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RESEARCH ARTICLE

Development of ethnomathematics-based educational modules for elementary geometry

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Abstract: The ethnomathematics module aims to help students better understand and appreciate mathematics daily by combining mathematical concepts with regional cultural backgrounds. This research aims to develop a valid and effective ethnomathematics-based module on flat building materials for class II SD N Depok 2 Sleman Regency. This research is development research (R&D) using the ADDIE development model. The object of this research is an ethnomathematics-based module on plane material. Indonesia is a country that is rich in culture and has excellent potential in the application of ethnomathematics. Various ethnic groups in Indonesia have developed unique mathematical practices in their cultural activities, such as traditional buildings and food. Ethnomathematics can be essential in strengthening local culture through an independent learning curriculum. This learning combines mathematical concepts with regional culture. Based on the results of observations made, it was concluded that the learning process at SD N Depok 2 Sleman Regency was still not optimal because, in the learning process, they only used textbooks from the government, which were the only source of learning during learning. The subjects of this research were class II students at SD Negeri Depok 2 Sleman Regency, totalling 28 students, one lecturer, and one teacher, who were the validators. The data analysis techniques used are qualitative and quantitative data analysis. The results show that this research produced an Ethnomathematics-Based Module on Flat Building Material for Class II, which is feasible based on expert validation results with a score of 91%, and student response results are very effective with an average field trial score of 92%. Based on these results, developing an ethnomathematics-based module on flat building materials is feasible and effective for the phase I independent curriculum mathematics learning process.

Keywords: ethnomathematics, mathematics module, research and development, quadrilaterals and triangles

1 Introduction

Education is the most critical and fundamental aspect of human life to create quality individuals. Mathematics education contributes to other areas of education (Bohara, 2024; Brandhofer & Tengler, 2024). Thus, learning mathematics in schools plays a vital role in the education system because learning mathematics is one of the formal ways to improve mathematical abilities in people's lives, especially school-age people (Trisniawati, 2018). Mathematics learning is about understanding definitions, finding formulas, and mastering certain problem-solving and proof methods, but it also relates to developing mathematical thinking patterns (Triwahyuningtyas et al., 2020).

The Minister of Education and Culture issued the Merdeka Belajar program policy to support good education. Merdeka Belajar Curriculum is one form of evaluation of the 2013 Curriculum. Daimah and Suparni (2023) assume that the concept of the Merdeka Belajar Curriculum leads to project-based learning, which aims to develop soft skills such as leadership, integrity, communication skills, and good teamwork, as well as forming characters that match the student profile of Pancasila. Another opinion from Fianingrum et al. (Daimah & Suparni, 2023) is that The Merdeka Learning Curriculum gives freedom to schools that align with the needs of students and the surrounding community. The Merdeka Curriculum can help students understand mathematical concepts through the context of local culture.

Based on observations made by researchers in September 2020, it can be concluded that the learning process at SD N Depok 2 Sleman Regency is still not optimal because it only uses

textbooks from the government, which are the only source of learning during learning. The shape material in the textbook is still general. The LKS (Learner Worksheet) book's contents have yet to provide real examples of flat shapes in everyday life, and the pictures on the LKS are not colourful, so they do not attract students' attention. So far, mathematics teaching materials, especially in elementary schools, rarely contain elements of local culture, so not a few students know their cultural customs, in line with the opinion expressed by (Yusriya, 2020) that in the current era, many young people do not know the local culture of their region and the many social changes that occur, especially in the behaviour of today's youth who prefer western culture. There is also a need to be enhanced with gamification elements (Ranuharja et al., 2024; Vidakis et al., 2019).

