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Teachers' Ability in Writing Mathematical Literacy Module Based on Local Context

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Abstract

One problem in elementary schools in facilitating students' literacy skills is the limitation of teaching materials. This study aims to explore the ability of elementary school teachers to write mathematical literacy modules based on the Bengkulu context. This research is descriptive research with a quantitative approach. Subjects consisted of two groups taken from 40 postgraduate students of elementary school teachers' education FKIP UNIB. Data were collected using ability tests, document analysis, and interviews. The results showed that: (1) there were differences in students' abilities to understand teaching materials before and after developing the module. (2) the fresh graduate students are better at choosing local context problems, designing modules, and displaying modules. (3) students from elementary school teachers tend to be better at developing indicators, presenting material, and examples of reinforcement. (4) the literacy mathematics module-based local context has met the criteria valid in terms of construction, material, language, and readability.

Keywords: Teachers' Ability, Module, Mathematics Literacy, Local Context, Descriptive Research

1. Introduction

The main problem in learning in schools such as elementary schools is the limited teaching materials that can facilitate students' thinking skills. This requires teachers to be more creative in developing teaching materials so that the achievement of student learning outcomes can be maximized. However, the demands of students' abilities in the 21st century must have at least four skills: critical thinking, creative thinking, communication skills, and collaboration skills (Salim, 2019). Skills needed in the 21st century are based on literacy, competence, and character (Direktorat Pembinaan SMA, 2017). In addition, applying AKM (minimum competency assessment) in learning in schools requires the development of literacy skills in students.

Literacy is the ability that a person has to read and write (Kern, 2000; Graff, 2006). Literacy is also related to student life at home and the surrounding environment to cultivate noble character (Creswell, 2014; Satgas, 2018). Students need to develop literacy skills to be accustomed to solving literacy problems. The literacy ability that focuses on the PISA test is mathematical literacy. Mathematical literacy is an individual's ability to formulate,

apply, and interpret mathematics in various contexts (OECD, 2013). Mathematical literacy skills can help a person relate mathematics's role in everyday life (OECD, 2013; Puspitasari et al., 2015; Fajriyah, 2018; Masjaya & Wardono, 2018). There are three concepts of mathematical literacy, namely (1) the ability to formulate, apply, and interpret mathematics in various contexts, (2) the involvement of mathematical reasoning and the use of mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena; and (3) the benefits of mathematical literacy abilities are that it can help someone apply mathematics to everyday life as a form of constructive and reflective community involvement (OECD, 2013; Stacey, 2010).

Mathematical literacy emphasizes students' ability to analyze, reason, and communicate ideas effectively in solving mathematical problems they encounter (OECD, 2009). Mathematical literacy abilities are very important to solving problems faced in everyday life (Setiawan et al., 2014; Puspitasari et al., 2015). The common problem is that students have not been familiarized with literacy learning. Literacy abilities can be optimized by getting used to PISA questions (Sasongko et al., 2016). In accordance with this, (Purnomo & Dafik, 2015) mentions that frequently giving questions such as PISA will train and improve Indonesian students' ranking in the PISA score.

The achievement of students in schools in mastering literacy abilities still needs to be a concern, especially in Indonesia. Several tests conducted to measure the ability of students in Indonesia internationally need to be considered. Tests such as PISA show that Indonesian students' position or rank is still low. Indonesian students' ranked mathematics 63 out of 70 countries in 2015, ranking 64 out of 65 countries in 2012 (OECD, 2016; OECD, 2013).

Several aspects cause the low mastery of students on the tests conducted by PISA. The math problems in the PISA questions measure the ability of reasoning, problem-solving, and arguing (Wardhani & Rumiati, 201). The research results related to students' ability to solve PISA questions (Haji et al., 2018) at the middle school Bengkulu City found it difficult to relate real-life aspects to mathematical problems (models). According to (Kharizmi, 2015), multiliteracy followed by students' difficulties in improving literacy abilities were because of inadequate literacy practices and environments.

These problems indicate that it is necessary to emphasize learning that is oriented and facilitates students' abilities. As facilitators in developing students' abilities, teachers need to carry out innovative learning, especially in learning mathematics in elementary schools. (Sungkono, 2009) suggests that one of the competencies that a teacher needs to have is developing teaching materials. A teacher ideally controls the competence in developing teaching materials. Teaching materials make learning more effective, and the teacher will have a lot of time to guide students in understanding a learning topic. Learning activities must be designed so that students are facilitated in gaining knowledge. This is in accordance with Government Regulation Number 58 of 2013 concerning the learning process that changes the pattern of passive learning to active-seeking learning where students actively build their knowledge which is strengthened by a scientific approach learning model (Mendikbud, 2014). Several research results show that the development of teaching materials can affect literacy abilities. Research conducted by (Arvyaty et al., 2017) states that the mathematical literacy abilities of level 3 and 4 students can be improved by developing mathematics teaching materials with a metacognitive guidance approach for eighth-grade students. According to the National Center for Competency-Based Training, teaching materials are learning tools or tools used by teachers in the learning process in the classroom (Prastowo, 2011). One of the important goals of literacy strategies in content learning is to form students who can think critically and solve problems (Ming, 2012). Efforts must be made to encourage and guide teachers through developing literacy-based teaching modules. The development of teaching materials can use the context of everyday life or based on ethnomathematics, especially in the Bengkulu context.

