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Etnomathematics In E-Modules Using A Scientific Learning Approach For JHS Students

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ABSTRACT

This study has the aim of obtaining a suitable e-mathematical module, valid and interesting, and effective for use in learning. The research method used is development research or R&D (Research and Development) through the ADDIE approach (Analysis, Design, Development, Implementation, and Evaluation) with the subject of State Junior High School (Junior High School) students in Bandar Lampung City. The instruments used are interviews, questionnaires (questionnaires) in the form of expert validation questionnaires, needs analysis, and product trials to students, as well as documentation. The results of the study based on the validation of material and media experts obtained scores of 3.55 and 3.43 with the criteria "fit for use". The results of the product attractiveness trial to students for large groups and small groups obtained scores of 3.71 and 3.73 on the "very interesting" criteria. The effectiveness test of the N-gain score obtained a result of 0.71 which was classified in the "high" category.
Keywords : E-Module Mathematics, Ethnomathematics, Scientific Learning Approach.

ABSTRAK

Penelitian ini memiliki tujuan untuk memperoleh modul e-matematika yang sesuai, valid dan menarik, serta efektif untuk digunakan dalam pembelajaran. Metode penelitian yang digunakan adalah penelitian pengembangan atau R&D (Research and Development) melalui pendekatan ADDIE (Analysis, Design, Development, Implementation, and Evaluation) dengan subjek siswa SMP Negeri (SMP) di Kota Bandar Lampung. Instrumen yang digunakan adalah wawancara, angket (angket) berupa angket validasi ahli, analisis kebutuhan, dan uji coba produk kepada mahasiswa, serta dokumentasi. Hasil penelitian berdasarkan validasi ahli materi dan media memperoleh skor 3,55 dan 3,43 dengan kriteria "layak pakai". Hasil uji daya tarik produk kepada siswa untuk kelompok besar dan kelompok kecil memperoleh skor 3,71 dan 3,73 pada kriteria "sangat menarik". Uji efektivitas skor N-gain diperoleh hasil sebesar 0,71 yang diklasifikasikan dalam kategori "tinggi".
Kata kunci : E-Modul Matematika, Etnomatematika, Pendekatan Pembelajaran Ilmiah

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PRELIMINARY

Education is the most important part of human life and is the main aspect of the formation of qualified Human Resources (HR). As stated in the preamble of the 1945 Constitution which states that the purpose of the education sector in Indonesia is to educate the life of the state (Istikomah et al., 2020).

Over time, science and technology are like two inseparable components (Septiyani & Apriyanto, 2019). So that humans continue to develop advanced technologies on the basis of their knowledge and allow learning developers to change the appearance of printed teaching materials. One form of the implementation of technology development coupled with the development of science is the emergence of digitally accessible modules, which are commonly called e-modules. In this rapidly developing era, E-mathematics modules have become independent learning media with a digital mathematical system structure (Dimhad, 2013). Mathematics has also made a major contribution to the development and progress of science and technology (Mutaqin, 2016). Basically, in this field, it has a characteristic that the appearance of the module is more attractive and valid, and in it is effective to be suitable for use, therefore it is the goal of research using this electronically accessed module.

The electronic module is functionally a teaching material with an appropriate design according to the student learning curriculum system and is made using technology. The current curriculum uses the 2013 curriculum (Kemendikbud, 2013). The goals of national education include cognitive and psychomotor aspects as well as emotional aspects. Likewise, the objectives of the 2013 curriculum are to realize good social and spiritual attitudes, creativity and curiosity, and cooperation through the development of psychomotor abilities and intelligence in equal portions (Musfiqi, 2014). This is evidenced by the results of pre-research by interviewing teachers and assessing the information provided by students using questionnaires at SMP Negeri 23 Bandar Lampung and SMP Negeri 24 Bandar Lampung that about 72% of students have never used modules presented in electronic form.

In addition, researchers interviewed teachers that students still have difficulty understanding the material that has been delivered at school and teachers only use material with teaching materials that have been provided by the school. And with the results from students, there are about 88% of students like modules that are easy to use and interesting. Based on this statement, research that uses the development of electronic modules is interesting on the basis of ethnomathematical methods. Ethnomathematics is a type of

mathematical science that develops in a particular cultural focus, such as a set of norms and rules that apply in society, beliefs, and values. These norms or rules are recognized by people from a group of a culture or the same cultural group (Suherman, 2018). Culture-based mathematics, commonly referred to as ethnomathematics, is an approach method in a multicultural society whose role is to explain the function of mathematics itself (Safitri et al., 2021). Ethnomathematics was chosen because it is closely related to everyday life, such as the results of pre-research statements by students, which is about 85% of students worry if one day local culture is forgotten. In addition, ethnomathematics has never been applied in learning at school.