Not a few students consider math to be challenging to learn because it involves complex and complicated concepts. In line with research conducted by Putri (2023), students need help understanding math learning and the basic concepts of math learning. Maesaroh (in Sofiana et al., 2023) revealed that the task of an educator is to make lessons that were not exciting, exciting, and what is considered difficult become easy. Thus, providing positive approaches and guidance is essential so students can easily understand the mathematical concepts of flat building materials (Vaiopoulou et al., 2021). In addition, educators can develop teaching materials, one of which is modules. Modules developed by educators can be adapted to the characteristics of students by incorporating local culture into mathematics learning (Sriwanti & Sukmawarti, 2022). The concept of mathematics embedded in cultural practices is called ethnomathematics.

Ethnomathematics in education intends to investigate the process of understanding and processing mathematical knowledge and applying mathematical ideas to help solve problems related to daily activities. In line with Finariyati's statement (in Safitri et al., 2024) that learning is associated with ethnomathematics, it is hoped that students will better understand culture and that educators can instil cultural values early on. One of the mathematics materials associated with ethnomathematics is triangular and rectangular flat shapes. Cognitive skills in mathematics learning based on local culture often involve activities or problems relevant to students' daily lives (Nipyrakis, 2024). It helps students develop problem-solving, critical thinking, and logic skills (Papadakis & Kalogiannakis, 2019a, 2019b).

Meanwhile, non-cognitive skills in ethnomathematics learning teach students to appreciate cultural diversity and traditions in how they understand the world. This can increase tolerance and mutual respect between cultures. Applying the ethnomathematics module helps students understand and appreciate their cultural heritage. Students feel their identity is essential and relevant in an educational context by connecting math concepts with local cultural practices. Ethnomathematics is capable of being developed into mathematics learning in the classroom. In line with Ayuningtyas and Setiana (in Putri et al., 2023), educators can integrate ethnomathematics in learning by making ethnomathematics nuanced teaching materials.

Based on the empirical studies that have been carried out, researchers are interested in producing teaching materials for ethnomathematics-based flat building material modules that are valid and effective so that they can be used by teachers in learning flat building in grade II elementary schools and can help students in discovering new things, thus enabling them to gain more information about local culture. The exercises in the module encourage students to actively discover the concepts learned so that educators can carry out the role of facilitator by the demands of learning (Papadakis & Kalogiannakis, 2020). In developing this ethnomathematics-based module, researchers used several Indonesian batik motifs, traditional houses and traditional Indonesian food as tangible examples of cultures that have motifs resembling flat shapes. The ethnomathematics-based module developed can fade the impression that math is complicated and replace it with the impression that math is fun and concrete learning (Mohamad et al., 2024).

2 Materials and methods

Research and development method R&D (Research and Development) is applied in this study. R&D is a type of research model that is widely developed today (Petousi & Sifaki, 2020). Zakariah et al. (2021) stated that the R&D model is often interpreted as a process or steps to develop a new product or improve an existing product. Setyosari (in Munfaridah, 2020) stated that this development research is very familiar with learning technology that develops learning products and designs such as media, teaching materials, and learning system designs. The development procedure in this study uses the ADDIE model with five stages, namely (Analysis, Design, Development, Implementation, and Evaluation). The following are the results of developing an ethnomathematics-based learning module.

2.1 Analysis

The needs analysis in this research was conducted by interviewing class II educators at SD N Depok 2. From the observations, the learning process still needs to be improved because only textbooks from the government are used, which are the only source of learning. While learning takes place, material analysis is carried out by identifying the primary material that needs to be taught. Researchers chose shape material developed by adapting existing learning outcomes about flat shapes.

2.2 Design

The chosen media will be adjusted to convey the lesson material at this stage. Teaching materials will be used as ethnomathematics-based modules related to batik culture, houses, and food to learn mathematics about flat figures. This ethnomathematics-based module uses the Canva application with illustrations supporting learning. The module's content consists of a beginning section, a core section, and an end section.

The module will be printed as an A4 textbook and provided digitally on the platform Anyflip. This mathematics learning module is designed with an ethnomathematics nuance. The modules are designed with various contrasting colours to attract students' interest using the developed media.

