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Development of Mathematics E-Modules with Cultural Context to Support Mathematical Literacy

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ABSTRACT

This research aims to develop a culture-based mathematics E-Module to support students' mathematical literacy in a valid, practical, and effective way. The ADDIE development model was used in this research. Data was collected with validation sheets, response questionnaires, and evaluation questions and analyzed descriptively qualitative and quantitative. The validity of the E-Module, with a validation score of 81.5%, fits the valid criteria. Practicality with a response questionnaire score of 90.49% according to practical criteria. Effectiveness was assessed from student evaluation results with an average $N-Gain$ percentage of 63.166% according to somewhat effective criteria. The results showed that the E-Module with cultural context is feasible and practical and has a positive impact on improving students' mathematical literacy skills.

1. Introduction

Mathematical literacy is the ability to use mathematics in valuable ways in various daily activities to understand the surrounding environment and make better decisions (Burkhardt et al., 2024). Mathematical literacy is a person's ability to efficiently formulate, use, and interpret mathematics in various contexts of daily life problems (Sari, 2015). According to OECD (2023), mathematical literacy is an individual's capacity to reason, formulate, use, and interpret mathematics to solve problems in various real-world contexts. The PISA 2022 framework explains that the three main aspects of mathematical literacy are content, context, and 21st-century competencies. Mathematical content is the category of mathematical concepts used to solve problems. Context refers to the real-world

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situations in which mathematics is applied, and contexts are divided into four categories: personal, occupational, social, and scientific. 21st-century competencies are the skills needed to face challenges, including critical thinking, creativity, research, inquiry, etc.

Mathematical literacy is used to solve real-world problems systematically and relevant to the context of life. The context in question consists of personal, work, social, and scientific. One of the contexts easily found in students' daily lives is the social context; culture is included in the social context. According to Poernomo et al (2021), the context of numeracy literacy is part of mathematics that relates to practical and conceptual matters, such as using mathematical components in the fields of work, arts, sports, and others by geographical and socio-cultural conditions. Culture has great potential to bridge students' understanding of mathematical concepts through meaningful daily experiences; by utilizing this context, students can more easily understand the material while appreciating local wisdom. Some studies that discuss cultural contexts can support mathematical literacy include research that discusses students' numeracy literacy skills in solving socio-cultural context problems on geometry topics at the junior high school level (Rezky et al., 2022), the effectiveness of character-based contextual approaches and local culture on the mathematical literacy skills of junior high school students (Wahyuningtyas et al., 2020).

Mathematical literacy is measured in the Program for International Student Assessment (PISA). PISA is an international study that assesses the quality of education systems. Indonesia's ranking in mathematical literacy is 70, with an average score of 366 (OECD, 2023). The number is relatively low compared to the PISA conducted in 2018, with the average mathematical literacy score obtained by Indonesia being 379 (OECD, 2019). The government, through the Ministry of Education, held a National Assessment (AN) to support PISA. The national assessment is one form of evaluation of the education system by the ministry at the primary and secondary education levels (Peraturan Menteri Pendidikan, Kebudayaan, Riset, Dan Teknologi Nomor 17 Tahun 2021 Tentang Asesmen Nasional, 2021). AN aims to measure cognitive learning outcomes, non-cognitive learning outcomes, and the quality of the learning environment in educational units. Cognitive learning outcomes include reading literacy and numeracy. Schools are essential in supporting the government's efforts to improve student literacy and numeracy. The strategic role of schools in supporting students' literacy and numeracy can be realized in various forms, including supporting teachers in developing innovative and engaging learning.(Feriyanto, 2022)

In 2023, one of the private secondary schools in Banyumas district participated in the National Assessment, which measured reading literacy, numeracy literacy, and environmental survey. The 2023 school report card poster showed that students' numeracy skills decreased from 2022; the skills assessed were students' understanding of the domains of numbers, algebra, and geometry. This makes researchers want to create teaching materials that can support students' mathematical literacy skills with a cultural context easily found in everyday life. One of the fascinating cultures to learn is the art of Begalan, which has many equipment in its performance. Each tool has a diverse shape and can be used to study geometry, such as ilir and iyan, which are square, conical steamer, circular coins, etc. (Kusno et al., 2023). Mathematics learning related to culture and tradition allows students to reflect on and appreciate local and other tribal