Based on the problems thatAs described in the previous presentation, it can be concluded that there is a need for teaching materials that follow developments in the field of science and technology that are easy to apply and easy to use, so researchers are interested in developing an ethnomathematics-based electronic module of mathematics through various focuses of scientific learning approaches to support student learning processes and be integrated by the teacher in his teaching.

Researches on teaching materials have been carried out by previous researchers, including the design of ethnomathematical-oriented learning tools for congruence and congruence materials (Grace, 2018), Development of Interactive Mathematics E-Module Using Visual Studio (Sutrisno, 2019), Development of Exe-Learning-Based E-Module Characterized by Ethnomathematics in Class VIII Class VIII Students' Room Building Materials (Kurniasari et al., 2018), Project Based Learning Contains Ethnomathematics in Mathematics Learners (Mahendra, 2017), Development of Chemical Balance E-Module Based on Scientific Approach for Class XI SMA/MA (Asmiyunda et al., 2018), as well as E-Module Development Based on Ethnomathematics to Improve Problem Solving Ability (Utami et al., 2018).

METHODS

The research method used in this research is research and development or what is termed R&D. Aims to develop, the effectiveness and usefulness of the product to be developed to be tested, in the form of material products, methods, strategies, technology, and so on. In this case, the researcher uses the ADDIE learning design model or Analysis, Design, Development, Implementation, and Evaluation (Destiana & Adistuti, 2020). The ADDIE model is a model in which it describes the stages in a systematic and systematic way in use

so that the desired results can be achieved. This model also aims to design and develop an efficient and effective product.

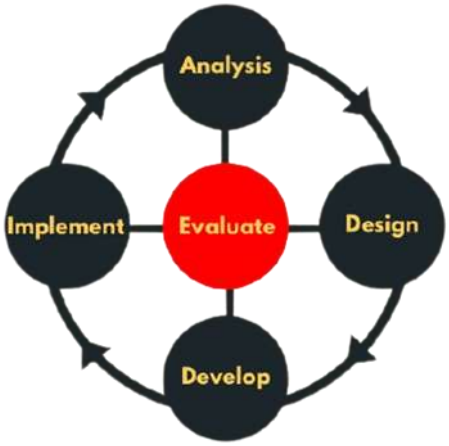

Figure 1. Stages of the ADDIE Model.

1. ***Analysis*** **(Analysis Stage)**

   This stage is an activity of analyzing the needs of the teaching materials to be developed, in order to adjust and meet the needs of the product targets.

   At this stage, there are three classifications of types of activities that can be carried out to carry out the analysis process, including:

   a. Needs analysis is used with the aim of identifying problems in the field so as to produce teaching materials for the development of ethnomatics modules that are useful for teaching and learning activities.
   b. Analysis of student characteristics aims to determine the condition of students in terms of ability to learn motivation, economic and social background, individual academic, interest in learning, and the physical condition of students.
   c. Curriculum analysis aims to examine and analyze basic competencies and competency standards that will be used as a basis for developing modules (Sari, 2017).

2. ***Design*** **(Design Stage)**

   The activity at this stage is to make a design with several steps before producing a learning device product in the form of an ethnomathematical-based electronic module.

3. ***Development*** **(Development Stage)**

   This stage is carried out by concretizing the results of the planning at the design stage (Anita Trisiana, 2016).

As for Several steps in developing a conceptualized e-module product design are as follows.

a. Draft writing needs to be adapted to the needs of researchers based on the e-mathematical module framework
b. Validating math e-modules to material experts, and media. Mathematics e-modules must be declared valid and feasible by these experts before being implemented in learning. This validation stage until it is declared valid is carried out more than one revision.
c. The editing of the math e-module draft includes the editing and assessment process by a team of experts
d. Revise for errors or deficiencies in the math e-modules that have been made. When the e-module is said to be feasible, then the script processing or production will be carried out.