2.3 Development

Level development translates design specifications into physical form, producing the final product. Activities at this stage include searching and collecting all the sources needed for material development, creating supporting tables, creating illustrative images, typing, and arranging layout.

2.4 Implementation

The module design that has been developed will be implemented in real classroom learning situations, namely, by field trials. Field trials were carried out after validation from experts and educators and the revision stage. The field trial phase in this research involved class II students at SD N Depok 2, Sleman Regency.

During this field trial, students will be asked to complete a questionnaire regarding their assessment of developing an ethnomathematics-based module on plane material.

2.5 Evaluation

Evaluation is the final stage of the ADDIE development model. It aims to measure the validity and effectiveness of the module being developed and improve the stages that have been carried out, namely stage analysis, design, development, and implementation. The evaluation results are suggestions the validators gave to improve the final results of the ethnomathematics-based module.

The data collection tools used were questionnaires and observation guides. A questionnaire is a written question asked to the respondent; the respondent fills in the answers according to the list of questions received. The advantage of the data collection technique of distributing questionnaires is that it is relatively cheap, does not require much effort, and can be repeated (Pasaribu et al., 2022). Data collection using questionnaires in this research was carried out by distributing validation questionnaires aimed at validators and students to assess the validity, practicality and effectiveness of the ethnomathematics module being developed.

Meanwhile, observation collects data directly at the location to obtain information about the occurring conditions. Researchers observed class II of SD N Depok 2 by observing and recording conditions regarding the learning process. They observed learning methods and teaching materials to support learning and followed students' classroom learning processes.

These five stages are the stages that will be passed in developing ethnomathematics-based learning modules on shape material. According to Rayanto (in Mesra et al., 2023), the ADDIE Model has advantages such as sound design quality, clear learning objectives, carefully structured content, controlled workload for education experts and students, integrated media, relevant student activities, and highly tied assessments, for desired learning outcomes, as well as being cost-effective and time-saving, and each phase builds on each other. The ADDIE Model, according to Sugiyono (in A'yun et al., 2022), can be described in Figure 1.

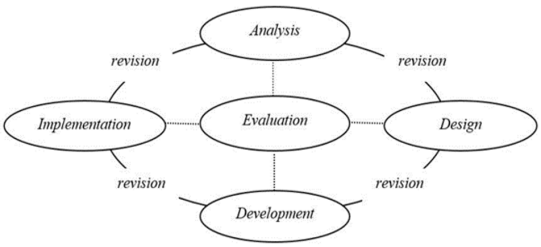

Figure 1 ADDIE Model

Data collection techniques in developing ethnomathematics-based module research use observation, interview, questionnaire and documentation techniques. Observation is collecting data by observing directly at the location to obtain information about the occurring conditions. Researchers observed class II of SD N Depok 2 by observing and recording conditions regarding the learning process. Researchers made observations by observing learning methods, teaching materials to support learning and following students' learning process in class. The indicators of Observation Instrument grid include: 1) Learning Methods; and 2) Learning Materials.

Next is the interview; interviews are conducted between researchers and resource persons in the school environment. Interviews were conducted to obtain information regarding problems with learning resources, namely teaching materials, that the teaching materials used during learning were only printed books from the government whose material was still general and the availability of worksheet books which did not contain actual examples of daily life and pictures. in the book it is not coloured. Researchers conducted interviews using Indonesian and Javanese. The indicators of Interview Instrument grid include: 1) Mathematics learning methods that have been used; 2) Mathematics learning teaching materials that have ever been developed; 3) Students' interest in mathematics modules that have been developed; and 4) Obstacles experienced when using modules that have been developed.