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cultures.(d'Entremont, 2015)

Based on observations in one of the private secondary schools in Banyumas Regency, it was found that mathematics learning is still dominated by the use of printed books and teacher presentations. This approach makes it difficult for students to understand math concepts, especially geometry. To overcome this problem, the developer developed a cultural context-based math E-Module that contains pictures, interesting illustrations, and interactive media. This E-Module is designed to make it easier for students to learn independently while supporting their mathematical literacy skills.

Previous research shows that E-Modules have a positive impact on mathematical literacy. (Efendi et al., 2024) developed E-Modules that directly support improving mathematical literacy. (Fathani & Pangestu, 2024) also found that integrating local culture into mathematics learning can improve students' understanding of mathematical concepts. In addition, research by (Cahyono & Budiarto, 2020; Susanto et al., 2022) showed that culture-based math E-Modules not only help students understand the material but also support the development of mathematical literacy by linking abstract mathematical concepts to real experiences based on local culture. Therefore, this E-Module is expected to improve students' mathematical literacy with an ethnomathematics approach significantly

Many E-Module development studies have been conducted to support mathematical literacy in mathematics learning. However, the development of interactive E-Modules by integrating cultural contexts in improving mathematical literacy skills has not been widely carried out. Therefore, researchers developed mathematics E-Modules with cultural contexts, to support valid, practical, and effective mathematical literacy skills with the ADDIE development model. This research can introduce local culture as a context in supporting students' mathematical literacy and can provide new experiences for students to learn by connecting technology with mathematics.

2. Method

The development of this E-Module refers to the ADDIE development model. The model is used because it has coherent, structured steps and can achieve development needs. The ADDIE model has five stages: Analyze, Design, Develop, Implement, and Evaluate.

2.1. E-Module Development Stages

2.1.1. Analyze

The analysis stage aims to determine the product that needs to be developed through observation and information gathering. The information was collected from an interview with a mathematics teacher from one of the private secondary schools in Banyumas. The selection of one teacher as a resource person was based on the consideration that the teacher has direct experience in teaching geometry materials, especially cone space, and understands the difficulties that students often experience. The analysis included needs analysis, student characteristics, and task analysis. Needs analysis aims to identify field problems and teaching materials to develop efficient and effective learning modules. Student analysis studies student characteristics based on education level and relevant materials.

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Task analysis identifies solutions by developing culture-based E-Modules to support students' mathematical literacy.

2.1.2. Design

The design of this E-Module includes determining the learning objectives of the material arrangement and interactive features that will be used in the module, such as animations, learning videos, and interactive practice questions. The E-Module is also equipped with cultural contexts related to cones, such as bamboo steamers (kukusan), and historical buildings, such as Monjali (monument jogja kembali). The E-Module is designed to be accessible through computer and smartphone devices, making it easier for students to learn outside the classroom. Storyboarding is done at this stage to map the learning flow.

2.1.3. Development

At this stage, the E-Module begins to be developed in accordance with the design. Development is carried out using Canva to design and develop modules until they are suitable. The developed module includes material about the basic concepts of cones and how to calculate the surface area and volume. Material expert validators and media experts also carried out the validity test of the E-Module at this stage.

2.1.4. Implementation

The implementation phase was conducted in one of the private junior high schools in the Banyumas district, involving 22 seventh-grade students who became the research sample. Students were given E-Modules to study for four meetings, and teachers provided guidance on the use of E-Modules in the learning process. During the implementation, students used the module outside class hours to deepen their understanding of cones. Practicality and effectiveness tests were conducted at this stage. The practicality test was conducted by distributing response questionnaires to use E-Modules to teachers and students of the research subjects, and the effectiveness test was conducted by distributing mathematical literacy test questions to students. The mathematical literacy test questions with cone material relate to problems in everyday life, such as conical farmer's hats and cone-shaped tumpeng rice.

2.1.5. Evaluation

Evaluation is done after receiving suggestions and input from validity, practicality, and effectiveness tests. The suggestions and input are then improved so that the E-Modules developed can be valid, practical, and effective.

