



ANALYSIS OF NEEDS FOR THE DEVELOPMENT OF ETHNOMATHEMATIC E-MODULES BASED ON RIAU MALAY CULTURE TO FACILITATE MATHEMATIC LITERATURE ABILITY OF SMA/MA STUDENTS

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Abstract

This research aims to determine the needs of teachers and students before the formulation of Riau Malay based ethnomatematics e-module to facilitate student's mathematical literacy skills. This research used qualitative descriptive methods that are oriented towards the development of a product. The subject of this research were two mathematics teacher and students of class XI of SMA Nurul Falah Pekanbaru. Data were collected by using interview method and questionnaire distribution. The data obtained were analyzed into three aspects which are analysis of curriculum, analysis of students, and analysis of materials. The result shows that the curriculum that is being used is curriculum 2013. Teaching materials that are being used are textbooks from Erlangga publisher. Result of student's analysis shows that 85,7% of students need the exercise about literacy and numeracy in mathematics subject. 71,4% of students agree that literacy questions in mathematics subjects that contain elements of Riau Malay culture will increase their interest in understanding the problem. The result of this research shows that it is necessary to develop an ethnomatematics e-module based on Riau Malay culture to facilitate student's mathematical literacy skills.

Keywords: Needs Analysis, Ethnomatematics, Mathematical Literacy Skill, E-Module

INTRODUCTION

Today's world is a world with rapid development of science and technology as known as era of globalization. The era of globalization is identified by the emergence of

increasingly fierce competition, increasingly dense information, diverse communication patterns, and openness. In order to welcoming this 21st century, learning and human resources are needed which able to



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develop relevant skills. Several skills should be owned by student such as critical thinking, creative and innovative, collaborative, and communicative (Kusmiati, 2018). To develop the skills mention before, other skills needed which are no less important for students to be mastered in the 21st century is literacy skills which include capability of reading, doing math, and using science.

Mathematics is one of the compulsory subjects taught to students from elementary school to high school. In everyday life, students are expected not only to be able to use mathematics as a means of counting, but also to be able to use mathematics to solve problems according to the demands of the times (Dinni, 2018). So that mathematics can be used meaningfully to solve everyday problems, students must have mathematical literacy skills. Stacey and Turner (Hanum et al., 2018) emphasized that literacy in mathematical context is the ability to use mathematical thinking to solve everyday problems and prepare for life's challenges. Mathematical thinking in question is problem solving, logical reasoning, communication, and interpretation. (Haara, Bolstad, & Jenssen, 2021) emphasized that literacy in mathematical context is the ability to use mathematical thinking to solve everyday problems and prepare for life's challenges. Mathematical thinking in question is problem solving, logical reasoning, communication, and interpretation (Hanum et al., 2018). According to Abdussakir (Cahyono & Budiarto, 2020) There are eight mathematical literacy competencies, namely thinking mathematically, posing

mathematical problems, mathematical modeling, mathematical reasoning, mathematical representation, mathematical symbolization, mathematical communication, and the use of information technology.

According to Pratiwi (2019), One way to see the literacy skills of students in Indonesia is through the results of an assessment conducted by PISA (The Programme for International Student Assessment). The subject of PISA assessment consists of basic literacy tests in the fields of reading, mathematics, and science regardless of the curriculum of each country that participates in this assessment. PISA publishes its assessment results every three years. If the results obtained by a country are above the achievement index, then it is considered as country with educational standards that are able to meet the needs of the international market. This also applies the other way around. If the results obtained by a country are below the achievement index, then the country is considered to improve its education standards and system.

Judging from the achievement of Indonesian mathematical literacy, the results of the 2018 PISA survey show that the results of Indonesia's mathematical ability are ranked 72 out of 78 countries with a score of 379 out of an average score of 489. Based on the result of this survey, *Organisation for Economic Cooperation and Development* (OECD) put Indonesia on Level 1 (OECD, 2019). The PISA score published in 2018 is not much different from previous years. The PISA results in 2000 for example, showed that Indonesia was only ranked 39th out of 41 participating countries. After 15 years, Indonesia's

achievements are still at an alarming level compared to other participating countries. This is evidenced by the fact that in 2015 it was only ranked 64th out of 69 participating countries (Pratiwi, 2019).

