

Strengthening Numerical Literacy Through Problem Based Learning Mathematics Teaching Materials for Madrasah Ibtidaiyah Students

Eva Luthfi Fakhru Ahsani

Institut Agama Islam Negeri Kudus, Kudus, Indonesia
evaluthfi1@gmail.com

Eka Prasetiyawati

Institut Agama Islam Negeri Kudus, Kudus, Indonesia
prasetiyawati98@gmail.com

Abstract

This study aims to describe the application, students' numeracy literacy, supporting and inhibiting factors of the application of problem-based learning-based mathematics teaching materials to develop students' numeracy literacy. This study used a descriptive qualitative approach with data collection techniques, observation, interviews, documentation and test techniques. Data analysis was guided by triangulation, processing data analysis technically in the form of reducing data, presenting the final data and drawing conclusions based on the data analysis model of Miles and Huberman. The research was conducted in the even semester of 2023 at MI Naba'ul Ulum Wonorejo Tlogowungu Pati, involving teachers and students as research informants. The research findings show that teachers use the lecture method and do not use the media when learning takes place. So that some students feel bored and do not pay attention to learning. With the application of problem-based learning-based mathematics teaching materials to develop numeracy literacy, there are five steps. Student numeracy literacy can be measured from several indicators. As well as there are supporting and inhibiting factors for the application of problem-based learning-based mathematics teaching materials at MI Naba'ul Ulum Wonorejo Tlogowungu Pati.

Keywords: Mathematics Teaching Materials, Problem Based Learning, Numerical Literacy.

INTRODUCTION

Teaching materials are learning devices or offices that contain material, limits, learning strategies, and revision approaches that are arranged efficiently and attractively to achieve learning (Yuberti, 2014).

Teaching materials can also be interpreted as materials that must be preceded by students for learning purposes (Kosasih, 2021).

Teaching materials are all kinds of teaching materials created to help teachers carry out educational activities in the classroom. The material in question can be written or expressed orally. With the help of teaching materials, students can learn fundamental skills methodically and coherently, so that in the end they can master all competencies in an integrated and comprehensive manner. Teaching materials are tools, data, or texts that teachers need to research and organize the application of learning (Mufidah, 2017). Books from the Ministry of Education and Culture's Book Center are currently used as teaching materials for SD/MI mathematics. Because it is used nationally, this book is considered not optimal without other books as a complement to mathematics teaching materials (Sulistiyani & Deviana, 2019). Teaching materials serve as guidelines for teachers in carrying out the learning process in the classroom (Ahsani, 2020).

Math is a subject that is taught from elementary school to college. Mathematics is an important point, the explanation is that it serves as the foundation and rationale for various subjects. Mathematics is a rational discipline that does not recognize inductive contradictions, it is the study of examples, consistency, and a coordinated framework, ranging from the inexplicable to the logical (Ruqoyyah, 2020). In learning mathematics, teachers need to provide detailed explanations, examples, and provide reinforcement to students not just to memorize (Ariyanti & Ahsani, 2022). The first form of literacy in the history of human civilization was numeracy literacy. Both are considered functional forms of literacy and are quite helpful in everyday life. Math skills are useful for learning, working and interacting throughout life. As a result, numeracy literacy is cultivated consistently and methodically both in the classroom and in learning activities outside the classroom (extracurricular) (Ministry of Education, Culture, Research and Technology, 2021). Numeracy-oriented learning in elementary schools must be managed optimally so that students' numeracy skills are optimized (Ahsani et al., 2022).

Based on observations at MI Naba'ul Ulum, teachers use the lecture method and do not use media when learning takes place. So that some students feel bored and do not pay attention to learning. During the observation, the teacher gave math problems on fraction material totaling 10 essay questions. Of the 21 students in class IV, there are five students whose scores have not met the KKM.

From the problems that occur above, researchers provide solutions by applying problem-based learning-based math teaching materials. is

designed to develop numeracy literacy. So that students are more interested in learning math and of course learning math will be more fun. Mathematics teaching materials based on problem-based learning involve students directly in carrying out the stages of practice to answer a problem in their own way by utilizing various sources, not just relying on and imitating their teacher's work when solving problems used in real life. So that it can increase students' problem-solving creativity and expand their understanding of how to solve difficulties or get new information related to these challenges (Yustianingsih et al., 2017). As research conducted by (Fitri Ayu, 2020) shows that there is an increase in students' reading interest by using PBL-based magazine teaching materials.

