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Development of Lombok Culture-Based Ethnomathematics Module to Improve Mathematical Literacy of Class IV Elementary School Students

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ABSTRACT

Quick influence on the success of the teaching and learning process can be done by developing an innovation and learning tools, one of which is through modules as teaching materials. The creation of an ethnomathematics module based on Lombok culture is expected to help develop students' mathematical literacy skills. The purpose of this development research is to get feedback from users and ensure the validity of the module. The subject of this research is Majuwet Elementary School in Lombok. This type of research is Research and Development (R&D) based on the 4D research and development model. The stages carried out are the definition stage (Define), the planning stage (Design), the development stage (Development), and the deployment stage (Disseminate). Collecting data in this study using tests, questionnaires and documentation. The results showed that the Lombok culture-based ethnomathematics module was declared valid based on the validity test. The results of the data analysis of material experts obtained 0.67 results with valid categories, media experts obtained 0.80 results with valid categories, 81% small-scale trials with agreed criteria, 87% large-scale trials with strongly agreed criteria, practicality test by the teacher 76% with practical criteria. The practicality criteria and the N-gain value show that students' mathematical literacy abilities have increased after using the modules in the learning process, with a value of 0.54 in the medium category. This research produced a valid and practical module in improving students' mathematical literacy skills and effectively used in the learning process in class IV mathematics.

Keywords: [Ethnomathematics Module, Lombok Culture, Mathematical Literacy]

INTRODUCTION

Mathematics is a comprehensive and responsible subject in the development of modern technology and human thought in various fields. When studying mathematics, students can use their own skills to create mathematical ideas. Students can develop numerical ideas using their own abilities while concentrating on mathematics. The basic idea in solving problems is student understanding. Mathematical concepts related to the problems they face during the process of solving them will be known and understood by someone who has mathematical literacy (Fahmy et al., 2018)

Curriculum reforms have begun to reexamine the nature of mathematics in schools, leading to changes in the choice and organization of mathematics content and increased emphasis on mathematical thinking processes, practices and ways of working (Goos, 2020). In the 2013 curriculum, students are expected to be able to use calculations and formulas to answer test questions in mathematics and use their

reasoning and analysis skills to solve everyday problems. Resolving several problems not only in the form of routine questions but also more on problems encountered in everyday life (Suryapuspitarini et al., 2018)

Rifai & Wutsqa (2017), explain that in everyday life, students face problems related to themselves, the community, work, and other factors. There are many problems related to learning mathematics. Good math can help students solve these problems. One of the most frequently asked questions is about what tools are needed to solve various problems in everyday life. Therefore, mathematical literacy is very important in everyday life.

Literacy is a foundational skill for all aspects of lifelong learning which includes human rights. Basic mathematics education is a requirement for one of these aspects (Mahdiansyah and Rahmawati, 2014). In PISA 2018 it is stated that numeracy proficiency is a single skill to form, use and describe mathematics in different settings. This includes using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena, as well as mathematical reasoning. As a result, individuals are better able to understand mathematical concepts in the context of everyday life, produce high-quality output, and understand the concrete and tangible results of their work. In addition, mathematical literacy is discussed not only in learning material but also in learning criminal law, statistics, facts, and mathematics in everyday life. In addition, literacy in mathematics teaches students how to communicate and understand phenomena related to mathematics (OECD, 2019). In the context of mathematics, PISA 2018 is included as one of three mathematical processes, which include analyzing a situation from a mathematical point of view, making use of mathematical concepts, facts, procedures and penalties, and analyzing mathematical knowledge. Therefore, mathematics has a very close relationship with everyday life, so mathematical literacy skills are very important (Hera & Sari, 2015). Human resources can be improved by having mathematical literacy skills Mathematical literacy can make it easier to understand how mathematics is used in everyday life (Masjaya & Wardono, 2018).

Mathematics is still considered to have no connection with culture. As a result, students have a negative perception of mathematics. The majority of students believe that culture and mathematics are unrelated. This is possible because the mathematics taught in schools is less contextual and far removed from the actual situation. After all, mathematics is ingrained in our daily lives (Pathuddin & Nawawi, 2021). Mathematics contains abstract concepts, so learning mathematics means learning something abstract (Herawaty et al., 2019). Therefore, it must be able to bridge the gap between school and the field by using contextual learning resources (Pathuddin & Raehana, 2019). Utilizing local culture is one of the contextual learning approaches that can be used. Ethnomathematics is a field of study that seeks to understand the mathematical principles that underlie a culture (Jatia et al., 2019).

