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The Use of Problem Based Learning-Based Electronic Student Worksheets (E-LKPD) as an Effort to Improve Elementary School Student Mathematical Literacy

Dini Wahyu Mulyasari, Gunarhadi, Roemintoyo
Universitas Sebelas Maret, Master Program of Educational Technology
Surakarta, Indonesia
diniisaura@gmail.com, gunarhadi@fkip.uns.ac.id, roemintoyo@yahoo.co.id

Abstract. The rapid development of the 21st century must be followed by excellent human resources (HR) so that people can adapt and even contribute to this development. One of the essential skills in building the 21st century is mathematical literacy. Knowing the importance of mathematical literacy, the development of this competence in the learning process must also be maximized. The government has been emphasizing building excellent and competent generations according to the needs of the 21st century through the learning program policy. The integration of mathematical literacy into learning activities seems to have been implemented, although it is not optimally implemented yet. Communication, technology, and values are three important things that must be considered by educators in attempting to develop student literacy skills. The purpose of this study is to describe the importance of using Problem Based Learning (PBL)-based E-LKPD for learning so that in the implementation of this research, the study literature method will be used by collecting the reference sources relevant to the topic from various scientific researches. The results showed that PBL-based E-LKPD was considered capable to be one of the solutions in the attempt of developing students' mathematical literacy, as well as in the literature aspect, this PBL-based E-LKPD is highly supportive to be applied to a wider learning scale.

Keywords: Literacy, Mathematical Literacy, Problem Based Learning, Student Worksheets

1 Introduction

The formal purpose of learning mathematics is to learn the principles included in mathematics, by mastering the principles and concepts of mathematics, people can continue their education to the next level or get a certain job. However, the goal for individual is more important in studying mathematics because that will be the basis for them to apply mathematical principles and concepts in everyday life (Indriani & Novianti, 2018). The ability of an individual to use mathematics in everyday life is called the student's mathematical literacy skill. According to the PISA, mathematical literacy is defined as an individual's capacity to formulate, use, and interpret mathematics in various contexts (Nurkamilah et al., 2018). That reason makes mathematical literacy one of the essential components to build 21st-century skills because, with this skill, one is considered to have the ability to analyze all occurred changes (Nurkamilah et al., 2018; Alismail & McGuire, 2015).

Mathematical literacy involves several activities such as mathematical reasoning and using mathematical concepts, procedures, facts, focus, and tools to describe, explain and predict phenomena (Dores & Setiawan, 2019). Various activities in reasoning and using various mathematical concepts help individuals to recognize the role of mathematics in everyday life, as well as help individuals in making assessments and solutions based on the context and circumstances. The role of mathematics in technological developments in the world is as a tool to describe phenomena as well as provide solutions to real-world problems. Therefore, mathematical literacy must be the focus of learning mathematics so

that an individual will have competence in adapting to world development (Syahlan, 2015; Novalia & Rochmad, 2017).

Because mathematics does not only learn about the principles and concepts but also the functions, benefits, and applications in everyday life, a learning program that connects mathematics in school and life is needed. Learning programs that increase students' mathematical literacy skills must be prioritized by the school (Nur Dinni, 2018). School or teacher strategies in facilitating and improving students' mathematical literacy can be done by: providing learning resources and choosing learning methods that are considered capable of improving mathematical literacy (Daryanto, 2013; Radiusman, 2020).

The basic principle for teachers in choosing learning programs to improve mathematical literacy is to realize students' knowledge of the five processes in assessing mathematics, to be confident in student's ability to do mathematics, to be a problem solver, to communicate mathematically, and to reason mathematically (Susanti & Syam, 2017). Three factors affect teachers to succeed in developing learning facilities in attempting to increase mathematical literacy including communication, technology, and values applied during the learning process (Sugiyati, 2016; Roemintoyo & Budiarto, 2021).