So with the description above, the researcher made a study entitled "Strengthening Numerical Literacy Through the Implementation of Problem Based Learning in Mathematics Instruction for Students of Madrasah Ibtidaiyah".

METHODS

The type of research carried out by researchers is *field research*. The approach taken by researchers is a qualitative approach. This research was conducted at MI Naba'ul Ulum Wonorejo Tlogowungu Pati. Researchers aim to explore in-depth and direct information about the application of problem-based learning-based mathematics teaching materials to develop numeracy literacy of grade IV students at MI Naba'ul Ulum Wonorejo Tlogowungu Pati.

Determination of the sample in this study using purposive sampling. The purposive sampling technique is a data sampling technique that uses a special review. It will be easier for researchers if, as in this particular review, the person is considered an expert on what is expected or perhaps he is the implementer (Sugiyono, 2016). The subjects of this study were fourth grade teachers and 14 students of MI Naba'ul Ulum Wonorejo Tlogowungu Pati.

Data collection techniques in this study are observation, interviews, documentation and test techniques. Data analysis is guided by triangulation, processing data analysis with techniques such as reducing data, presenting the last data to draw conclusions based on the Miles and Huberman data analysis model in research on the application of *problem-based learning-based* mathematics teaching materials to develop numeracy literacy of grade IV students at MI Naba'ul Ulum Wonorejo Tlogowungu Pati.

RESULT AND DISCUSSION

Application of Mathematics Teaching Materials Based on Problem Based Learning to Develop Numeracy Literacy of Fourth Grade Students of MI Naba'ul Ulum Wonorejo Tlogowungu Pati

The application of teaching materials *based on problem-based learning* is to increase students' mathematical solution skills, increase students' problem-solving knowledge skills and invite students to learn how to work in groups to find a way out of the problem (Hersika and Zetriuslita, 2020). Mathematics teaching materials are various school mathematics materials that are arranged numerically for mathematics learning, both written and unwritten. The production of mathematics teaching materials is very important considering many factors, among others because it must be in accordance with the learning objectives of arithmetic both regarding objective attributes, educational plans, and critical thinking prerequisites (Mufidah, 2017).

Problem based learning is an educational technique that utilizes certifiable circumstances to show understudies how to think fundamentally and deal with issues and interjects the main thoughts and data from the topic or subject. Rhem defines problem based learning as learning that begins when students face a challenge in a concise and straightforward manner. To gather and coordinate new information, problem based learning uses issues as a starting point. The direction of group learning is then determined by this issue (Paul and Donald, 2012).

Numeracy literacy is one of the components of mathematics. As a general example from the side of people's lives related to citizenship, understanding the hearts of people, being experienced in work, being recreational, such as finding out scores in sports and games, and customs as a component of deep information and civilized human culture. seen, numeracy literacy is practical or a part that can be used in everyday life (Wahyu, 2021).

Application of problem-based learning-based math teaching materials in class IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati. In the application of this teaching material, researchers use mathematics teaching materials for the rectangular area of the Flat Buildings Chapter. The steps in its application are the learning planning stage, the learning implementation stage and the evaluation stage. In the learning planning stage, the teacher ensures that the learning goes well by preparing a lesson plan (RPP), analyzing the mission and learning objectives, preparing prota, promes, syllabus and also analyzing how the character and motivation of students learn. The steps in the core activities are a) orienting students to

the problem, the teacher presents the material and gives examples of problems, b) organizing students to learn, the teacher asks students to form groups, c) helping students to learn. Group investigation, the teacher asks students to work on problems and then discuss them with their respective groups, d) develop and present work, the teacher asks representatives of each group to come forward to the front of the class and e) analyze and evaluate the problem solving process, the teacher provides opportunities for students to ask questions.

