# Development of an RME-Based Digital Module with a Sundanese Cultural Context on Students' Numeracy Literacy Ability

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## ABSTRACT

The purpose of this study was to develop a digital module based on RME with a Sundanese cultural context on students' numeracy literacy skills. This study used a type of research and development with the ADDIE model consisting of five stages, namely Analysis, Design, Development, Implementation and Evaluation. Data collection techniques in this study include interviews, observations and questionnaires. The results of this study state that this RME-based digital module is valid, practical and effective for use in mathematics learning. In this module there is an RME learning design combined with local wisdom of Sundanese culture so that abstract mathematics learning can be easily learned by students. In addition, there are numeracy literacy-based practice questions that can improve students' skills in working on literacy questions. This module is interactive digital so that in its implementation students can easily use gadgets or other computer devices. This module is designed using the RME approach, on the material of two-variable linear equation systems for class X. In this module, the RME learning principles are applied, namely dedactical phenomenology, Guided Reinvention and Self Developed Model, with the context of Sundanese cultural problems. The Sundanese cultural context used is related to typical Sundanese food, typical Sundanese equipment that is sold in the market and traditional Sundanese houses.

Keywords: digital module; RME; culture; numeracy literacy

## INTRODUCTION

Numeracy literacy skills are one of the abilities that students must master to answer the challenges of today's life. This ability is needed to process, communicate, and interpret mathematical information in various contexts in order to survive in today's modern society (Tresnasih et al., 2022). Numeracy is knowledge and skills in using types of numbers and symbols related to basic mathematics to solve practical problems in different daily life contexts (Baharuddin et al., 2021). Numeracy plays an important role in everyday life, especially in making decisions based on information in all aspects of daily life (Rahmawati et al., 2023).

However, based on survey results, numeracy literacy skills in Indonesia are still below expectations. The 2018 PISA results show that Indonesia is ranked 73rd out of 78 participating countries. Based on a study of the 2018 PISA results, there are still Indonesian students who have difficulty dealing with situations that require problem solving skills using mathematics (Darmastuti et al., 2024).

The low numeracy literacy ability is caused by several factors, including abstract mathematical concepts and the application of inappropriate learning methods (Khotimah, 2018). Apart from that, the low numeracy literacy skills in Indonesia are because teachers have not familiarized students with literacy-based questions (Nicky Dwi Puspaningtyas,

2020). If we look at mastery of concepts, most students do not understand mathematical concepts or students understand the concepts incorrectly (Perdana & Suswandari, 2021). In terms of learning, there are still many shortcomings, including learning that is still teacher-centered, lack of application in everyday life (Rada & Fauzan, 2019), students only memorize formulas and solution patterns taught by the teacher without understanding it (Komarudin, 2017), and students only get information and work on questions from the teacher without trying to explore (Imswatama & Muhassanah, 2016).

This fact actually contradicts constructivist learning theory, where knowledge is formed in cognitive structures in interaction with the environment, or it can be interpreted that knowledge is constructed by students themselves (Uba Umbara, 2017). Learning mathematics by emphasizing the real world and cultural elements (Imswatama & Lukman, 2018) can help students' initial knowledge to enter into abstract mathematical concepts (Indriyani et al., 2021). Realistic Mathematics Education (RME) is a human activity which has the characteristic that in the mathematics learning process students are given the opportunity to rediscover ideas and concepts through teacher guidance (Artika et al., 2019), so that students not only get concepts from the teacher but the students themselves construct them. this knowledge (Yanti et al., 2016).

In the current digital era, learning is starting to transform into the use and development of technology. Integration of technology in learning through digital devices, online platforms, and multimedia resources creates a dynamic learning environment and enriches students' learning experiences(Siringoringo & Alfaridzi, 2024).There are several research results related to the use of technology in learning and the results can improve students' abilities (Isra Nurmai Yenti, Meilin Vanesha Putri, 2016)(Meiliasari et al., 2015)(Zulkifly et al., 2022). One use of technology in learning is with interactive digital modules. Interactive digital modules are digital modules that have the advantage of displaying several interactive materials (Ammy, 2021). Currently there is no research and development related to RME-based interactive learning modules with a Sundanese cultural context as an effort to improve numeracy literacy skills. Apart from that, Sundanese culture is a culture that in its daily life carries out mathematical activities based on practical values found in its life (Nisa et al., 2019). Based on this background, the focus of this research is the development of RME-based interactive digital modules with Sundanese cultural content as an effort to improve students' numeracy literacy skills. The problem formulation in this research is to determine the validity, practicality and effectiveness of the interactive digital module.