This study's subjects were 22 seventh-grade students at one of the private secondary schools in Banyumas. The sample selection was based on communication with the mathematics teacher.

2.2. Processing of Data

This research will produce a mathematics E-Module product with a cultural context to support mathematical literacy skills that are valid, practical, and effective so that it needs proper data collection and processing. Data were collected through instruments that had been prepared and then analyzed using qualitative and quantitative descriptive analysis techniques. Qualitative data is

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data obtained from respondents' input and suggestions. The respondents in question include material and media expert validators, teachers, and students. Quantitative data is data obtained in the form of results of filling out questionnaires by validators of material experts and media experts, teachers, and students in the form of assessment scores. The following is an explanation of each test used in this study:

2.2.1. Validity Test

The validation sheet consists of an E-Module validation sheet, teacher and student response questionnaire validation sheet, and test question validation sheet. The E-Module validation sheet is used to determine the validity/feasibility of the E-Module, which material experts and media experts assess. The teacher and student response questionnaire validation sheet are used to determine the feasibility of teacher and student response questionnaires before use. The test question validation sheet is used to determine the feasibility of the test questions before use. Expert validators carried out this validation. Expert validators are lecturers from the field of Mathematics Education. The validation sheet uses four options, namely very suitable with a score of 4, ideal with a score of 3, less suitable with a score of 2, and not perfect with a score of 1. Analysis of the assessment results from the validator is based on the average score obtained. The data analysis technique of the E-Module validation test results was analyzed from the formula adapted from the following:

$$P = \frac{\sum X}{\sum X_i} \times 100\% \quad (1)$$

Description:

P	:	Validity Percentage
X	:	Response Score per Item
X_i	:	Maximum Total Score per Item

The calculation results using the formula are interpreted and concluded as follows, according to the evaluation classification criteria shown in Table 1.

Table 1. Validation Assesment Criteria

Criteria	Category	Validity
$90\% \leq P \leq 100\%$	Very good	No need for revision
$75\% \leq P \leq 89\%$	Good	No need for revision
$65\% \leq P \leq 74\%$	Fair	Revision
$55\% \leq P \leq 64\%$	Less	Revision
$0\% \leq P \leq 54\%$	Very Less	Revision

Source: (Santosa et al., 2017)

2.2.2. Practicality Test

The practicality of E-Modules was measured using teacher-response questionnaires and student-response questionnaires. Teacher and student response questionnaires use four options, namely very suitable with a score of 4, ideal with a score of 3, less suitable with a score of 2, and not perfect with a score of 1. The data analysis technique of practicality is carried out in five stages. The first stage is to recapitulate the scores of teacher and student response

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questionnaire sheets, and the second stage is to calculate the average score of each response with the following formula.

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad (2)$$

Description:

$\bar{x}$: Average Score
x_i : The Score of the Question- i, with $i \epsilon N$
n : The Number of Students

The third stage is to complete the answer criteria on each teacher response questionnaire and student response questionnaire according to the following table.

Table 2. Criteria of Response Questionnaire

Average Interval	Response Criteria
$3{,}251 < \bar{x} \leq 4{,}00$	Excellent
$2{,}501 < \bar{x} \leq 3{,}250$	Good
$1{,}751 < \bar{x} \leq 2{,}500$	Less
$0{,}00 \leq \bar{x} \leq 1{,}750$	Not Good

Source: modified from (Purnomo & Palupi, 2016)

The fourth stage is to calculate the percentage of practicality, namely K, with the following formula.

$$K = \frac{S}{N} \times 100\% \quad (3)$$

Description:

K : Practicality Percentage
S : Number of Students who Gave Good and Excellent Responses
N : The Number of Students

The fifth stage is to conclude the criteria for the practicality of E-Modules according to the following Table 3.