Students' numeracy literacy by applying mathematics teaching materials based on problem-based learning in class IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati can be measured from several indicators, namely a) the number of mathematics and nonmathematics teacher training, b) the number of problem-based and project-based mathematics education, c) the percentage of nonmathematics education that involves numeracy literacy elements, d) students' mathematics scores and e) the results of PISA, TIMSS, and INAP mathematics tests.

Supporting and inhibiting factors for the application of *problem-based learning-based* mathematics teaching materials in class IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati. Supporting factors for the application of *problem-based learning-based math teaching materials* are as follows: a) the physical condition and health of students, b) students pay attention to the teacher in explaining the material, c) students have the motivation to learn, d) the relationship between teachers, e) the activeness of students, f) facilities and equipment. g) teaching staff. And the inhibiting factors are: a) in working on problems that contain problems in everyday life, some students do not want to work on these problems and b) peer friends who deliberately invite their friends to talk or play outside the learning material during the activity. In this case, teaching materials are one of the important components in improving students' literacy skills (Ahsani & Hanik, 2022).

Students' Numeracy Literacy with the Application of Mathematics Teaching Materials Based on Problem Based Learning

Success application of materials teaching materials to develop Students' numeracy literacy can be seen from several indicators. Based on the results of the study, it can be analyzed that the indicators of students' numeracy literacy with the application of problem-based learning-based mathematics teaching materials in class IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati are the number of mathematics and nonmathematics teacher training, the number of problem-based and project-based mathematics education, the percentage of nonmathematics education involving numeracy literacy elements, student mathematics

scores and the results of PISA, TIMSS, and INAP mathematics tests. The training of mathematics and nonmathematics teachers is a measure of students' numeracy literacy. According to Loviga Denny Pratama and Wahyu Lestari, teachers must continue to learn, participate in scientific activities such as training, seminars, workshops to broaden their horizons, increase experience and apply it in teaching and learning activities carried out by teachers. So that one of The most important thing in improving competence is that teachers need to take part in training activities. Through training can affect teacher professionalism in teaching (Pratama & Lestari, 2020).

According to Wahyuni Teresia, students' math scores and the results of the PISA, TIMSS, and INAP tests are indicators of numeracy literacy at the school grade level (Teresia, 2021). According to Henry Agus, Susanto, values in mathematics education can include: the value of cooperation, the value of freedom, the value of discipline, the value of accuracy / perseverance, the value of accepting opinions, the value of respect and the value of understanding (Veteran Bangun Nusantara Sukoharjo Correspondence & Sujono Humardani No, n.d.).

Problem-based and project-based mathematics education are indicators of numeracy literacy. According to Sri Hastuti Noer, problem-based mathematics education is an education that provides a learning environment with problems as its basis, meaning that learning begins with a problem that must be solved. The problem is raised in such a way that students need to interpret the problem, gather the necessary information, evaluate alternative solutions and present the solution (Noer, 2011). According to Manawia H Lapase, the use of project-based mathematics learning is more effective in improving student learning outcomes both from cognitive aspects, affective aspects and psychomotor aspects compared to conventional learning models such as lectures (Lapase, 2021).

Non-mathematics education involving numeracy literacy elements can be applied in thematic learning. According to Ryzal Perdana and Meidawati Suswandari, the application of numeracy literacy in thematic learning is an implementation of learning activities that involve numeracy in several subjects to be studied. For example, in one theme there are several subjects with their own design using methods, models, approaches, and providing media that can make it easier for students to understand numeracy material easily (Perdana & Suswandari, 2021).

According to Pangesti, numeracy literacy means information and the ability to (1) decipher, obtain, use, and pass on various types of numbers and numerical images to deal with common sense problems in everyday life; (2) assess data introduced in different structures (tables, diagrams,

outlines, and so on) to make judgments (Sa'adah et al., 2021). The application of problem-based learning-based mathematics teaching materials in class IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati can affect students' numeracy literacy.

According to Pangesti, numeracy literacy means the information and ability to (1) decipher, obtain, use, and pass on various types of numbers and numerical images to deal with common sense problems in daily life; (2) assess the data introduced in different structures (tables, diagrams, outlines, and so on) to make judgments (Sa'adah et al., 2021). Application of problem-based learning-based mathematics teaching materials in the classroom IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati can affect students' numeracy literacy. According to Seruni Rahmatul Nasoha et al. Revealing some research shows that the PBL (Problem Based Learning) model is able to support students to work with capacities that are classified as part of numeracy literacy (Nasoha et al., 2022).