Rosa & Orey (2016), argue that it is important to recognize the contributions that members of different cultural groups make to the understanding of mathematics; the recognition and identification of diverse mathematical practices in varied contexts; and the relationship between mathematics learning and student experiences, all of which should be key ingredients for understanding complete and mature mathematics lessons. From an ethnomathematics point of view, this is one of the most important goals for developing a mathematics curriculum. the use of regional culture as a teaching tool that can assist students in applying their knowledge and skills to use in real-world situations. Core competence in the cognitive domain in each real subject is one of the provisions for students who have factual, conceptual, and

procedural knowledge based on their curiosity about phenomena and events related to science, technology, art, and culture. When ethnomathematics (mathematics with cultural overtones) is used in mathematics education, it is hoped that students will have a better understanding of both the subject matter of mathematics and its cultural context. This will make it easier for teachers to instill cultural values in students that are part of the national character. Sumiyati et al (2018) explained the use of ethnomathematics-based learning media to obtain learning outcomes, which showed that the experimental class that was given treatment and the control class that was not given treatment had different critical thinking abilities. This shows that students' mathematical critical thinking skills are affected when using ethnomathematics-based geometry learning media.

One of Lombok's local cultures related to calculation, measurement, modeling, and design, especially with regard to traditional Sasak people's buildings, namely the *traditional bale* (traditional house), crafts in the form of woven and *kereng sesek* (woven cloth), arts such as *gendang beleq* (big drum), *cilokak* (traditional music), *gula gending /tundeh trade* (cotton candy) and various kinds of culture in Lombok. In addition, Lombok is also known as the island of a thousand mosques. The various kinds of Lombok culture, as explained above, contain some of the material in mathematics lessons, namely flat sided shapes. The field itself is included in geometric mathematics. One illustration of how to solve everyday math problems that arise from cultural heritage and problems that require students to use their logical and critical reasoning skills can be solved by utilizing regional cultural heritage.

Zaenuri & Dwidayati (2018) explain that children's experiences with mathematics in everyday life and mathematics taught in schools are very different. Therefore, it is necessary to improve the good learning process, among others by providing interesting teaching materials, in order to arouse students' enthusiasm and interest in mathematics. Teaching materials, according to Ayuningtyas & Setiana (2019) are a collection of speculations, realities, ideas, and techniques that are made to work with teaching and educational experience. This is in accordance with the current 2013 education plan, which expects teachers to be creative and have the ability to create teaching materials that are new, different, interesting, context-based, and adapted to the level of student needs (Wulantina & Maskar, 2019).

Based on interviews with school teachers, several problems were found in mathematics learning activities. Students have a tendency to memorize or see learning formulas when working on problems or using visual forms in teaching materials that place more emphasis on formulas. However, these teaching materials have not aroused student activity and have not linked the material discussed with the culture in which students live. In addition, students have not utilized these teaching resources in everyday life. The absence of real cultural applications that can be linked to mathematics is one reason. Therefore, students view mathematics as a subject that is tiring and troublesome. So that students can learn independently, the process of learning mathematics cannot be separated from the media in the form of teaching materials. One type of teaching material that can help students in learning is a module.

Students often experience learning difficulties which result in low learning outcomes, hence the creation of an innovation and learning tool that allows them to quickly influence the success of the teaching and learning process in understanding mathematics. Poor learning outcomes are caused by the use of teaching materials and learning methods that are not appropriate (Sohibun & Ade, 2017). Therefore, making teaching materials in the form of modules is one approach to improve student learning. Izzati & Fatikhah (2015) say that a module is a learning resource

consisting of a series of learning activities arranged systematically according to the student's circumstances. Students can benefit from these activities in achieving their learning goals by creating an independent learning process. Linking learning to local culture-based ethnomathematics modules will make students learn mathematics contextually in the real world. As explained by Supriyanti & Mastur (2015) the ethnomathematics learning approach results in students actively participating in the search for local culture related to flat buildings and teachers use teaching aids related to culture to increase student learning motivation.