2. Method

The research method used is exploratory research with a qualitative approach. The exploratory method aims to explore broadly the causes or things that influence the occurrence of something and is open, looking for elements, characteristics, and properties of the object of research (Arikunto, 2010). The study aimed to explore teachers' ability to develop mathematics literacy modules based on the Bengkulu context. The focus of the Bengkulu context

used in this mathematics module consists of (1) Bengkulu culture, (2) history, (3) Bengkulu tourism, and (4) Bengkulu food specialties.

The targets in this study were students of the Elementary teacher's education postgraduate program at the University of Bengkulu who were divided into two groups. The first group is students who have less than or equal to two years of teaching experience at school (≤ 2 years), and the second group is students who have more than two years of teaching experience (> 2 years). The data collection technique used consists of three, namely: (1) ability test, (2) document analysis, and (3) interview.

The data analysis technique used is a descriptive statistical analysis that aims to describe students' abilities and describe the results of the development literacy module in the Bengkulu context. Analysis of the teacher's ability in writing teaching materials as measured by tests using the following formula.

$$Grade = \frac{score}{maksimum\ score} \times 100$$

Table 1: Ability level category

Student's final grade	Level
67-100	High
34-66	Moderate
0-33	low

Document analysis uses an analysis sheet with a score range of 1-5, which is used in assessing the mathematics modules developed by students. The results of the assessment scores are interpreted with the following criteria.

Table 2: Criteria module

Interval	Criteria
1.00-1.80	Very less
1.81-2.60	less
2.61-3.40	moderate
3.41-4.20	good

3. Results

3.1 Description of development product

The mathematical literacy module developed in this study focused on literacy problems in the Bengkulu context. The Bengkulu context was chosen as a literacy problem in conveying the material concept, namely fractional operations. Literacy refers to the Bengkulu context, namely: the context of typical food, cultural context, historical context, and tourism context. (1) Bengkulu specialties, such as tat cake, a *lemma* (fermented young bamboo), processed *kalamasi* oranges, *rendang Lokan*, *tempoyak* (processed fermented durian fruit), and *gelamai*. (2) the cultural context of Bengkulu which consists of: *Tabot*, *Batik Diwo Kepahiang*, the ceremony of *medurasan* (engagement), Bengkulu traditional house (*Bubungan lima*). (3) Historical context, such as Malborough Fort, Sentot Alibasa Grave, Jamik Mosque. (4) The context of tourism, such as: Panjang beach, *Tapak padri*, *Rindu hati* tourism, *Suban*.

The mathematical literacy module based on the developed Bengkulu context is compiled by presenting material, examples of strengthening questions, and strengthening exercises. In terms of content, the module material is arranged based on basic mathematics competencies for fifth-grade elementary school students. The module developed is based on the results of the identification process of problems found by the teacher when carrying out the learning process in the classroom. The analysis was carried out by making direct observations at schools and Bengkulu contexts that are familiar to elementary school students in Bengkulu.



Panjang Beach



Tradisional house



Tat cake



Bungkarno's house

Figure 1: Bengkulu contexts

The Bengkulu contexts in Figure 1 are used in presenting the material in the literacy module to facilitate the presentation of material and strengthening exercises. For example, the use of Bengkulu context in presenting material such as the following figure.