The low mathematical literacy ability of students is also reinforced by the results of interviews conducted with mathematics teachers at high school in Pekanbaru city in 2021. The results of the interviews revealed that students tend to be lazy to read and understand the editorials written in the question text. In addition, students easily give up in working on problems because most of the questions and the examples presented in mathematics textbooks are considered far from the daily lives of students. This causes the low interest of students to read, understand sample questions, and solve problems presented in mathematics textbooks on the market.

An alternative to overcome the problems described above is to provide materials that meet curriculum requirements by taking into account the needs and social and cultural backgrounds of students. Ethnomathematics can be seen as solution to produce teaching materials that are suitable for the student's social environment. According to (Sennen, 2020), from the context of learning mathematics, the ethnomathematical approach is a culture-based learning that uses cultural symbols to bring up mathematical concepts. According to Zhang & Zhang (2010) Ethnomathematics is defined as the study of the relationship between mathematics and sociocultural backgrounds which shows how mathematics is acquired, transferred, disseminated, and specialized into

diverse cultural systems. In this case, learning mathematics associated with certain cultural concepts is a form of learning mathematical literacy. The above statement is reinforced by the results of research conducted by Hanum et al. (2018). The results of this study indicate that through ethnomathematical-based learning increases students' curiosity so that it has a positive effect on increasing mathematical literacy abilities of class VIII MTs Al-Washliyah Tembung. Beside that, Surat (2018) in his article stated that ethnomathematics is an interesting, fun, and innovative learning option, because it is expected to bring up contextual meaning. Mathematics teaching for students should be adapted to their culture. In addition to the diversity of cultures in Indonesia, the difficulty of students understanding mathematics obtained in school and the difficulty of students relating it to real life are the main factors in the importance of integrating culture-based learning in learning (Andriyani & Kuntarto, 2017). Mathematics consists of six basic activities that can be related to culture, namely counting, determining locations, measuring, designing, playing, and explaining. Thus, the scope of ethnomathematics is to find patterns of mathematical reasoning by embracing a certain culture and then realizing it in everyday life that has mathematical values (Kinasih, 2019)

In order to achieve the goal of integrating ethnomathematics in mathematics, an appropriate teaching media is needed to be integrated with culture-based mathematics materials. Along with the development of the times and the demands of the situation during the current pandemic, a learning

facility is needed that is able to fully accommodate the needs of students, but can still be used by students independently. The suggestion is in the form of a module that is integrated with the use of technology so that it gives birth to a new concept in the form of an electronic module (e-module). E-module is a module that is presented using electronic media that contains one material to achieve certain learning objectives. According to Maryam et al. (2019) E-Modul is an electronic version of a printed module that can be read on a computer and designed with the required software. According to Ratriana et al. (2021) Modules packaged in electronic form will make it easier for students to learn independently compared to modules packaged in printed form. In addition, electronic modules are considered more practical because they can be used anywhere through the use of devices owned by students.

Based on the description above, a new innovation is needed to integrate local culture with school mathematics materials. The innovation is to produce a product in the form of an electronic module (E-module) based on Riau Malay culture ethnomathematics which is expected to facilitate the mathematical literacy skills of SMA/MA level students. This article aims to determine the needs of teachers and students in the field before the formulation of the Riau Malay culture-based ethnomathematics e-module to facilitate students' mathematical literacy skills.

METHODS

This study uses a qualitative descriptive method oriented to the development of a product. This

research is a preliminary study to see the needs in the field before developing a product in the form of an ethnomathematics e-module (Saputro, 2017). The subjects in this study were two mathematics teachers at SMA Nurul Falah Pekanbaru and class XI students at SMA Nurul Falah Pekanbaru, totaling 21 people. The data in this study were collected through interviews with subject teachers and distributing questionnaires to students. Interviews with teachers were conducted directly, while student questionnaires were distributed through the help of google forms. The object of study in this article includes three aspects, namely 1) curriculum analysis to study and understand the depth of the material in accordance with the applicable curriculum; 2) analysis of student characteristics which aims to obtain an overview of the needs and characteristics of students; and 3) material analysis to determine the right material to be presented in the e-module to be developed (Rahmadani et al., 2018).