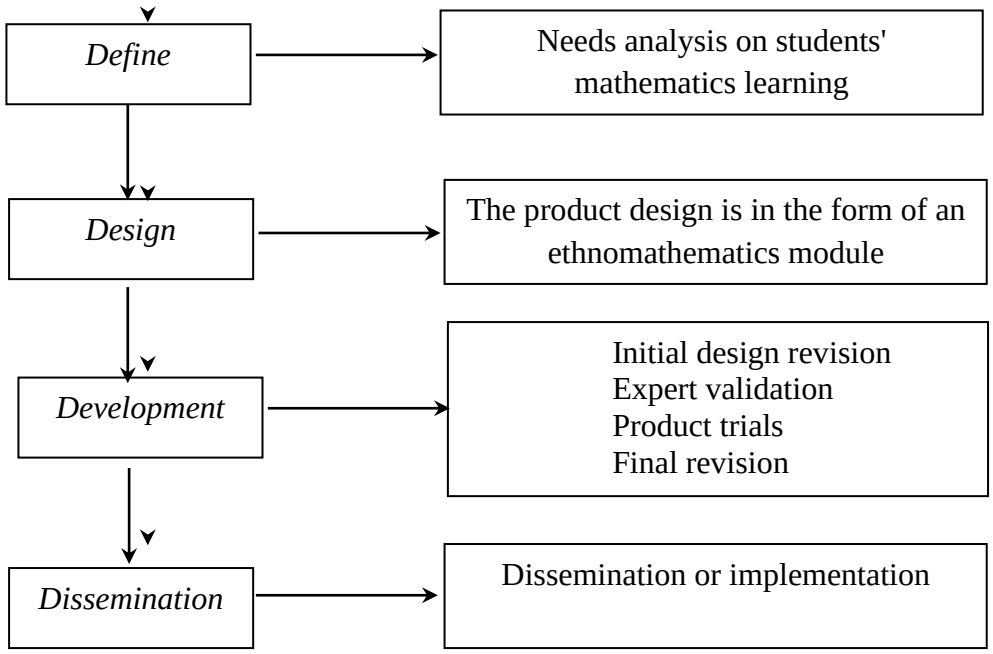
One method that is expected to be an alternative for the development of learning innovations is culture-based mathematics learning whose development is carried out in accordance with local wisdom, especially Lombok culture, in order to foster sensitivity to recognize and develop one's own culture which has been lost over time.

Based on the description above, this study developed a valid and efficient teaching material in the form of an ethnomathematics module based on Lombok culture. The developed Lombok culture-based ethnomathematics module can be used as a learning medium by students. The Lombok culture-based ethnomathematics module is expected to be able to assist students in connecting material with the problems and experiences of students' daily lives.

MATERIALS & METHODS

The research method used in this development research is Research and Development (R&D) with a 4-D model (four D-models). The 4-D model consists of 4 stages of development namely define, design , develop , and disseminate .

The following steps for the development model can be seen in the image below:



Aiken's V formula is used to determine the readability of the ethnomathematics module and the validation results provided by experts. Based on item evaluation by a panel of experts consisting of n individuals, Aiken (1985) developed Aiken's V formula to determine content validity coefficients. This formula measures how close an item represents the construct being measured. Something is considered invalid if the legitimacy coefficient is below 0.30; Conversely, if the item validity coefficient is greater than 0.30, then it is considered valid.

RESULT And DISCUSSION

This research and development resulted in an ethnomathematics module based on Lombok culture and consisting of flat material consisting of polygons, squares, rectangles, and triangles. The Lombok culture-based ethnomathematics module was developed based on the concept of mathematics in the culture that exists in Lombok as content to complement teaching materials in the form of an ethnomathematics module. The purpose of using local culture as material for making modules is to make it easier for students to understand the flat shape material in the module and introduce students to the relationship between mathematics and the culture in the surrounding environment. Therefore, this module is equipped with several pictures of local wisdom such as traditional buildings, traditional food, and arts and crafts in Lombok.

The research results that will be presented include: (1) the validity of the module according to the assessment of material and media experts; (2) module legibility based on student responses; (3) the results of the practicality test of the module; and (4) the effectiveness of the Lombok culture-based ethnomathematics module in increasing students' mathematical literacy.