4. *Implementation* (Implementation Stage)

Teaching materials with proper and valid classifications are then applied in schools during the learning activities. Product testing through the application of mathematics e-modules on students. This implementation stage is carried out in class VIII, one of the state junior high schools in Bandar Lampung City

5. *Evaluation* (Evaluation Stage)

The activity at this stage is the final stage of the previous activities because it is an evaluation of the whole after being feasible and tested. This stage is also obtained from the results of teacher and student questionnaires, teacher interviews, and observations in schools.

The research was conducted at SMPN Bandar Lampung with the focus on the subject of class VIII students.The technique used in data collection by researchers in research and development of electronic mathematics modules on an ethnomathematical basis uses several types, namely interviews by analyzing the needs and characteristics of students, as well as analyzing the curriculum of the teaching materials to be developed, in order to adjust and meet the needs of the product targets, questionnaire (questionnaire), and documentation.

The learning product in the validation test consists of a media expert test and a material expert test. Assessment of the media test and material test is carried out in the form of a questionnaire. The following is the formula used in calculating the results of the questionnaire, namely(Syafnuri et al., 2019):

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

With,

$$x_i = \frac{Total\ Score}{Maximum\ Total\ Score} \times 4$$

Information: $\bar{x}$ = Final average

x_i = total score of assessment answers

n = number of validator

Expert Validation Data Analysis

Expert validation data analysis consists of four answer options and each produces a different score. The answer has a graded value of 1 to 4 with the eligibility criteria as shown in table 1 below:

Table 1. Validation Criteria Score

Quality Score	Eligibility Criteria	Information
$3{,}26 < \bar{x} \leq 4{,}00$	Valid	No Revision
$2{,}51 < \bar{x} \leq 3{,}26$	Quite Valid	Partial Revision
$1{,}76 < \bar{x} \leq 2{,}51$	Less Valid	Partial Revision and/or review of material
$1{,}00 < \bar{x} < 1{,}76$	Invalid	Total Revision

Product Trial Data Analysis

The student response questionnaire in this sub-chapter has four answers with different scores for each. The answers have a gradation of values from 1 to 4 with attractiveness criteria as shown in table 2 below:

Table 2. Attractiveness Trial Criteria

Quality Score	Attractiveness Criteria
$3{,}26 < \bar{x} \leq 4{,}00$	Very interesting
$2{,}51 < \bar{x} \leq 3{,}26$	Interesting
$1{,}76 < \bar{x} \leq 2{,}51$	Less attractive
$1{,}00 < \bar{x} \leq 1{,}76$	Very Unattractive

Effectiveness Test Data Analysis

Product effectiveness analysis can be seen from the difference between the results of the pretest and posttest conducted by students. Furthermore, the calculation is carried out using the gain normality formula (N-gain) (Hake, 1998).

$$(g) = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

The criteria for determining the high and low value of N-gain can be determined based on table 3 below:

Table 3. Criteria for Gain Value

Value Achievement Criteria	Effectiveness Level
$(g) \geq 0{,}7$	High Effectiveness
$0{,}3 \leq (g) < 0{,}7$	Moderate Effectiveness
$(g) < 0{,}3$	Low Effectiveness

RESULTS AND DISCUSSION

Based on the results of the processed data, the development carried out by this researcher resulted in an ethnomathematics-based e-mathematics module with a scientific learning approach for junior high school students. This research and development is carried out using the ADDIE model, namely Analysis, Design, Development, Implementation, and Evaluation.

1. ***Analysis*** **(Analysis Stage)**

   At the analysis stage, it is done by analyzing in the field with data collection techniques, namely interviews and questionnaires so that some of the problems have been identified, namely teachers still use teaching materials that have been prepared or available from the government, have never practiced in the field with culture in the surrounding environment and are associated with mathematics, and have never used a module with electronic media. So that researchers have the idea to develop teaching materials in the form of ethnomathematical-based electronic modules and adapted to the curriculum of learning activities in the current version through a scientific approach.