RESULT AND DISCUSSION

E-Module ethnomathematics based on Riau Malay culture is designed by taking into account the findings from the needs analysis conducted. Implementation of needs analysis starts from curriculum analysis, material analysis, and analysis of student characteristics. The description of the results of the needs analysis is as follows:

Curriculum Analysis

Curriculum analysis is carried out to study and understand the depth of material that has been determined

by the curriculum. This process sees whether the material taught in class is in accordance with the competencies to be achieved or not. To analyze the curriculum, researchers interviewed subject teachers and observed each teacher's learning tools. The curriculum used is the 2013 curriculum. To develop learning tools, the mathematics teacher at SMA Nurul Falah is guided by Permendikbud No. 37 of 2018 concerning changes in Core Competencies (KI) and Basic Competencies (KD). The teaching materials used are mathematics textbooks published by Erlangga. During the pandemic, online learning made using of these textbooks, so students had difficulty understanding math material independently. In addition, the mathematics textbooks used do not integrate local culture and the questions presented have not facilitated students' mathematical literacy skills. In practice, the teaching materials provided by the teacher for this material have not been able to facilitate students' mathematical literacy skills. The same thing was also found in research conducted by (Purwoko et al., 2020). The results of the study stated that the existence of mathematics textbooks caused problems for students. Anderson (Purwoko et al., 2020) mentioned that mathematics textbooks tend to turn off students' interest and cause boredom. Students will find it difficult to present abstract problems that are less relevant to students' daily lives. Based on Permendikbud No. 37 of 2018, for class XII there are basic competencies 3.2 Determine and analyze the size of the concentration and distribution of data presented in the form of frequency distribution tables and histograms and

4.2 Solve problems related to the presentation of measurement and enumeration data in frequency distribution tables and histograms. This material is one of the numeracy literacy materials in the 2013 curriculum.

Student Characteristic Analysis

This analysis aims to obtain information about the description of the needs and characteristics of students. These are then reviewed to establish specifications and changes in behavior or goals and materials. The characteristics of these students can be in the form of academic ability, age and level of maturity, number of students per class, student background, and student habits. (Ahmad, 2019). The results of this analysis are used as a reference for designing the e-module to be developed. Students who study Statistics are in class XII SMA/MA aged 16-19 years. According to Piaget's theory of cognitive development (Mu'min, 2013), students aged over 15 years already have formal operational cognitive abilities. At this stage, normally students are able to think abstractly, more idealistically, and more logically. However, the basis for developing this e-module is that the e-module must be able to be used by students independently, both by high, medium, and low ability students (Alfiah, Roza, & Maimunah, 2020).

Characteristics of students were analyzed by looking at the results of interviews with subject teachers and the results of distributing questionnaires. By looking at the results of student answers when filling out the questionnaire, 100% of students already have the latest

technological devices in the form of laptops and mobile phones based on Android/iOS. In addition, 100% of students need a mathematics learning module that can be accessed via a laptop/smartphone. Based on the results of this analysis, it can be seen that learning materials will be very appropriate if presented using electronic modules or e-modules because almost all students who are the subjects of this study already have compatible devices to access electronic teaching materials. Ratriana et al. (2021) revealed that e-modules can be used anywhere so they are more practical. In addition, e-modules can also present information in a structured, interesting, and very interactive way. It aims to increase students' interest and motivation to understand and solve mathematical problems.

Students who fill out the questionnaire are students who have taken the Computer-Based National Assessment (ANBK). For mapping the quality of education, the questions tested in the ANBK are literacy and numeracy questions. After participating in ANBK, 85.7% of students answered that they needed literacy and numeracy exercises in learning mathematics. The students of SMA Nurul Falah Pekanbaru mostly live on the coast of the Siak river, Pekanbaru. As is known by the public, the coast of the Siak river is the origin of Malay civilization in Pekanbaru City, so there are many Malay historical relics. Therefore, students already feel familiar with Riau Malay culture. In addition, the background knowledge possessed by students regarding Riau Malay culture is through Riau Malay Culture (BMR)

subjects which are mandatory local content subjects in Riau Province.