First, communication which in this case relates to the tools that help students in developing mathematical understanding, communication is a form of interaction between students with teachers and learning resources. In developing students' mathematical literacy, learning resources and learning methods must be able to create communication that involves constructive thinking and social interaction to create mathematical conceptual thinking (Wardiah & Nurmahaludin, 2019). Second, is the technology used during the process of developing mathematical literacy. This is because mathematically literate individuals must be able to use technological tools in investigating mathematical ideas and in finding solutions to mathematical problems (Sugiyati, 2016; Irawan & Suryo, 2017). So learning resources and learning methods in the development of mathematical literacy must be adapted to technological developments. Third, is the element of character values in mathematics. Mathematical values are related to one's emotions, beliefs, and attitudes toward the principles and nature of mathematics itself, emotions and values during the process of developing mathematical literacy affect the individual's belief in the solution chosen from the problem (Nurkamilah et al., 2018). To have this belief, a student must know the role of mathematics in today's society as well as the historical, social, cultural, and scientific context of its development, so that in the development of mathematical literacy, the chosen learning resources and methods must be able to link between concepts and benefits in the life development.

This study discusses the importance of mathematical literacy, especially at the elementary school level, and the way that can facilitate elementary school students in developing mathematical literacy skills in terms of methods and learning resources. The learning resources discussed are adapted to the principles of developing mathematical literacy and adapted to students' characteristics.

2 Research Methods

This research is qualitative research with a literature study research design or method (Anggito & Setiawan, 2018). This literature study was conducted by examining sources both from books and journals related to mathematical literacy, Problem Based Learning models, and learning resources (Arikunto, 2010). The results of various studies will be used as a basis for identifying and describing the effectiveness of PBL-based electronic student worksheets (E-LKPD) analytically and narratively that have been applied to several cases, as well as education levels by expecting this study to improve students' mathematical literacy in the future, especially at the elementary school level.

3 Discussion

3.1 The Importance of Mathematical Literacy for Elementary School Students

The school literacy movement program (GLS) initiated by the Ministry of Education and Culture (Kemdikbud) in Elementary Schools (SD) is carried out through three stages, namely the habituation stage, the development stage, and the learning stage (Permatasari, 2015). In this era, the mathematical

ability that students learn is not only the ability to calculate but also the ability to reason logically and critically in problem-solving which is called mathematical literacy.

The development of students' mathematical literacy needs to be facilitated since elementary school (Nolaputra et al., 2018), this is based on the assumption that basic mathematical abilities at the elementary level support students' mathematical abilities at the next level. Students also have to be aware that mathematics exists and is used in everyday life, especially in the current era where the development of science and technology is growing rapidly. Referring to the GLS, the development of mathematical literacy can be done through the learning process (Nurkamilah et al., 2018).

The importance of providing knowledge about the use and function of studying mathematics in everyday life during the learning process can make it easier for students to learn mathematical concepts (Alifia & Pradipta, 2021). In addition, mathematical literacy in elementary schools is the first basis for students to think deductively and inductively related to mathematical problems, because at the secondary school level students must be able to evaluate conjectures, solutions and conclusions from a mathematical phenomenon that is being solved (Wardiah & Nurmahaludin, 2019; Machaba, 2018). High school students must be able to reason deductively and inductively by formulating conjectures, solutions and conclusions, and develop their mathematical reasoning skills (Kolar & Hodnik, 2021).

If referring to the PISA standard, there are seven basic skills in mathematical literacy, namely: (1) Communication, related to how to convey ideas and views on the confronting mathematical phenomena; (2) Mathematising, related to the individual's ability to implement mathematical procedures/principles in the real-world; (3) Representation, related to the individual's ability to present problems using mathematical representations; (4) Reasoning and Argument, the individual's ability to reason and provide logical arguments; (5) Devising strategies for problem-solving, the individual's ability to solve problems; (6) Using symbolic, formal and technical language and operation, the ability to use formal and technical language symbols and operations; and (7) Using mathematical tools (Pradana et al., 2020; Haara et al., 2021).