2. ***Design*** **(Design Stage)**

   Module Design Preparation

   Covers and e-module icons are designed using the Canva online application. Preparation for the design of the electronic module begins with the creation of a

framework that includes the title page (cover), introduction, core competencies and basic competencies, concept maps, learning activity materials with scientific learning approaches, summaries and final evaluation tests, as well as a bibliography or closing.The learning process uses a scientific approach consisting of 5M such as Observing, Questioning, Gathering Information, Associating, and Communicating and reinforced with ethnic elements, namely using traditional games and there are videos and pictures in this electronic module.

a. Instrument Design

The instrument used is a questionnaire to evaluate the media created. The design of the evaluation instrument begins with the preparation of a questionnaire grid, then composes an evaluation questionnaire, which will be given to experts to determine product quality. As well as a questionnaire for students to understand their reactions to the developed media. Furthermore, the product quality instrument developed was given to material experts and media experts in the form of a questionnaire, and for students it was done in the form of a google form.

3. *Development* (Development Stage)

a. Results of Making Electronic Modules

At the stage of compiling this module, in general, there is the preparation of the content of the module which is developed into a learning media in the form of a module with a scientific basis. The developed module has components that are designed to assist and facilitate students' mathematical processes in studying number pattern material. The display of several sections of the revised ethnomathematical-based e-module can be seen in the following display.

