Innovation of E-Module Mathematics Teaching Materials Based On Ethnomathematics For Students' Creative Thinking Abilities

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ABSTRACT

This research aims to develop ethnomathematics-based e-module mathematics teaching materials for students' creative thinking abilities using Research and Development (R&D) research. This research uses the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. Data collection techniques using observation, questionnaires and documentation.The instruments used in this research were test and non-test instruments. The test instrument for students' creative thinking abilities is in the form of essay questions and the non-test instrument is a questionnaire for student learning independence. The data used is quantitative data and qualitative data. Measuring product suitability with validation tests. The results obtained in this research are classically the average value of student response results is included in the very good category. This is obtained from increased student enthusiasm or motivation to learn, which can be seen during the learning process and the final results (posttest) obtained. ethnomathematics-based e-module mathematics teaching materials for students' creative thinking abilities are suitable for use at every level of education.

Keywords: E-Modul Mathematics; Etnomathematics; Creative Thinking

1. INTRODUCTION

The impact of the Covid-19 pandemic is very large, especially in the world of education. Many students complain about changes to the learning system that is usually carried out so that various kinds of digital learning media are currently needed in the learning process both offline and online (Novianti et al., 2020) (Cronje, 2020). Based on the results of field observations and surveys, it was found that almost 87% of elementary, middle, high school and tertiary students complained about online learning during the Covid-19 pandemic which resulted in low student learning outcomes. The decline in learning outcomes was caused by students' lack of understanding in mastering the material because the learning methods and media used were still limited. Limited direct guidance by teaching staff, students prefer self-taught learning and assistance from their parents at home. The problem in this research is the lack of teacher innovation in designing learning media which can result in less interesting, boring learning and low learning outcomes. The learning media designed is a teaching material/interactive media product, where the interactive media has been integrated with Higher Order Thinking Skills (HOTS) materials and questions (Riski et al., 2023)(Ichsan et al., 2019) where there are HOTS questions that have been integrated with Acehnese ethnomathematics so that students can think creatively mathematically. The aim of this research design is to ensure that teachers at SD Negeri 4 Bireuen are able to develop ethnomathematics-based E-module media so that the media that has been produced can be implemented directly with students during the learning process and can improve students' creative thinking abilities.

Students are also expected to be able to improve students' critical thinking skills after understanding the material and following the learning process.(Dwi Ravilla et al., 2023) learning is carried out by utilizing learning videos based on Problem Based Learning using the Renderforest application (Idris & Khaulah, 2020). The ability to think critically is one of the abilities that can be improved in line with innovative learning models.

However, after the pandemic ended, as time went by, many alternative learning media that were used during the pandemic are still used today with the latest innovations. Smartphones are an example of a device that is currently frequently used by all educational groups. With the help of a smartphone, it makes it easier for learning to browse the internet, download e-books, e-modules and e-LKPDs in applications that are already installed on the smartphone.

2. LITERARTURE REVIEW

According to (Khaulah & Novianti, 2019) Learning tools or teaching materials are tools that have been used so far and must be studied according to basic competencies so that they can achieve learning objectives. One learning tool that can improve students' creative thinking abilities is by using mathematics e-module media (Aghaei et al., 2022)(Setiyani et al., 2020). Learning tools or teaching materials are tools that have been used so far and must be studied according to basic competencies so that they can achieve learning objectives. One learning tool that can improve students' creative thinking abilities is by using mathematics e-module media (Kartiko & Mampouw, 2021). E-module learning media is an electronic-based learning resource so it can be used in education that utilizes digital technology (Novianti, Zaiyar, et al., 2023).

Dari & Sudatha, (2022) Says that the format used in e-module media is in the form of digital devices presented in electronic format which can be accessed via digital devices such as computers, tablets or smartphones containing text, images related to the material so that it can be accessed anytime and anywhere. just. Based on research results (Sunita, 2020) E-module media is often used in Distance Learning (PJJ) so that it gives students a great opportunity to learn independently with the help of material presented in digital format. The E-module media that has been designed in this research is the Mathematics E-module media. E-Mathematics Module is an electronic-based learning module used in teaching and learning mathematics (Puspitasari et al., 2021) (Novianti, Zaiyar, et al., 2023).

