Sum of All Fears: The Effects of Math Anxiety on Math Achievement in Fifth Grade Students and the Implications for School Counselors. *Georgia School Counselors Association Journal*, *21*(1), n1.

Saputra, P. R. (2017). Kecemasan Matematika dan Cara Menguranginya (Mathematic Anxiety and How To Reduce It). *PYTHAGORAS: Jurnal Program Studi Pendidikan Matematika*, *3*(2).
Sfard, A., Nesher, P., Streefland, L., Cobb, P., & Mason, J. (1998). Learning mathematics through conversation: Is it as good as they say? *For the Learning of Mathematics*, *18*(1), 41–51.
Sokolowski, H. M., & Ansari, D. (2017). Who is afraid of math? What is math anxiety? And what can you do about it. *Frontiers for Young Minds*, *5*(57), 1–7.
Sriraman, B., & English, L. (2010). Surveying theories and philosophies of mathematics education. In *Theories of mathematics education* (pp. 7–32). Springer.
Stacey, K. (2011). The PISA view of mathematical literacy in Indonesia. *Journal on Mathematics Education*, *2*(2), 95–126.
Utomo, A. P., Yuana, K., Narulita, E., Fikri, K., & Wahono, B. (2018). Students' errors in solving science reasoning-domain of trends in international mathematics and science study (TIMSS). *Jurnal Pendidikan IPA Indonesia*, *7*(1), 48–53.
White, H., & Sabarwal, S. (2014). Quasi-experimental design and methods. *Methodological Briefs: Impact Evaluation*, *8*, 1–16.
Wilson, J. W., Fernandez, M. L., & Hadaway, N. (1993). Mathematical problem solving. *Research Ideas for the Classroom: High School Mathematics*, *57*, 78.
Yenmez, A. A., & Gökçe, S. (2020). Mathematicians in the eyes of students: An image study. *Elementary Education Online*, *19*(2), 766–781.