When referring to the core competencies of learning mathematics in elementary schools according to the Regulation of the Minister of Education and Culture (Permendikbud) No. 37 of 2018, Students can understand and present factual and conceptual knowledge by observing and asking questions based on curiosity about themselves, God's creatures and their activities, and the objects they found at home, school, and the playground (Syahlan, 2015). The core competencies clarify the general objectives of implementing mathematics learning according to the 2013 curriculum, including (1) improving intellectual skills, especially the students' high order thinking skills; (2) forming students' skills to solve a problem systematically; (3) obtain high learning outcomes; (4) train students in communicating their ideas, especially in writing scientific papers; and (5) develop students' character (Pramita et al., 2016).

Expert opinions related to the importance and benefits of mastering mathematical literacy skills in everyday life, as well as government support through educational programs that formulate the objectives of learning mathematics, are not only to understand concepts but also to be more applicable, strengthen the opinions about the importance of developing mathematical literacy since elementary school during the learning process.

3.2 Problem Based Learning in Improving Students' Mathematical Literacy

Efforts to improve mathematical literacy skills require an independent learning process. Independent learning is a learning process that involves students more in an effort to achieve learning objectives. The purpose of independent learning is to provide student learning experiences so that students can construct knowledge or a concept according to that experience (Widiyono & Millati, 2021). The Problem Based Learning (PBL) model is one model that is considered capable of helping students improve their mathematical literacy skills (Seibert, 2021).

Conceptually, PBL is an active learning model that provides opportunities for students to learn and sharpen their problem-solving skills, develop competencies with academic content standards, and realize the relevance of applying content area learning for practical purposes in real problems (Kimianti & Prasetyo, 2019; Sushariyanti et al., 2020). The emphasis of the PBL model lies in applying real-world problems to academic knowledge so as to bridge theory with real-world learning.

The principles of the PBL model that must be considered during the learning process are: (1) students are self-learned and self-directed in learning; (2) learning takes place in small groups and the teacher's role as a facilitator; (3) all groups must participate equally; (4) teachers must be able to encourage curiosity, motivation, teamwork, problem-solving and active involvement of students in groups; (5) the information presented acts as a problem-solving stimulus (Sushariyanti et al., 2020). The four stages of PBL learning are 1) presenting or identifying problems; 2) making a plan to solve the problem; 3) implementing a plan to solve the problem; and 4) evaluating the results of the implementation plan (Purnama & Suparman, 2020; Suryawati et al., 2020).

The success of the PBL model in improving students' mathematical literacy has also been proven in several previous studies. The PBL model is suitable for developing mathematical literacy skills and competencies for elementary school students through problem-based learning, students learn to understand and process information about real-world problems which indirectly provide self-confidence, critical thinking, and teamwork (Hidayah et al., 2020; Personal et al., 2021). Besides acquiring those skills, the PBL model also encourages students to have a deep understanding of concepts and increase theoretical knowledge (Seibert, 2021). In the development of mathematical literacy, the implementation of PBL can be adjusted to student characteristics so that the problems taken are relevant. The foundation of problem-based learning theory is social constructivism which argues that students will develop knowledge by building reasoning from all the knowledge they already have and all that is obtained as a result of interacting with other people (Munawaroh, 2020). The various principles, theories, and evidence reviewed by several experts emphasize that the PBL model is a suitable model to improve students' mathematical literacy.

3.3 The Role of Electronic Student Worksheets as Learning Resources in Improving Students' Mathematical Literacy

Student Worksheet (LKPD) is one of the types of teaching materials that can be used by teachers to encourage increasing student learning activities. LKPD itself is printed teaching material in the form of paper sheets containing the main material, a summary of the material, and instructions for carrying out learning tasks that must be completed by students (Hidayah et al., 2020). This definition shows that LKPD emphasizes more on student learning activities through the tasks given so that new knowledge is formed from the learning experiences that have been carried out. The purpose of using LKPD in the learning process is to make it easier for educators to manage the learning process, to help educators direct their students to be able to find concepts through their activities or in teamwork (Purnawati et al., 2020; Suryaningsih & Nurlita, 2021).