The validity of the module according to the assessment of material and media experts

The results of the Lombok culture-based ethnomathematics module validation test can be seen in the table below

Table 2 Validation of the math module

Expert	Rated aspect	Evaluator	S	Σ S	N(C-1)	V	Ket
Theory	Content Eligibility	36	24	24	36	0.67	Currently
	Eligibility of Presentation	30	20	20	30	0.67	Currently
	Language Eligibility	27	18	18	27	0.67	Currently
	Contextual Feasibility	24	16	16	24	0.67	Currently
	Total	**117**	**78**	**78**	**117**		
	Average					**0.67**	**Currently**
Media	Module Size	6	4	4	6	0.67	Currently
	Module Cover Design	24	17	17	21	0.81	Tall
	Module Content Design	62	44	44	54	0.81	Tall
	Total	**92**	**65**	**65**	**81**		
	Average					**0.80**	**Tall**

The expert's assessment of the ethnomathematics module was declared to meet valid criteria so that the developed module could be tested on students. The results of module approval by material experts obtained an average value of 0.67 with details of the feasibility aspect of the content obtaining 0.67, the feasibility aspect of presentation obtaining 0.67, the feasibility aspect. language 0.67 and the contextual completeness aspect 0.67. In addition, module validation by media experts obtained an average value of 0.80 with details of module size obtaining 0.67, module cover design obtaining 0.81, module content design obtaining 0.81.

Modules that are designed taking into account the emotional development of students are well evaluated by subject matter experts. Idrus et al (2020) explained that students' emotional intelligence can be improved through character education. Media experts also said that the developed module is suitable for use with flat shape material in the teaching and learning process because it has a high level of validity. The module which was declared feasible by media experts by Sulaiman et al (2019) stated that the results of the expert validation questionnaire showed that the level of achievement of the module could be continued for learning, because the contents of the module were suitable for use in learning and validated by media experts, and the material was categorized as valid, so learning modules can be used in learning.

Readability Based on Student Responses

The ethnomathematics based mathematics module on the island of Lombok was tested on fourth grade students. This trial phase was carried out twice, namely small-scale trials and large-scale trials. for more details the results of student responses to the Lombok culture-based ethnomathematics module are in the table below

Table 5 Student responses to the limited scale test

School	Student	Score (%)	Criteria
MI NW Majuwet	10	81	Good to apply

The results of the trial were limited to 10 students at school, and the student response to the module was an average of 81%, so the Lombok culture-based ethnomathematics module was classified as strongly agreeing. Judging from the student's agreement on the use of the module in a limited scale trial, then the module can then be tested on a large scale. The results of a wide-scale trial can be seen in the table below

Table 6. Student responses to a wide-scale test

School	Student	Score (%)	Criteria
MI NW Majuwet	24	86,81	Very good

Student response questionnaires yielded an average score of 86.81% for the broad-scale testing stage which met the criteria of strongly agree. In the student questionnaire there is a comment column which aims to give students comments on the module used. There were several student comments including, students felt happy learning to use the module because they quickly understood the subject matter in the module, the presentation of material in the module was interesting, fun so they didn't feel bored learning. TL et al (2021) explained that modules will be easily accepted by students if they provide understanding and have good validity and are appropriate for application in learning.

Module Practicality Test Results

The results obtained from the questionnaire practicality test can be seen on table below.

Table 7 Practical test results for the math module

School	Teacher	Score (%)	Criteria
Mathematics teacher MI NW Majuwet	1	76	Practical

This practicality test aims to determine the user's ease in using the module as an effective and interactive learning medium to improve students' mathematical literacy skills. Practicality test questionnaires were given to teachers with the aim of obtaining information related to the Lombok culture-based ethnomathematics module being developed. The results of the teacher's response provided a very practical response to the Lombok culture-based ethnomathematics module so that it deserves to be said as an effective learning media. The results of the practicality test questionnaire analysis for the module obtained good results, namely obtaining an average value of 76 belonging to the practical criteria, so it can be concluded that the Lombok culture-based ethnomathematics module is practically used by users as teaching materials that are easily understood and understood by users.

The Effectiveness of the Lombok Culture-Based Ethnomathematics Module in Improving Students' Mathematical Literacy

The effectiveness of teaching materials developed in class IV students of MI NW Majuwet, totaling 24 people. In measuring the level of effectiveness of teaching materials in the form of ethnomathematics modules students are given test questions totaling 8 essay questions. The effectiveness of the module is seen through *the pretest* (before learning using the module) and *posttest* (after learning using the module). The table and figure below display the results of the pretest and posttest of student learning outcomes.