Therefore, 78.6% of students agree that math problems based on Riau Malay culture will make it easier for them to learn. 78.6% of students agree that literacy questions contained in mathematics textbooks tend to be difficult to understand because the problems presented are not close to students' lives. 71.4% of students agree that literacy questions in mathematics subjects that contain elements of Riau Malay culture will increase their interest in understanding these questions.

Ethnomathematical activities in the Riau Malay community are very diverse. Starting from counting, measuring, and various applications in literature, fashion, carving, ship design and folk games (Hasanuddin, 2017).

These results was in line with opinion of (Sennen, 2020) which states that ethnomathematics can be viewed as lens for understanding mathematics as a result and product of culture. In this case, learning mathematics that is connected to a certain cultural context is a form of learning mathematical literacy that allows students to be involved in solving problems in their environment. Surat (2018) also revealed that culture-based mathematics learning will be an interesting, fun, and innovative learning alternative because as members of the cultural community, students are expected to be able to internalize the contextual meaning of mathematics and participate in supporting the literacy movement.

Material Analysis

Material analysis aims to identify, detail, and systematically

compile the relevant material to be presented in the e-module. The material chosen in the development of this e-module is statistical material. This material was chosen because included in the component of numeracy literacy material in the 2013 curriculum mathematics subject, namely interpreting statistical information. (Kemendikbud, 2017). In addition, basic statistical skills are very important to be able to understand, analyze, interpret, and draw conclusions from various statistical information and can give meaning to problems that arise from various statistical information in the media. (Wildani et al., 2019). Statistics is one of the materials in mathematics. Statistics can be seen as a tool to solve problems that always occur in

everyday life, in the workplace, and in science (Wulansari et al., 2019). The preparation of materials in the development of teaching materials refers to the composition of materials contained in the 2013 curriculum and contained in Permendikbud No. 37 of 2018 KD 3.2 and 4.2, namely:

KD 3.2 : Determine and analyze the size of the concentration and spread of data presented in the form of frequency distribution tables and histograms

KD 4.2 : Solve problems related to the presentation of measurement and enumeration data in frequency distribution tables and histograms

Based on the basic competencies above, the e-module material is organized into 10 meetings.

Table 1. E-Module design for each meeting

Meeting	Learning Material	Time Allocation
1	Presentation of Data in the Form of Diagrams (Lines, Bars, and Circles)	2 JP
2	Presentation of Data in the Form of Frequency Distribution Table	2 JP
3	Presentation of Data in the Form of Histograms and Ogives	2 JP
4	Average Counting Single and Grouped Data	2 JP
5	Mode of Single and Grouped Data	2 JP
6	Median of Single and Grouped Data	2 JP
7	Quartile of Single and Grouped Data	2 JP
8	Range, Interquartile Range, and Quartile Deviation	2 JP
9	Average Deviation	2 JP
10	Variety and Standard Deviation	2 JP

CONCLUSION AND RECOMMENDATION

Based on the results of research conducted at SMA Nurul Falah Pekanbaru, it was concluded that the

curriculum used was the 2013 curriculum. 37 of 2018 concerning changes in Core Competencies (KI) and Basic Competencies (KD). The teaching materials used are

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mathematics textbooks published by Erlangga. During the pandemic, online learning made use of these textbooks, so students had difficulty understanding math material independently. In addition, the mathematics textbooks used do not integrate local culture and the questions presented have not facilitated students' mathematical literacy skills. Most of the students of SMA Nurul Falah Pekanbaru live on the coast of the Siak river, Pekanbaru, where in this location there are many relics of Malay culture so that students feel familiar with Riau Malay culture. In addition, the background knowledge possessed by students regarding Riau Malay culture is through Riau Malay Culture (BMR) subjects which are mandatory local content subjects in Riau Province. The material chosen in the development of this e-module is statistical material. The preparation of materials in the development of teaching materials refers to the composition of materials contained in the 2013 curriculum and contained in Permendikbud No. 37 of 2018 KD 3.2 and 4.2. Therefore, we need an e-module of Riau Malay culture ethnomathematics to facilitate students' mathematical literacy skills.

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