The process of developing mathematical literacy is influenced by three factors, namely: communication, technology, and values (Kolar & Hodnik, 2021). The principle of technology factor is related to the method of the teacher's mathematical literacy development process that must be adapted to the times and technology. Learning resources and information provided during the learning process can be accessed as much as possible and adapted to current technological developments (Budiarto et al., 2020; ren, 2019). The implementation of technology in developing students' mathematical literacy in this case lies in the use of electronic-based worksheets (Hidayah et al., 2020). Electronic student worksheet (E-LKPD) is expected to be able to assist students in gaining self-learning experiences so as to increase mathematical literacy skills. Electronic LKPD has an important role for teachers in providing meaningful information automatically and offering fast and appropriate feedback, in addition, other studies have confirmed that the development of electronic LKPD obtains valid, practical, and meaningful results for students (Hidayah et al. , 2020; Indar Anggara Putra, 2019).

The third factor that can influence and help teachers to develop students' mathematical literacy is values. The value referred to in this case is to provide confidence, knowledge, and positive attitudes to students to be able to appreciate and realize the importance of the role of mathematics in all life aspects. A student's uncertainty in facing and trying to find solutions to mathematical problems is often the biggest obstacle to develop students' mathematical literacy (Purnama & Suparman, 2020). E-LKPD as a learning tool that emphasizes more mathematical activities should be able to reduce students' fear and uncertainty about the solutions to the problems presented in the various tasks and activities presented. Students are accustomed to dealing with mathematical literacy problems in E-LKPD which in turn increases students' self-confidence and mathematical literacy skills.

3.4 PBL-Based E-LKPD as an Effort to Improve Mathematical Literacy Skills for Elementary School Students

The concept of electronic student worksheets (E-LKPD) based on Problem Based Learning (PBL) as an effort to improve mathematical literacy skills, especially for elementary school students, is a printed LKPD with two features, namely offline and online learning activities (Purnama & Suparman, 2020; Lailiah et al., 2021). Offline activities are applied when students are learning in the class with the teacher, while online learning activities are applied by students as self-learning outside the learning process in the class. In the online feature, students can carry out learning activities such as assignments, videos, and audio by accessing the barcodes that have been prepared.

PBL-based E-LKPD means that all learning activities (tasks that must be completed by students) contained in the E-LKPD have PBL (problem-solving) elements. So that the PBL model is not only used by teachers during the learning process but also in the applied learning resources, by using PBL-based E-LKPD there is no reason for the disconnection between students' knowledge of mathematical concepts and mathematics in everyday life (Hidayah et al., 2020; (Hidayah et al., 2020) Putrawangsa & Hasanah, 2018; Hwang & Ham, 2021).

PBL-based E-LKPD can be considered a step for teachers in fulfilling the communication aspects of developing mathematical literacy. Communication is a tool that helps students in developing mathematical understanding. The interactions and correlations between learning models and learning resources used by teachers during the learning process create conceptual thinking. This deep conceptual thinking can later become a determining factor for the development of students' mathematical literacy.

4 Conclusion

The use of learning methods and learning resources must complement each other so that it is easier for students to accept a certain concept. This opinion can be implemented in the process of developing students' mathematical literacy. PBL is one of the methods that considered capable of assisting teachers in developing students' mathematical literacy. To support this method, teachers can use PBL-based E-LKPD. PBL-based E-LKPD is considered capable of assisting students in improving mathematical literacy skills and is designed according to student needs and characteristics.

Apart from student needs and characteristics, activities in PBL-based E-LKPD can be adapted to learning programs designed by teachers according to the topics and concepts that will be studied.

The results of the discussion on the PBL-based E-LKPD potential to improve mathematical literacy can be followed up by carrying out the stages of developing these learning resources. Topics, contents, and learning concepts can be adapted to student needs and characters. Considering the great contribution of mathematical literacy as a provision for students in dealing with changes and technological developments, the development of these skills needs to be honed as early as possible.

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6 References

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