Mathematics e-module media can also be developed through a contextual or problem solving approach, which relates to situations in everyday life in teaching mathematical concepts (Sari, 2022). By connecting contextual issues with the mathematics material being taught, you can develop a deeper understanding of the mathematical context. Mathematics E-module media based on local wisdom is learning material in PDF format or an interactive application that is prepared based on traditional values or customs or local knowledge of a community group area(Lubis et al., 2022)(Wati et al., 2021). The process in developing e-module media involves the involvement of local cultural figures who are delivered in accordance with the cultural values of the Aceh region so that it is formed in an electronic learning media that has been designed so that students can understand the characteristics and appreciate local values and traditions.

The research method used is the Research and development (R&D) method as a development method. The R&D method used is ADDIE development which is often used as a systematic approach to product development such as models, methods, media or teaching materials (Wijayanto et al., 2022). The ADDIE model is also an approach that is used to design, develop and evaluate learning programs (Utami et al., 2023)(Novianti, Khaulah, et al., 2023). There are consists of 5 stages, namely: (1) Analysis, the stage where there is identification of learning needs, students, lesson materials, learning objectives, so that they can help understand the aims and objectives to be achieved; (2) Design, the stage carried out involves the flow of preparing learning plans, learning methods and developing selected content in a systematic and detailed manner related to learning programs and materials; (3) Development, a stage consisting of preparing materials, developing media and other learning tools in accordance with the plans that have been prepared; (4) Implementation, the involvement of educators in delivering material to students which is carried out after the learning material has been developed; (5) Evaluation, the stages carried out at the evaluation stage of the results of the learning process which have been carried out using several

instruments related to the evaluation plan in the form of feedback from students, measuring student effectiveness.

According to Novianti, Salpina, et al., (2023), the data collection techniques used were (1) The results of independent evaluation tests carried out to determine the abilities of individual students after using mathematics e-module media in understanding learning objectives; (2) Questionnaire results, which are given to each student to obtain the results of several assessments from various aspects or indicators that have been created; (3) Documentation, a form of document containing written or graphic data that supports the research plan that has been carried out.

3. RESULT AND DISCUSSION

The results of research conducted at the Bireuen 4 Public Elementary School on the mathematics subject of addition and subtraction were by using the E-Mathematics Module learning media to improve students' creative thinking abilities. At the Analysis stage, the research team carried out an initial analysis before conducting learning using mathematics e-module learning media. This initial analysis is carried out by carrying out pretest questions at the beginning with the aim of finding out the extent of students' understanding regarding the material to be studied, so that the results of the pretest will then take action so that a solution can be taken that suits the students' needs by carrying out a updates related to mathematics e-module teaching media so that students can improve their creative thinking skills in solving everyday or contextual problems related to ethnomathematics(Novianti, Salpina, et al., 2023).

At the Design stage, the research team's priority product is the digital learning media e-mathematics module which will be designed with several paths. Before arriving at the stage of designing the e-module, what must be designed first is the content of the mathematics module which consists of the material title, foreword, concept map, material, example questions, exercises, and bibliography (An, 2020). Then, after the content, material, exercises and example questions have been completed, the completed media module will be applied using the Heyzine application so that it can be used and can be shared in the form of a website link and can be shared with students and can be utilized by the general public through media platforms. social (Anggreni & Sari, 2022).

At the Development stage, the activities carried out are related to the media design which has been designed to be as attractive as possible with all the items in the module being complete, then the e-module media will be assessed first in relation to the assessment rubric which will be assessed by the validator team. The following are the results of developing mathematics e-module media.

Tabel 1. Example of Mathematics E-Module Media

No	Picture	Information	No	Picture	Information
1		Cover page	5		Introduction
2		Foreword	6		Learning material related to Acehnese ethnomathematics
3		List of Contents	7		Learning materials related to Acehnese ethnomathematics and exercises
4		Concepts Map	8		Bibliography

4. DISCUSSION

After the media module is designed, validation is carried out by two validators, namely the material expert validator and the media expert validator, by assessing the suitability of the media that has been designed by following the assessment rubric that has been prepared. The following are the results of material validation carried out by two material validators.