Supporting and Hindering Factors in the Implementation of Mathematics Teaching Materials Based on Problem Based Learning

The application of teaching materials in learning activities can run well and can achieve the desired goals, there must be supporting factors and inhibiting factors. Likewise, the application of *problem-based learning-based* math teaching materials in learning mathematics in class IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati.

Supporting factors in the application of mathematics teaching materials based on problem-based learning are the physical condition and health of students, students pay attention to the teacher in explaining the material, students have learning motivation, relationships between teachers, student activeness, facilities and educators. Of the several supporting factors above, the most supportive factors in the application of problem-based learning-based mathematics teaching materials are students' motivation to learn, students' activeness, facilities and educators. If the school has adequate facilities and foundations, techniques and abilities of educators in educating and using appropriate facilities and frameworks, students will learn more easily and quickly (Inayah et al., 2021).

The inhibiting factor in the application of problem-based learning-based mathematics teaching materials is that some students do not want to work on problems related to everyday life. Peers who deliberately invite their friends to talk or play around outside the learning material. Of the several inhibiting factors above, the most inhibiting factor in the application of problem-based learning-based mathematics teaching

materials is in working on problems that contain everyday problems some students do not want to work on these problems. From the above problems, the researcher provides a solution by applying *problem-based learning-based* mathematics teaching materials and the teacher punishes students who play alone and invite their friends to come to the front of the class to work on problems.

CONCLUSION

Application of *problem-based learning-based* mathematics teaching materials in the classroom IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati. The steps in its application are the learning planning stage, the learning implementation stage and the evaluation stage. The steps in the core activities are a) orienting students to the problem, the teacher presents the material and gives examples of problems, b) organizing students to learn, the teacher asks students to form groups, c) assisting group investigations, the teacher asks students to work on problems and then discuss them with their respective groups, d) developing and presenting work, the teacher asks representatives of each group to come forward to the front of the class and e) analyzing and evaluating the problem solving process, the teacher gives students the opportunity to ask questions. Students' numeracy literacy by applying *problem-based learning-based* mathematics teaching materials in grade IV MI Naba'ul Ulum Wonorejo Tlogowungu Pati can be measured from several indicators, namely a) the number of mathematics and nonmathematics teacher training, b) the number of problem-based and project-based mathematics education, c) the percentage of nonmathematics education that involves numeracy literacy elements, d) students' mathematics scores and e) the results of PISA, TIMSS, and INAP mathematics tests. There are several supporting and inhibiting factors as follows: a) the physical condition and health of students, b) students pay attention to the teacher in explaining the material, c) students have learning motivation, d) relationships between teachers, e) student activeness, f) facilities and g) educators. And the inhibiting factors are: a) in working on problems that contain problems in everyday life, some students do not want to work on these problems and b) my classmates who deliberately invite their friends to talk or play.

REFERENCE

Ahsani, E. L. F. (2020). Analysis of Teaching Materials for 2013 Curriculum Based on Multiple Intelligence for Grade IV. *ELEMENTARY: Islamic Teacher Journal*, 8(1), 19-36. <https://doi.org/http://dx.doi.org/10.21043/elementary.v8i1.7398>

Ahsani, E. L. F., & Hanik, E. U. (2022). Developing a 3D Page Flip E-Book Based on

145 | ICIE 2023

Science Literacy Integrated With Islamic Values for Fifth-Grade Students. *AL-BIDAYAH: Journal of Islamic Basic Education*, 14(2), 6.

Ahsani, E. L. F., Hanik, E. U., & Susilowati, R. (2022). Application of Scientific Approach Based on Higher Order Thinking Skills to Numeracy Literacy in Minimum Competency Assessment. *Proceedings of the National Conference*, September, 101-110.