The problem solving approach in this research is in the form of an RME-based interactive digital module with a Sundanese cultural context. This product is expected to be able to overcome problems related to students' low numeracy literacy skills. This module is digitally interactive so that in its implementation students can use it easily using gadgets or other computer devices. This module was designed using the RME approach, so that the RME learning principle is applied, namely dedactical phenomenology, where mathematics learning is through exploration of events that students can imagine, in this research using the Sundanese cultural context. The next principle is Guided Reinvention, where students are given the opportunity to rediscover a mathematical concept, so that in this interactive module students will be guided to rediscover mathematical concepts. The final principle is Self

Developed Model, students are given the freedom to develop mathematical models for the mathematical problems they face. Apart from that, in this interactive module there will be mathematical problems in the context of Sundanese cultural elements which will train students to solve problems based on numeracy literacy.

## RESEARCH METHODS

The method used in this research is the research and development method. This research was carried out at Muhammadiyah Vocational School, Sukabumi City, Class X Computer and Network Engineering (TKJ) in the even semester of the 2023/2024 academic year. The product testing subjects consisted of 20 class X students majoring in Computer and Network Engineering. The material tested was the System of Linear Equations in Two Variables (SPLDV). In this module, Sundanese culture is used, for example, determining the selling price of agricultural products, determining the calculation of traders in the Sundanese market, calculating the production costs of making steamed fish and so on. Data collection techniques in this research include interviews, observation and questionnaires.

This research uses a type of research and development with the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation and Evaluation. The research procedure is as follows. The research design is presented in table 1.

Table 1. Research Design

| Activities | Process | Achievement indicators |
|---|---|---|
| *Analysis* | preliminary study which includes literature studies regarding students' difficulties in solving numeracy literacy questions, analysis of the RME concept and exploration of elements of Sundanese culture as a context for mathematics learning | data was obtained for the development of RME-based interactive digital modules in the context of Sundanese cultural elements as well as instruments to measure the validity, practicality and effectiveness of the modules. |
| *Design and Development* | preparing RME-based interactive digital module content with a Sundanese cultural context based on data from analysis results in preliminary study activities, in this case including material, basic and core competencies, indicators and numeracy literacy instruments with a Sundanese cultural context. | RME-based interactive digital module design with a Sundanese cultural context whose validity has been tested. |
| *Implementation* | implementation of interactive digital modules in the classroom through laboratory trials and limited trials. | data on test results, advantages and disadvantages as well as suggestions for improvements for interactive digital modules. |
| *Evaluation* | analyzing the results of implementing interactive digital modules in the classroom. | data related to the practicality of interactive digital media by teachers and students. |

In this research, validation was carried out by 3 validators by providing validation, then analyzed using a Likert scale, with a rating range of 1-4.

## RESULTS AND DISCUSSION

The product developed in this research is an RME-based digital module with a Sundanese cultural context on students' numeracy literacy. The research model used in this research uses the ADDIE model, the results of which are as follows:

## Analysis

Based on the results of interviews and observations conducted, it was found that the classroom learning process implemented by the teacher did not involve students participating in each process so that students' numeracy literacy skills were still low. Apart from that, the use of monotonous and conventional learning methods such as lectures and delivery of abstract material by teachers results in students being less motivated in learning mathematics. Apart from that, the learning resources used are in the form of textbooks or student worksheets which are less interesting, so that students' motivation and interest in learning mathematics is increasingly low.

Based on the analysis of needs and problems, the problem solving approach in this research is in the form of an RME-based interactive digital module with a Sundanese cultural context. This product is expected to be able to overcome problems related to students' low numeracy literacy skills. The use of interactive modules can make learning take place in a conducive manner because it contains features that can help students gain an understanding of the material (Wulandari et al., 2021). This module is digitally interactive so that in its implementation students can use it easily using gadgets or other computer devices.

### *Design and Development*

In this stage there are several development plans carried out to develop teaching modules, including RME design in teaching modules, integration of Sundanese cultural contexts in mathematics learning, designing learning scenarios using the RME approach, designing learning materials and designing learning evaluation instruments.

The development of this digital module aims to make it easier for students to learn anytime and anywhere without being limited by space and time. This media was created with the help of several applications, namely Canva, Microsoft Office Word, and Flipbook Maker. This digital module is designed for learning activities that can be carried out individually. The appearance of this teaching module is adjusted to the characteristics and needs of students identified in the initial analysis, where the results of this analysis show that students are more likely to repeat lesson material through discussion with friends and independent study.