Table 3. Criteria for E-Module Practically

Practicality Criteria	Description
$85\% \leq K \leq 100\%$	Very practical, can be used without revision
$70\% \leq K \leq 85\%$	Moderately practical, can be used but needs minor revisions
$50\% \leq K \leq 70\%$	Less practical, and not recommended for use because it needs significant revisions
$0\% \leq K \leq 50\%$	Not practical, cannot be used

Source: modified from (Akbar, 2013)

2.2.3. Effectiveness Test

The effectiveness of E-Modules in supporting mathematical literacy skills can be known through pretest and posttest scores. The pretest was conducted before

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students studied cones using E-Modules, and the posttest was conducted after students studied cones using E-Modules. The scores obtained are then analyzed using the $N-Gain$ score to determine the significant difference between the test results before and after the use of E-Modules.

The $N-Gain$ test, which stands for Normalized Gain, is a commonly used method to measure the effectiveness of a learning or intervention in improving student learning outcomes. The $N-Gain$ scores range from -1 to 1. A positive value indicates an increase in learner learning outcomes after learning. Meanwhile, negative values indicate a decrease in learner learning outcomes. The $N-Gain$ score can be calculated as follows.

$$N-Gain=\frac{Posttest\ score-Pretest\ score}{Ideal\ score\ -\ Pretest\ score} \tag{4}$$

The level of significant of the E-Module being developed is interpreted using the $N-Gain$ score criteria in Table 4.

Table 4. The $N-Gain$ Score Criteria

$N-Gain$ Value	Criteria
$0{,}70 \le N-Gain \le 1{,}00$	High
$0{,}30 \le N-Gain < 0{,}70$	Medium
$0{,}00 < N-Gain < 0{,}30$	Low
$N-Gain = 0{,}00$	No Increase
$-1{,}00 \le N-Gain < 0{,}00$	There is a Decrease

Source: (Sukarelawa et al., 2024a)

The level of effectiveness of implementing interventions is determined by using the $N-Gain$ percentage, as Equation 5.

$$N-Gain\ Percentage=\frac{Posttest\ score-Pretest\ score}{Ideal\ score\ -\ Pretest\ score}\times\ 100\% \tag{5}$$

The criteria of $N-Gain$ percentage result shows the level of effectiveness that is obtained.

Table 1. Criteria of Effectiveness Level

Percentage (%)	Criteria
$N-Gain\ Percentage < 40\%$	Not effective
$41\% \le N-Gain\ Percentage \le 55\%$	Less effective
$56\% \le N-Gain\ Percentage \le 75\%$	Moderately effective
$N-Gain\ Percentage \ge 76\%$	Effective

Source: (Sukarelawa et al., 2024b)

Researchers and observers assessed the test scores obtained to ensure consistency of assessment and to ensure that they were not influenced by subjective factors. Inter-rater reliability testing was conducted using Cohen's kappa coefficient. The formula for determining Cohen's kappa coefficient is as follows (Viera & Garrett, 2005).

$$KK=\frac{p_o-p_e}{1-p_e} \tag{6}$$

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Description:

KK	:	Cohen's Kappa Coefficient
p_o	:	The Observed Agreement Aroportion between Raters
p_e	:	The Expected Agreement Proportion due to Chance

Cohen's kappa coefficient interprets the strength of agreement as shown in Table 6.

Table 6. Interpretation of the Kappa Value

Cohen's Kappa Coefficient	Agreement
$KK < 0$	Less than chance agreement
$0{,}01 \leq KK \leq 0{,}20$	Poor agreement
$0{,}21 \leq KK \leq 0{,}40$	Fair agreement
$0{,}41 \leq KK \leq 0{,}60$	Moderate agreement
$0{,}61 \leq KK \leq 0{,}80$	Substansial agreement
$0{,}81 \leq KK \leq 0{,}99$	Almost perfect agreement

Source: (Viera & Garrett, 2005)

3. Results and Discussion

This section will explain the research results on the development of mathematics E-Modules with a cultural context to support mathematical literacy.