Ariyanti, M. Y., & Ahsani, E. L. F. (2022). Application of Flat Buildings Puzzle Learning Media to Improve Learning Outcomes in Mathematics Subjects of Grade IV Students. *ALPEN: Journal of Basic Education*, 6(2), 60-69. <https://doi.org/doi.org/10.24929/alpen.v6i2.151>

Fitri Ayu, M. (2020). Development of Mathematics Teaching Materials in the Form of PBL-Based Magazines to Increase Student Reading Interest (Development Study on Class VII Semester II Students of SMP Negeri 9 Tegal Comparison Subject Matter). *Pancasakti University Tegal*.

Inayah, C., Ahsani, E. L. F., Mastura, E., Ni'mah, L. S., & Amalia, V. (2021). The Influence of Facilities and Infrastructure in Supporting Elementary Students' Learning Achievement at Sekolah Indonesia Den Haag. *MODELING: Journal of the PGMI Study Program*, 8 (1), 52-63.

<https://doi.org/10.36835/modeling.v8i1.686>

Ministry of Education, Culture, Research and Technology. (2021). *Numeracy Literacy Module in Primary School*. Directorate of Primary School.

Kosasih. (2021). *Teaching Material Development*. Pt Bumi Aksara.

Lapase, M. H. (2021). Implementation of Project-Based Learning to Improve Student Learning Outcomes in Mathematics Subjects at SD Negeri Pinedapa. *Journal Paedagogy*, 8(2), 134.

<https://doi.org/10.33394/jp.v8i2.3492>

Mufidah, U. (2017). *Integrated Learning (Theory & Best Practices in Schools)*. PT Refika Aditama.

Nasoha, S. R., Araiku, J., Pratiwi, W. D., & Yusup, M. (2022). Students' Numeracy Skills through the Implementation of Mathematics Teaching Materials Based on Problem Based Learning. *Indiktika: Journal of Mathematics Education Innovation*, 4(2), 49-61. <https://doi.org/10.31851/indiktika.v4i2.7903>

Noer, S. H. (2011). Mathematical Creative Thinking Ability of Problem-Based Mathematics Learning. *Journal of Mathematics Education*, 5(1), 100.

Perdana, R., & Suswandari, M. (2021). Numerical Literacy in Thematic Learning for Upper Grade Elementary School Students. *Absis: Mathematics Education Journal*, 3(1), 9-15.

- Pratama, L. D., & Lestari, W. (2020). The Effect of Training on Pedagogical Competence of Mathematics Teachers. *Cendekia Journal: Journal of Mathematics Education*, 4(1), 278-285. <https://doi.org/10.31004/cendekia.v4i1.207>
- Ruqoyyah, S. (2020). Concept Understanding Ability and Math Resilience with Microsoft Exel VBA. *Tre Alea Jacta Pedagogie*.
- Sa'adah, A., Ningrum, F. Z., & Farikha, N. (2021). Scaffolding in Trigonometry Learning with Hots Problem to Improve Mathematical Numeracy Literacy Skills. *UNIKAL National Seminar on Mathematics Education*, 2(1), 167-174. <https://proceeding.unikal.ac.id/index.php/sandika/article/view/556>
- Sugiyono. (2016). *Educational Research Methods (Quantitative, Qualitative and R&D Approaches)*. Alfabeta.
- Sulistiyani, N., & Deviana, T. (2019). Analysis of Grade V Mathematics Teaching Materials in Malang City. *Journal of Elementary School Thought and Development*, 7(2), 133- 141.
- Teresia, W. (2021). *National Assessment 2021*. Guepedia.
- Veteran Bangun Nusantara Sukoharjo Correspondence, U., & Sujono Humardani No, J. (n.d.). The Value of Mathematics and Mathematics Education in the Formation of Herry Agus Susanto's Personality. 1, 116-124.
- Yuberti. (2014). *Learning Theory and Teaching Material Development in Education*. 185. <http://repository.radenintan.ac.id/5799/>.
- Yustianingsih, R., Syarifuddin, H., & Yerizon, Y. (2017). Development of Mathematics Learning Tools Based on Problem Based Learning (PBL) to Improve Problem Solving Ability of Class VIII Students. *JNPM (National Journal of Mathematics Education)*, 1(2), 258. <https://doi.org/10.33603/jnpm.v1i2.563>