Table 2. Material Expert Validation

Aspects and criteria	Precentage	Categori
Content	89,6 %	VeryValid
Presentation	65,4 %	Valid
Language	87.5 %	Very Valid

Based on table 2, the content criteria aspect obtained a percentage value of 89.6% related to the clarity of material, concepts and accuracy of examples related to Acehnese ethnomathematics. In the presentation criteria, the percentage of the validator team's results was

obtained at 65.4%, where the indicators were examples of questions, exercises, concept continuity. Meanwhile, for the

linguistic assessment, the percentage value obtained was 87.5%, which includes the appropriateness of sentence structure, ability to motivate and accuracy in language suitability.
Meanwhile, for media validators, the activities carried out by two media validators are:

Table 3. Media Expert Validator

Aspek dan Kriteria	Presentase	Kategori
Presentasi Media E-Modul	89,5 %	Sangat Valid
Kelayakan Grafis (Cover and Content)	65,5 %	Valid
Gambar	86,7 %	Sangat Valid
Kualitas Tampilan	96 %	Sangat Valid
Penggunaan dan Implementasi E-Modul	78 %	Valid

Based on table 3, the percentage for e-module media presentation is 89.5 with a very valid category, image criteria with a presentation of 86.7% with a very valid category, graphic feasibility criteria (cover and content) with a percentage of 65.5% with the category valid, display quality criteria with a percentage of 96% in the very valid category and criteria for the use and operation of e-modules, a percentage of 78% in the Valid category. The results of criticism and suggestions from the validator team can be seen in the table below:

Tabel 4. Result Critics

No	Critics	Revision
1	Lack of more detailed explanations regarding ethnomathematics-based material	Clarifying the study of material based on Acehnese ethnomathematics
2	In the example questions, a complete explanation is not provided	After the example questions, clear explanations have been added, so they are easy to understand
3	Color resolution/color combination is not in harmony so that the module appearance is less attractive	Improved color display
4	The questions displayed do not focus on Hots Questions so they are less able to motivate students to think critically	Example questions and exercises have been improved with Hots questions

At the Implementation stage, direct learning is carried out in class IV at SD Negeri 4 Bireuen regarding addition and subtraction material using mathematics e-module media, so that the results of the student learning tests in the initial and final tests can be seen as follows:

Table 5. Student pretest and postest score results

No	Pre-test	Post-test
1	55	96
2	45	80
3	55	90
4	54	87
5	67	89
6	45	78
7	45	90
8	60	76
9	65	78
10	60	100
11	45	89
12	56	99
13	63	88
14	56	88
15	48	65
Average	54,6	86,2

Based on table 5, the students' score during the pretest was an average score of 54.6. From these results it can be concluded that all students do not understand addition and subtraction material well. Therefore, a final test was carried out after learning by using e-module learning media so that the average score was 86.2, where the average score was above the KKM and was classified as complete. In the Evaluation Stage, researchers and students together evaluate the learning that has been carried out using ethnomathematics-based mathematics e-module learning media.

Student Learning Response Results

Learning using e-module learning media for participants, questionnaires were distributed to students to find out the extent of students' responses to learning. The summary results of the percentage analysis of students' abilities can be seen in the table below:

Table 6. Results of student responses

Assessment Aspects	Presentase	Kategori
Presentation of Content	89,72 %	Very Good
Benefit	87,56%	Very Good
Students' creative thinking abilities	92,64%	Very Good
media	82,32%	Very Good

Based on table 6, classically the average value of student response results is included in the very good category. This is obtained from increased student enthusiasm or motivation to learn, which can be seen during the learning process and the final results (posttest) obtained. This is due to new innovations in learning using e-module mathematics media, which also affects students' critical thinking abilities in solving questions in the module and final test questions.

Several previous research results related to the use of e-modules are also relevant to the research results (Dari & Sudatha, 2022). There is an increase in students' enthusiasm for learning, due to teachers facilitating e-module media as teaching materials used in learning that is oriented towards the discovery learning learning model. Likewise with (Wulandari et al., 2020) The application of interactive e-module media implemented in the learning process can improve student learning outcomes. The use of e-modules based on the Problem Based Learning (PBL) learning model can improve students' critical thinking abilities (Novianti, Zaiyar, et al., 2023).

5. CONCLUSION

Based on the results of data analysis and observations, conclusions can be drawn:
a. The feasibility of ethnomathematics-based e-module learning media, seen from the media and material aspects, received assessment results in the "Very Good" and "Decent" categories from media experts and material experts.
b. Classically the average value of student response results is included in the very good category. This is obtained from increased student enthusiasm or motivation to learn, which can be seen during the learning process and the final results (posttest) obtained.

6. ACKNOWLEDGEMENT

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