Figure 2. Front Cover and Foreword

Figure 3. Concept Map

Figure 4. Introduction

Figure 5. Basic Competencies

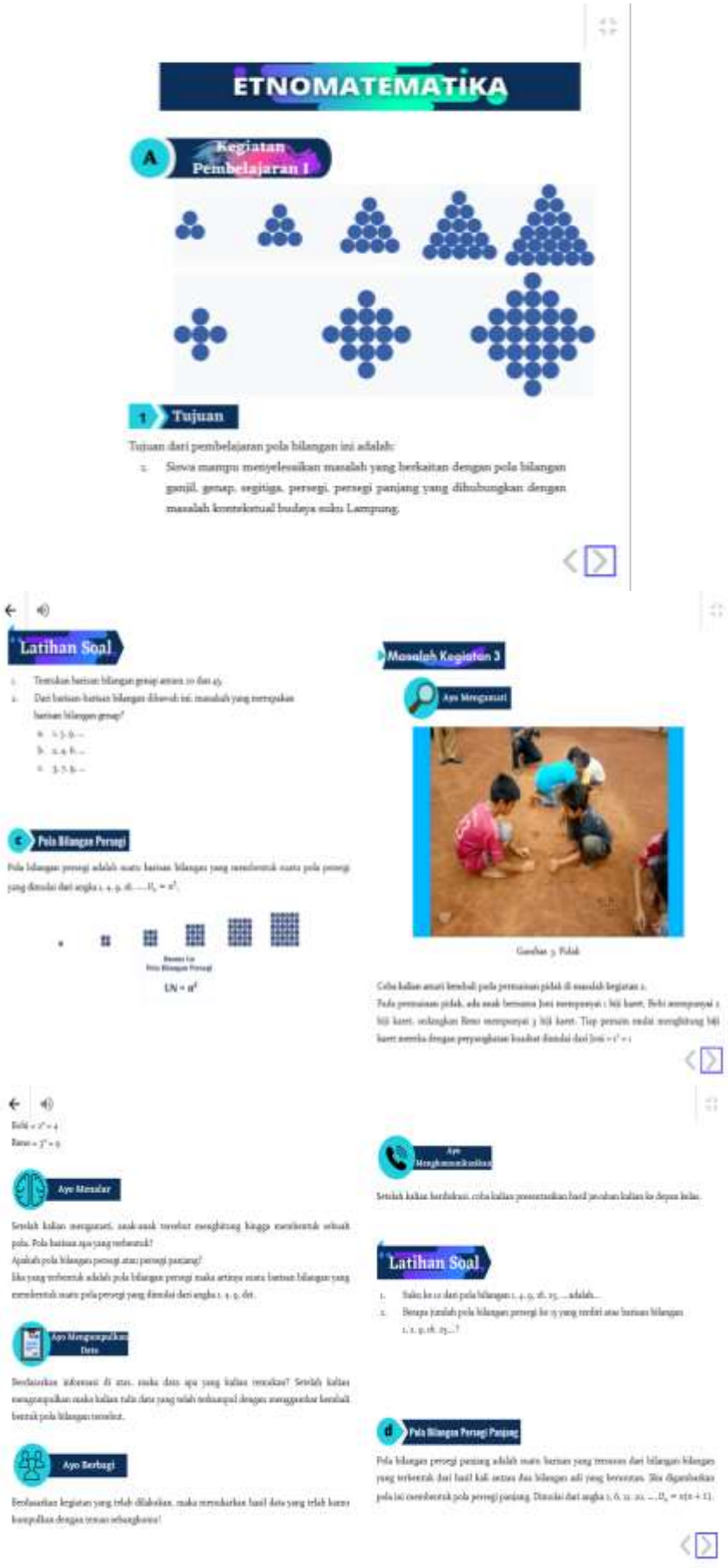

Figure 6. Learning Materials

b. E-Module Validator Results

Before distributing the product, validation is carried out to the validator in order to find out the shortcomings that exist to be considered in the product that has been made in material aspects, as well as media with an attractive appearance so that it is suitable for use in the learning process.

1) Material Expert

The validation was carried out by a material expert, namely Mr. Abi Fadila, M.Pd. and Mr. Dr. Achi Rinaldi, M.Si as one of the lecturers in the Department of Mathematics Education at Raden Intan State Islamic University Lampung. And the mathematics teacher at SMP Negeri 24 Bandar Lampung, namely Mrs. Suhita, S.Pd.

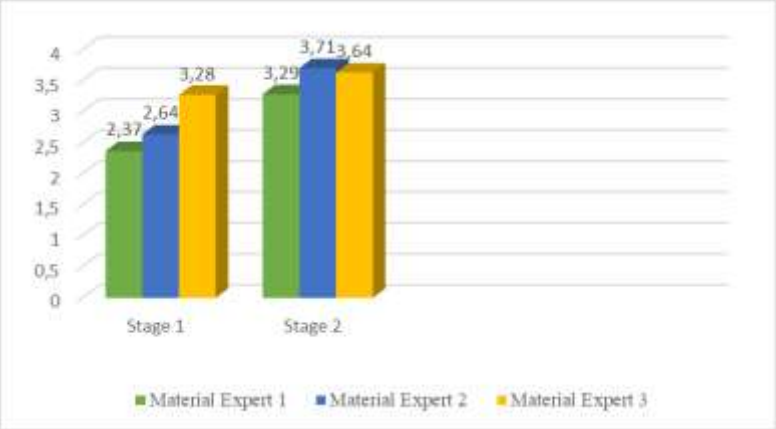

Figure 7. Material Expert Test Results Stage 1 and 2

2) Media Expert

The validation was carried out by media experts, namely Mr. Iip Sugiharta, M.Sc. and Mrs. Fraulein Intan Suri, M.Si as a lecturer in the Department of Mathematics Education at Raden Intan State Islamic University Lampung.

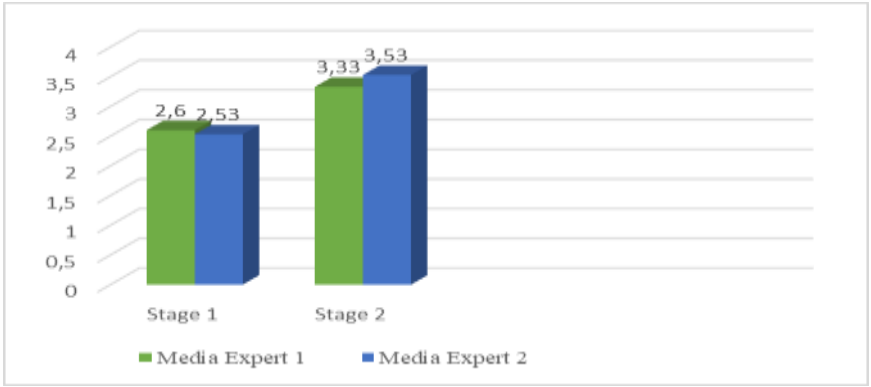

Figure 8. Media Expert Test Results Stages 1 and 2

c. Attractiveness Test

The attractiveness response test aims to test the level of attractiveness of the developed product. After the material experts and media experts confirm the results and announce the product is suitable for use, an interesting response test is carried out. Product trials of large groups and small groups were carried out at SMPN Bandar Lampung. Large and small group respondent tests were conducted with 10 and 20 students, respectively, and these students were selected heterogeneously. The results of product trials can be seen through the following diagram.