3.1. Analysis

This analysis stage is carried out to obtain the data needed in E-Module planning. At this stage, researchers made initial observations about the situation and conditions in learning at one of the private secondary schools in Banyumas. Mathematics learning is carried out using an the Merdeka curriculum based on the general curriculum used at this time. The use of the Merdeka curriculum has a significant impact on the teaching and learning process. Based on interviews with teachers, he said that one of the positive impacts of using this curriculum is that teachers can choose the material to be taught according to student abilities and school readiness. However, the school is still constrained by the selection of textbooks that are used only as a single learning source and teachers who only present the material as a supplement. This attracts researchers to introduce teaching materials that are easy to use and interactive so that they can increase student

The researchers made observations related to the situation and initial conditions of mathematics learning at school; from this, it was found that schools had difficulty carrying out the learning system using the Merdeka curriculum reference, especially in learning mathematics. This is due to students needing more time to be ready to use the system, and the time allocated to math learning activities tends to decrease with many targets and achievements; this makes teachers required to be creative and innovative in teaching and learning activities. In learning mathematics, teachers use the Merdeka curriculum package textbook as a learning resource and added several 2013 curriculum package books as support. The teacher stated that students are interested in learning geometry, especially curved-sided spaces that are associated with the context of everyday life. One of the contexts that is closely related to everyday life is the

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cultural context.

Based on interviews with several students, it was found that students like mathematics because students are curious about the final answer to the problem they are solving. However, many of them stop solving the problem because they are confused and doubtful about solving the solution. Another thing that students expressed in the interview process was that students like learning that can be related to everyday life. Students are also interested in learning that uses digital or internet-based teaching materials so that students can more easily access materials and practice questions. From several analyses that researchers have carried out, researchers feel the need to overcome this by providing a solution in the form of an E-Module or electronic module by linking culture to learning mathematics on cone material.

3.2. Design

At this stage, the researcher creates an E-Module design that will be developed and starts preparing E-Module content and instruments for valid, practical, and effective E-Module assessment. The following is a description of the design compiled in the study.

3.2.1. Preparation of E-Module Content

The preparation of E-Module content refers to the Merdeka curriculum. The E-Module content contains learning outcomes, keywords, student profiles of Pancasila learning activities, student reflections, and assignments. The E-Module content is organized into storyboards to facilitate the E-Module development process. The prepared E-Module content is associated with the cultural context of the E-Module. The addition of cultural context at the beginning of the E-Module as an example of objects in everyday life that are cone-shaped, such as traffic cones or the traditional house of Wae Rebo village called "Mbaru Niang" then there are also examples and practice questions that use the context of cones so that the E-Module that is compiled is easier for students to understand.

3.2.2. Preparation of E-Module Assesment Instruments

The preparation of E-Module assessment instruments on cone material to support mathematical literacy skills is done by compiling five E-Module validation sheets, student response questionnaire sheets, and evaluation test questions. The E-Module validation sheets prepared are material expert validation sheets, media expert validation sheets, teacher response questionnaire validation sheets, student response questionnaire validation sheets, and evaluation test question validation sheets.

3.3. Development

At this stage, the researcher compiled the E-Module according to the design made at the previous stage. E-Modules are compiled using the *Canva* application. The results of this stage are described in 4 sections as follows:

3.3.1 Development of E-Module Content

The final product is an E-Module used on cone material to support mathematical literacy skills. The E-Module design was developed into an easy-to-use module using the *Canva* application. At this stage, cone material was also added, and

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other media, such as learning videos, interesting animations, and images that are under the material, were selected as support. Sample problems and practice questions that support mathematical literacy skills began to be added at this stage.

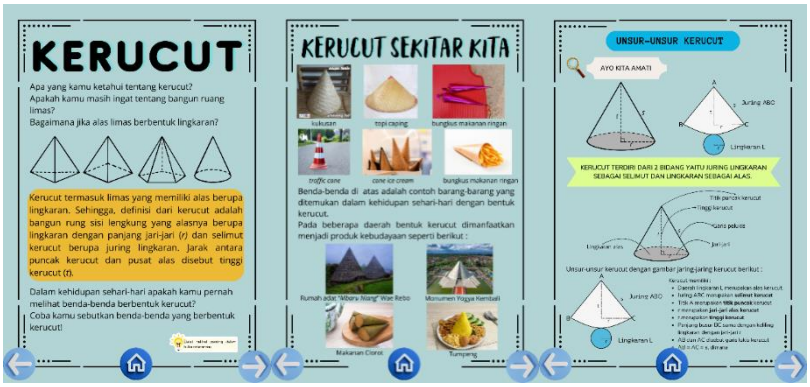

Figure 1. Math E-Modules with Cultural Context that have been Developed

3.3.2 Validity Test

Material experts and media experts conducted the validity test of the E-Module. In the validity test by the material experts, the average score obtained was 80%, so the developed E-Module falls into the good/suitable category according to Table 1 of the validity criteria. Suggestions from the material experts include (1) Adding cone volume proof practices. (2) Adding evaluation components to the module.