In this development stage, validation is also carried out regarding learning materials and media. To calculate the percentage of validity value, use the following formula (1).

$$\% = \frac{Total\ score\ obtained}{maximum\ score}\ x\ 100\%\ (1)$$

The values obtained are then adjusted to the validity score interpretation criteria in table 2.

Table 2. Validity Score Interpretation Criteria

| No | Persentase (%) | Information |
|----|---------------|-------------|
| 1 | 0 – 20 | Very invalid |
| 2 | 21 – 40 | Invalid |
| 3 | 41 – 60 | Fairly Valid |
| 4 | 61 – 80 | Valid |
| 5 | 81 - 100 | Very Valid |

The results of digital module validation related to material and media are as follows

Table 3. Material Validation Results

| No | Aspect | Validator | | | Total Score | Maksimum Score | % | Category |
|----|--------|----|----|----|-------------|----------------|-----|----------|
| | | 1 | 2 | 3 | | | | |
| 1 | Contents | 22 | 25 | 23 | 70 | 75 | 93 | Very Valid |
| 2 | Presentation | 9 | 8 | 9 | 26 | 30 | 87 | Very Valid |
| 3 | Language | 9 | 10 | 8 | 27 | 30 | 90 | Very Valid |
| 4 | RME | 14 | 14 | 13 | 41 | 45 | 91 | Very Valid |
| Jumlah | | 54 | 57 | 53 | 164 | 180 | 361 | |
| | Average | | | | | | 90 | Very Valid |

Table 4. Media Validation Results

| No | Aspect | Validator | | | Total Score | Maksimum Score | % | Category |
|----|--------|----|----|----|-------------|----------------|-----|----------|
| | | 1 | 2 | 3 | | | | |
| 1 | Presentation | 19 | 19 | 18 | 56 | 60 | 93 | Very Valid |
| 2 | Efect | 13 | 12 | 12 | 37 | 45 | 82 | Very Valid |
| 3 | Appearance | 22 | 25 | 25 | 72 | 75 | 96 | Very Valid |
| Jumlah | | 54 | 56 | 55 | 165 | 180 | 272 | |
| | Average | | | | | | 91 | Very Valid |

From Table 1 and Table 2 regarding the results of material and media validation, it can be concluded that the digital module is in the very valid category.

**Implementation**

After the product is validated, the next step is implementation in schools. The product implementation activity aims to see the practicality and effectiveness of digital modules when applied in learning at school. Implementation was carried out on 20 students in class X TKJ Muhammadiyah 1 Vocational School, Sukabumi City. In implementation activities, data was obtained that the digital modules developed were in the very practical category, in this case meaning that in general the digital modules developed had met the quality criteria for product suitability. Apart from that, the effectiveness of the digital modules developed is also included in the effective category. This can be seen from the t-test value, where the calculated $t_{value} = 17.28$ and $t_{table} = 2.093$, therefore the test decision is that $H_0$ is rejected so that there is a significant difference between the posttest and pretest values. Where the posttest score is higher than the pretest score. This module is digital interactive so that in its implementation students can use it easily using gadgets or other computer devices (Adna, SF; Chasanah, AP; Myasaroh, 2024). This module is designed using the RME approach, so that the RME learning principle is applied, namely dedactical phenomenology, where mathematics learning is through exploration of events that students can imagine, in this study using the Sundanese cultural context. The next principle is Guided Reinvention, where

students are given the opportunity to rediscover a mathematical concept, so that in this interactive module students will be guided to rediscover mathematical concepts. The last principle is the Self Developed Model, students are given the freedom to develop mathematical models for the mathematical problems they face. In addition, in this interactive module there will be mathematical problems with the context of Sundanese cultural elements that will train students to solve problems based on numeracy literacy.