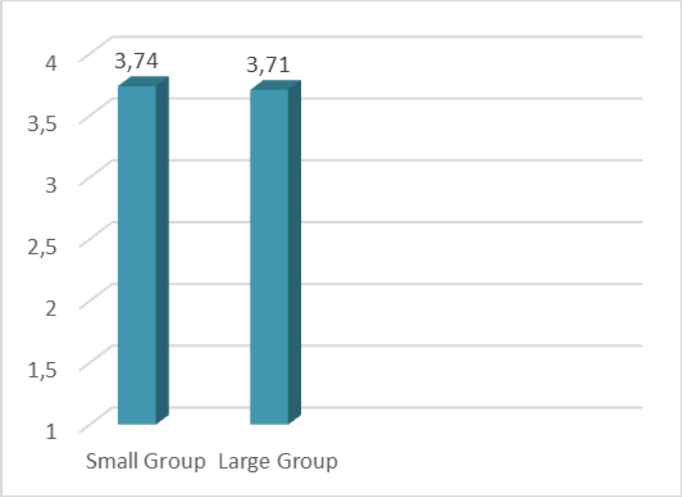

Figure 9. Small and Large Group Test Results

4. *Implementation* (Implementation Stage)

At the implementation stage, the researchers used an e-mathematical module with an ethnomathematical basis on a validated scientific learning approach. This implementation stage is carried out in class VIII of SMPN in Bandar Lampung City. At this stage, the research actors gave a pretest and posttest to the respondents, namely students, after which the effectiveness level was calculated. The following table shows the results of the product effectiveness test that was developed:

Table 4. Effectiveness Test Results

Pretest	***posttest***	**Ideal Maximum Score**	***G***	**Category**
48	85	100	0.71	High Effectiveness

Based on the results of the effectiveness test from the table above, the scores for the pretest and posttest are 48 and 85, with the ideal maximum score of 100. After

calculating the N-gain formula, the result of g is 0.71 with the category going into the "high effectiveness" category.

5. ***Evaluation*** **(Evaluation Stage)**

The researcher evaluates the analysis of the data that has been obtained, namely the validation results from material experts and media experts, which then obtained a score of 3.55 and 3.43 with categories suitable for use. The results of the attractiveness respondent test in the large and small groups entered the very attractive category with the results of 3.74 and 3.71. Then, by testing the effectiveness of obtaining the results of g with an index of 0.71 and qualification in the high category.

DISCUSSION

Based on the research and development process that has been carried out, that several tests have been carried out on development such as validation, revision, product testing, and product effectiveness testing, it can be said that this e-mathematical module is effective and can be used. Some studies state that the e-module is declared feasible and valid based on the results of expert validation (Yanindah & Ratu, 2021) and test attractiveness (Mardiah et al., 2018), others added the effectiveness test was declared effective (Fausih & Danang, 2015). The electronic module that the researcher developed went through a process of validation, revision, testing, to testing the effectiveness as a valid and feasible condition, as well as being interesting and effective as a learning teaching material. Products that have finished designing are then validated by material experts and media experts. This validation was carried out by validators and educational practitioners in their respective fields, the results by material experts and validation opinions from media experts obtained a score of 3.55 and 3.43 with the grouping of the criteria "Appropriate to use". After the product validation process, a small group and large group trial process was carried out by the respondents and obtained a score of 3.73 and 3.71 with a group classification of "Very Interesting" criteria.

Ethnomathematics which is one of the elements of this module is to link some traditional games characteristic of the Lampung ethnicity, so that it can be observed by students, and students become curious from what they have seen through observation, then collect data/information, then associate from The information obtained can then be communicated directly by students.

E-module developed by researchers is not only characterized by ethnomathematics, but is also equipped with KI/KD, concept maps, learning objectives, sample questions, learning material videos, and audio in order to produce students who are enthusiastic in carrying out the learning process and practice questions. However, this electronic module has drawbacks, namely the material is limited to class VIII number pattern material, and the ethnomathematics used is limited to Lampung culture.

CONCLUSION

Based on the acquisition of the value index through the research and development process, it is concluded that this study succeeded in obtaining teaching materials in the form of electronic modules in mathematics with an ethnomathematical basis through a scientific learning approach that is feasible to use. The attractiveness test of the respondents of SMP class VIII students who were produced in both categories in the small and large group test was in the very attractive criteria, and could effectively be used for classroom learning.

The suggestions from the researchers are:Further researchers can formulate e-module teaching materials that need to be developed and refined with other materials in a wider scope.

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