 <p>Kue bay tat yang menjadi ciri khas sekaligus favorit warga Bengkulu. Bay tat adalah kue mirip pai yang diisi dengan selai nanas. Lu ini juga diberi taburan keju. Nama bay tat sendiri berasal dari bahasa Bengkulu "bay" yang berarti induk dan "tat" dari kata tart. Dengan kata lain, bay tat adalah kue tart khas warga Bengkulu</p> <p>Fitri akan membuat kue bay tat. Untuk setiap resep ia memerlukan $\frac{1}{2}$ kg gula, $1\frac{1}{4}$ kg tepung terigu, $\frac{1}{8}$ kg mentega, dan $\frac{1}{4}$ kg telur. Untuk membuat satu adonan kue Fitri, $1\frac{1}{4}$ kg tepung ia memiliki 3 kantong terigu. Kantong terigu pertama ditimbang dengan berat ditunjukkan pada gambar berikut</p> 	 <p><i>Bay tat cake is a characteristic as well as a favorite of Bengkulu residents. Bay tat is a pie-like cake filled with pineapple jam. You are also given a sprinkling of cheese. The name bay tat itself comes from the Bengkulu language "bay" which means mother and "tat" from the word tart. In other words, bay tat is a typical Bengkulu tart cake</i></p> <p><i>"Fitri will make bay tat cake. For each recipe, she needs $\frac{1}{2}$ kg of sugar, $1\frac{1}{4}$ kg of flour, $\frac{1}{8}$ kg of butter, and $\frac{1}{4}$ kg of the egg. To make one cookie dough, Fitri, $1\frac{1}{4}$ kg of flour She has 3 flour bags. The first flour bag is weighed with the weight shown in the following picture.</i></p>
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Figure 2: Examples of using Bengkulu context

The presentation of the material above shows the use of the Bengkulu context in presenting the material for adding fractions. Using real problems like the example above can help students understand the material contextually. Students' literacy skills will be further honed by getting used to understanding real context problems and those that are close to the student's environment. This is in accordance with the opinion (Masjaya & Wardono, 2018) that with mastery of mathematical literacy, each individual will be able to reflect on mathematical logic to play a role in his life, community, and society. Mathematical literacy enables individuals to make decisions based on a constructive mathematical mindset. The real context, especially local culture, can support the improvement of students' abilities. The study's results (Nur & Palopo, 2018) stated that contextual learning using local Lombok culture as a context had a positive and significant impact on students' mathematical problem-solving abilities.

The modules are based on two research target groups, namely groups of teachers with less than two years of teaching experience and more than or equal to two years of teaching experience. Two lecturers evaluated modules from the postgraduate program in mathematics education. The validator's assessment of the literacy module's aspects of language, material, and construction criteria are good. The focus of the revision was emphasized in using the appropriate Bengkulu context and presenting the material using concepts.

3.2 The results of the exploration of the teacher's ability

Teachers who carry out module development are given a knowledge test before and after module development. The results of the teacher's ability test related to knowledge about module preparation are as follows.

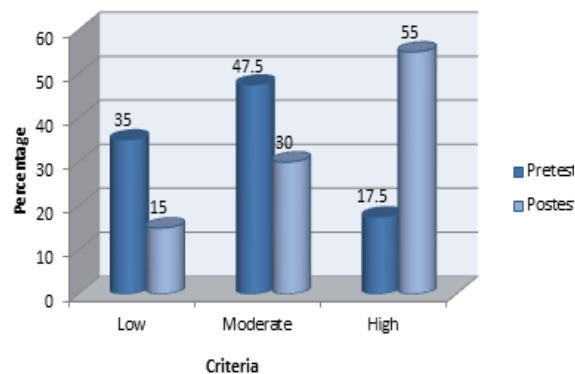


Figure 3: Description of teacher's ability

Figure 3 shows that there is an increase in the ability of teachers after implementing the module development. It can be seen that in the pretest, the average ability of teachers is in a low category. The posttest results show that there is an increase where the average in the category has a high ability. These results indicate that, on average, the teacher's ability to develop modules is good. Based on the study of the results of the module development, it shows that theoretically, construction and language are in a good category. The results of document analysis on literacy-based mathematics modules are as follows.

Table 3: Module assessment analysis results

Aspects of assessment	< 2 years		≥2 years	
	Score	Criteria	Score	Criteria
Indicator development	3.65	Good	4.31	Good
Context Selection	4.06	Good	3.67	Good
Material Presentation	3.37	Moderate	3.89	Good
Example of Reinforcement	3.21	Moderate	3.39	Moderate
Design and appearance	4.25	Good	3.24	Moderate

Data Table 3 shows that, generally, the category analysis results are moderate to good. The data shows a tendency that research subjects who have worked as classroom teachers for less than 2 years have higher scores on aspects of context selection and module design and appearance. However, in contrast to subjects with a working period of more than or equal two years, the aspects with the highest scores tend to be on developing indicators and presenting the material. The difference is that teachers with higher teaching experience tend to more easily show the material and the selection of indicators. Meanwhile, the age group of fewer than two years has advantages in design and appearance. This is supported by the many design and editing applications that are easy to learn through YouTube.

5. Conclusion

There are differences in students' abilities to understand teaching materials before and after developing the module. The tendency of fresh graduate students to be superior in choosing Bengkulu context problems, designing modules, and displaying modules. Students from school teachers tend to be superior in developing indicators, presenting material, and examples of reinforcement. The mathematical literacy module based on the designed Bengkulu context has met the criteria in terms of construction, material, and language.

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