In the validity test of the E-Module by the media experts, the average score obtained was 83%, so the developed E-Module falls into the good/suitable category. Suggestions from the media experts include (1) providing clear and detailed instructions for using the E-Module and (2) correcting writing errors in the E-Module. Furthermore, revisions were carried out according to the suggestions that had been received. In addition to the validity test of the E-Module, the researcher also tested the validity of the teacher response questionnaire, student response questionnaire, and test questions that would be used to test students' mathematical literacy skills.

The results of the teacher response questionnaire validity test, the average score obtained was 82%, so the teacher response questionnaire was included in the good/suitable for use category according to Table 1 validity criteria. The validator's suggestion is to add an assessment indicator about "evaluation". The results of the student response questionnaire validity test were 89%, so the student response questionnaire can be used with revisions according to suggestions. The validator's suggestion is to add an assessment indicator about "evaluation".

The results of the test question validity test were 87.5%, so the test questions were included in the good/suitable for use category. The validator's suggestion is (1) Correcting spelling errors in the questions and (2) Rewriting the questions in question number two. The results of the validity test that have been carried out are in accordance with research (Santi et al., 2024), which shows the importance of validating materials and media in developing learning tools to ensure their effectiveness in the classroom. This finding supports the results of (Fahrurrozi & Rahmawati, 2021), which also found that the validity of evaluation instruments,

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such as questionnaires and test questions, had a significant effect on the success of implementing learning tools. This shows the importance of validity in the instruments used to measure learning outcomes.

3.4. Implementation

The results of the implementation stage are described as follows

3.4.1. Preparing Teachers

Mathematics teachers guide learning by applying mathematics E-Modules with cultural contexts to support mathematical literacy. The teacher explains the learning activities in the E-Module.

3.4.2. Preparing Students

The subject of the implementation was the seventh grade at a private junior high school in Banyumas in 2023/2024, totalling 22 students. Learning was carried out using an E-Module on the cone material. The learning process was carried out according to the plan agreed upon with the school for four meetings. Before carrying out the learning process, students were asked to take a pretest on mathematical literacy skills. Students were also guided to learn the stages of cooperative learning in 3 meetings using an E-Module. Learning took place through the stages of learning activities in the E-Module. At the last meeting, a posttest was carried out as a learning achievement.

3.4.3. Practically Test

The practicality assessment of the E-Module was carried out by teachers who teach mathematics in the class using a response questionnaire. The results of the teacher response questionnaire obtained an average result of 93.48%, which means that the E-Module is included in the very practical criteria according to Table 3 of the practicality criteria for the E-Module. The advice given by the teacher on the response questionnaire sheet is that the developed E-Module is in accordance with the indicators and is interesting, the input for the E-Module is given a page so that students/teachers can quickly mention the parts to be delivered or marked.

Practicality is also measured using a student response questionnaire. The response questionnaire was given to students after using the E-Module. The average student response questionnaire of 87.5% is included in the very practical criteria according to Table 3 of the practicality criteria for the E-Module so that the developed E-Module can be used without revision and is easy to use. Other comments given by students regarding the use of the E-Module are as follows.