**Evaluation**

Analysis of the digital module that has been developed is that the module is a valid, practical and effective module used in learning at school. This RME-based digital module with a Sundanese cultural context was developed based on an analysis of student needs and character. This teaching module contains mathematical material developed based on the characteristics of RME, namely (1) guided reinvention, which provides opportunities for students to experience the process of reinventing mathematical concepts by carrying out activities that are possible through teacher guidance, (2) didactical phenomenology, namely exploring events that students can imagine, and (3) self-developed models, namely providing a wide creative space for students to develop mathematical models of the problems they face (Imswatama, 2023). The RME learning design used in this digital module is in the form of the100onceptt of the iceberg phenomenon, where the tip of the iceberg is the peak which contains formal mathematics, and the body of the iceberg is the process of forming formal mathematical concepts.
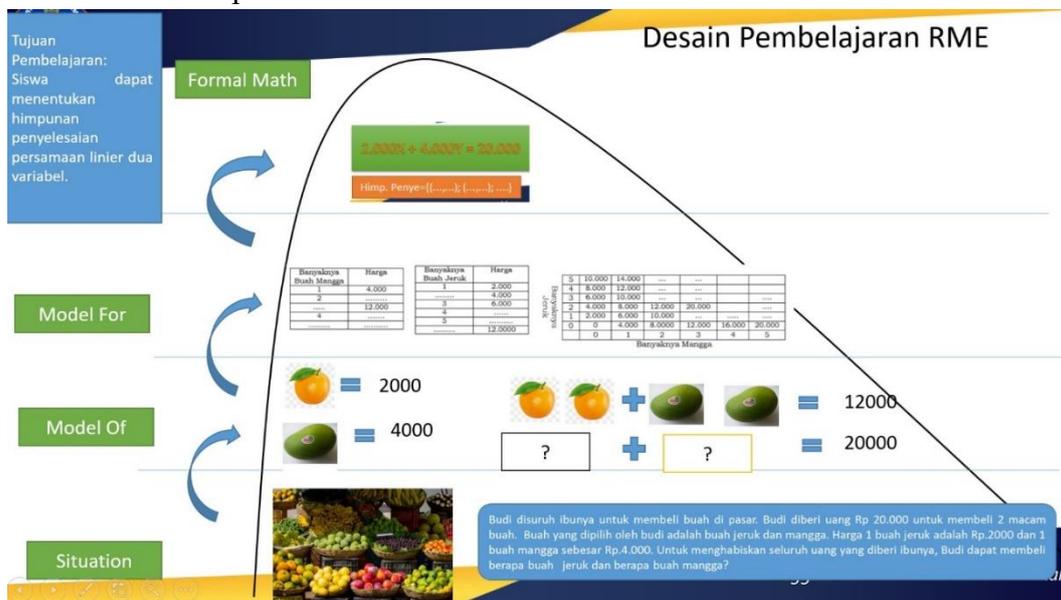


Figure 1. RME Learning Design

Based on this picture, it can be seen that to reach the top of the mountain or formal mathematics, it starts from presenting situations that students can imagine or situations related to environmental conditions that students often encounter, then the teacher directs them to develop a problem solving model related to the given situation. The concept of a "given situation" refers to a real or realistic context that is used as a starting point to facilitate the understanding of mathematical concepts. This situation is designed in such a way that it is close to the students' experience, allowing them to organize and construct their own

mathematical knowledge gradually from real-world problems to formal forms. At the for model level, students begin to recognize the general characteristics of the problem given. After that, the teacher leads students to find formal forms of mathematics. This is in accordance with research related to student learning trajectories in implementing RME learning (Batul et al., 2022).

The RME design in this digital module is presented attractively, making it easier for students to understand the material provided. An example of a learning presentation is as shown in Figure 2.



Figure 2. RME-Based Student Worksheet Display

The presentation of student worksheets is as shown in Figure 2. It can be seen that students are required to discover their own concepts by carrying out activities from the given situations. By using this digital module, it is hoped that students will get used to discovering concepts so that they will improve their numeracy literacy skills. This is in accordance with the opinion of Melyda et al that the RME approach has a positive impact in improving students' mathematical literacy skills (Melda Maulyda, 2023). Apart from that, according to Ayunis et al, the RME approach is more effective in improving numeracy literacy skills than conventional learning (Ayunis & Dorisno, 2022).

This module also presents questions related to numeracy literacy which aims to train students to get used to working on questions. By providing practice questions, it is hoped that it can provide students with knowledge regarding numeracy literacy questions and train students' skills in solving numeracy literacy-based questions. This is in line with the opinion of Puspaningtyas et al who state that providing literacy-based practice questions will have a significant impact on student learning outcomes (Nicky Dwi Puspaningtyas, 2020).

Figure 3. Example of A Numeracy Literacy Question

## CONCLUSION

Based on the results of the research and discussion explained above, it was concluded that the RME-based digital module with a Sundanese cultural context has been proven valid, practical and effective for students' numeracy literacy abilities.

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