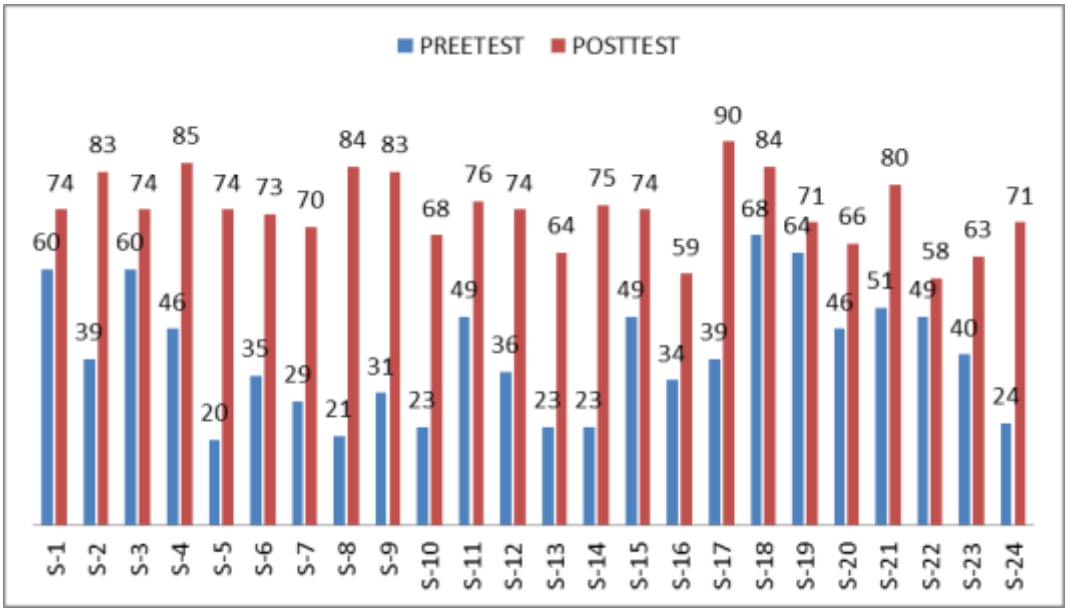


Figure 1 *pretest* and *posttest results* of students' mathematical literacy

pretest and *posttest* value data were also tested using N-gain, as shown in the picture above. This test aims to determine the current level of students' mathematical literacy the N-gain description is listed in the table below.

Table 8 Results of N-gain analysis of students' mathematical literacy *pretest* and *posttest*

Student	*Pretest*	*Posttest*	N-Gain	Criteria
MI NW Majuwet	39.96	73,88	0.54	Currently

The increase in students' problem-solving abilities and mathematical literacy with moderate criteria can be seen from the scores in the figure and table above. The mathematics module in this case can be said to be effective because it increases students' mathematical literacy after using the module in learning.

The mathematics module is effective for improving students' mathematical literacy skills because it presents examples of problems experienced in the surrounding environment and connects the material studied with local culture which has mathematical concepts contained in students' daily lives, thereby providing contextual knowledge. Contextual material can increase motivation, interest and encourage students to apply their knowledge (Zulfah & Aznam, 2018). Along with increasing motivation, interest and application will have an impact on increasing students' mathematical literacy abilities.

Based on the N-gain analysis, it is known that the increase in students' mathematical literacy skills showed that students experienced an increase after using the mathematics module, indicating a significant difference in the results of the *pretest* and *posttest. The* results can be seen from the increase in students' mathematical literacy in the *posttest scores.* The results of the N-gain test show that students' mathematical literacy in MI NW Majuwet students has increased in the medium category. This result occurs because students learn to use modules that provide interesting explanations about flat shapes. Another reason is that the Lombok island ethnomathematics-based mathematics module has an attractive appearance dominated by pictures and colors that make student learning attractive.

CONCLUSION

The Lombok island-based ethnomathematics module was declared valid by material and media experts. Based on the results of small and large scale trials, the developed module can be used as an effective learning tool. Educators also provide very definite responses to the

module fairness survey investigation. Based on these findings, it appears that the Lombok island-based ethnomathematics module is very useful for users as educational content that is easy to understand. Based on the N-gain analysis it is known that the module increases students' mathematical literacy. There is a significant difference in the pretest and posttest results, with N-gain included in the moderate category, and this difference can be attributed to the module.

Declaration by Authors

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