Table 7. Criticisms and Suggestions from Student Response Questionnaires

No.	Comments
1.	*Asyik, bisa dijadiin pengalaman! Terimakasih ust.*
2.	*Sebaiknya lebih dijelaskan lebih lanjut*
3.	*Pembelajaran kerucut ini sangat baik sehingga saya mengerti tentang kerucut*
4.	*Usahakan menjelaskan lebih lanjut, juga jangan cepat-cepat menjelaskannya*
5.	*E-Modulnya bagus, soalnya jangan susah*
6.	*Terimakasih telah membimbing dan mengajari kami semua*
7.	*Pembelajarannya harus lebih beragam lagi ya. Makasi materinya ust*

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Based on the comments given, there are several constructive inputs and positive sentences after using the E-Module. This supports the results of the average value obtained so that it can strengthen the statement that the developed E-Module is practical to use. This statement is in line with research conducted by (Safitri & Astuti, 2023), which states that E-Modules with a practical and easy-to-use cultural context can be a success factor in learning and supporting students' literacy mathematics skills.

3.4.4. Effectiveness Test

The effectiveness test was carried out by providing test questions consisting of two questions discussing the application of cones that can support mathematical literacy skills. The duration of the questions is 60 minutes. The results of the scores obtained by students after working on the mathematical literacy test questions are then tested with $N - Gain$.

Table 8. The $N - Gain$ Assesment

Average $N - Gain$ Score	Percentage
0,632772	63,166%

Based on the results of the analysis according to the results of the $N - Gain$ test and Table 4 $N - Gain$ criteria and Table 5 $N - Gain$ Percentage, it was identified that all students increased their mathematical literacy skills with two different categories, namely medium and high. 18 students were included in the medium category, 81.81%, and four students were included in the high category, 18.18%. Overall, the average $N - Gain$ score was 0.632273 and was included in the moderate increase category. Determining the effectiveness of developing a mathematics E-Module with a cultural context to support mathematical literacy skills can be seen from the $N - Gain$ percentage. The $N - Gain$ percentage obtained was 63.166% and was included in the moderately effective category.

Most students showed an increase in their' mathematical literacy skills in the moderate category. Some students showed an increase in the high category. Factors that influenced this increase include the E-Module only discussing the cone material, not thoroughly discussing curved side space shapes or other materials, and students need to be used to non-routine questions related to the cultural context to support mathematical literacy. Research conducted by (Rezky et al., 2022) explains the recommendations from their study that teachers need to provide questions that can measure students' numeracy literacy skills and can renew the implementation of the learning process in the classroom to support these competencies.

Based on the analysis results, Cohen's Kappa value obtained was 0.723, which is included in the "substantial agreement" category based on the interpretation in Table 6. This means that there is substantial agreement between observers in assessing the test data. It shows that the researcher are quite consistent in their assessments and are not influenced by subjectivity.

3.5. Evaluation Stage

The evaluation stage is carried out along with the E-Module development process. There were no revisions at the analysis and design stages, so that could be continued at the development stage. At the development stage, based on the

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validity test, the E-Module was evaluated according to the suggestions of expert validators until the E-Module was suitable for use without revision. At the implementation stage, input from teachers was in the form of additional pages to complete the material. At the same time, students suggested a more in-depth explanation that was not too fast, questions that were more appropriate to the difficulty level, and more diverse learning. Students also appreciated the E-Module as a fun learning experience and helped them understand the conic material. In the effectiveness stage, using more data with a quasi-experiment approach is recommended to increase the validity of the results. This improvement aims to make the E-Module more practical, effective, and relevant to the needs of students and teachers.

4. Conclusions

This development produced mathematics E-Modules with cultural context to support mathematical literacy. The developed mathematics E-Modules with cultural context are valid, practical and effective. The validity of the E-Module is based on the results of the validation of material experts and media experts with the average score obtained, which meets the valid criteria. The practicality of the E-Module is based on the results of the response questionnaire filled out by educational practitioners and students with the average score obtained, which meets the practical criteria. The effectiveness of the E-Module is based on the results of the scores of the evaluation questions filled in by students, who had an average percentage of N Gain score to meet the criteria quite effectively. E-Modules are feasible to use in learning activities, easy to use and can support mathematical literacy skills. The developed mathematics E-Module with cultural context is limited to cone material. Therefore, further research can be done to develop mathematics E-Modules with cultural contexts in other cultures and mathematics materials.

Author Contributions

The first author collected, processed, and analyzed the data and drafted the scientific article. The second and third authors provided feedback and suggestions for developing the research, analysis, and manuscripts.

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Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

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