Data analysis techniques use qualitative and quantitative analysis techniques. Qualitative data analysis is in the form of criticism, suggestions, and corrections provided by the team of experts, educators, and students in the ethnomathematics-based module that was developed. Quantitative data analysis is obtained from the scoring results through the validation sheet of assessments by material experts, media experts, class II educators and responses from class II students. The analysis carried out by the researcher is by calculating all the assessments that have been carried out. The data analysis used in the study is a Likert scale with four answers to show the validity and effectiveness of the ethnomathematics-based module. After obtaining the results of the module data calculation, the results will be converted into qualitative data to determine the attractiveness of the product being developed. The conversion of scores into assessment questions, according to Arikunto (in Efendi, 2022), can be seen in Table 1.

Table 1 Percentage scale table

Percentage Score	Interpretation
81% – 100%	Very Good
61% – 80%	Good
41% – 60%	Quite Good
21% – 40%	Poor
0% – 20%	Very Poor

3 Results

This research produced a module based on ethnomathematics on flat building materials of class II by taking elements of the Batik culture, traditional custom houses and traditional Indonesian food. The ethnomathematics-based module product is available in electronic form with a barcode scan to make it easier for students to learn independently at home, as the ethnomathematics-based module in printed form is only available in limited quantities. The research was conducted to determine the validity and effectiveness of ethnomathematics-based modules. Based on the research procedures, the results of the research can be described as following.

3.1 Potential and problems

The potential and problems in this research are an introduction or reference to the product to be developed, which is ethnomathematics-based modules on flat building materials. Based

on the observations of class teachers, interviews, and the analysis of student needs, it was concluded that students require varied mathematical learning modules and that there needs to be more local cultural relevance in learning mathematics of flat building materials.

3.2 Data collection

The initial research data is taken from the analysis stage. The analysis stage used is the analysis of needs and material analysis with interviews and observations of the teacher of SD N Depok 2 district of Sleman. According to (Hikmawati, 2020), an interview is a face-to-face meeting between the interviewer and the respondent to exchange information and ideas through questions and answers so that meaning can be constructed on a particular topic. While observation involves direct observation of the research subject, documentation studies involve collecting data from documents, archives, or other written material (Ardiansyah et al., 2023). The result is that the learning resources used in the learning process are not varied and only use printed teaching materials, LKS, less exciting and less in-demand learning videos, and the need for local cultural association in mathematical learning of flat building materials.

3.3 Initial product development

Initial product development after obtaining data, after finding problems at the analysis stage, then switching to the design stage, at this stage performed the design of the product module based ethnomathematics on flat building material triangle and quadrilateral according to the results of the phase of the analysis already carried out. What is done in the design phase is to design the module's content, select software to develop modules, design the contents and layout of the modulus, and create research instruments. The ethnomathematics-based module can be seen in Figure 2-4.

Figure 2 Module cover and instructions for use

Figure 3 Material description

The front cover page of the module contains the title of the module, which is by the material, namely "Flat Buildings Ethnomathematics-Based Module", the name of the module developer, the developer's university logo, the Tut Wuri Handayani logo, the Merdeka Belajar logo, there is a statement that this module was developed for grade II SD / MI.

Instructions for educators and learners on how to use the module. The instructions for using the module contain steps that make it easier for educators and students to use when studying in class or at home.

Figure 4 Activity sheet

The description of the developed material contains material about flat shapes that are associated with cultures in Indonesia, such as batik motifs, traditional houses, and traditional food, which are conveyed clearly.

At the beginning of the module, there are come to observe and come read activities that contain pictures and text descriptions of ethnomathematics links to batik ship motifs from Lampung, whose motifs are triangular, batik ilir from Cilegon, whose motifs are triangular and square and batik geblek renting from Kulon Progo whose motifs are right triangles. The module also includes pictures and text descriptions of the ethnomathematical connection to the Panjalin traditional house, with rectangular and triangular doors and supporting poles on the roof. Furthermore, a traditional food typical of Cilacap is jumbo tempe mendoan, whose manufacture is formed using ethnomathematics studies, from measuring ingredients to making long rectangular mendoan.

Activity sheets are sheets containing tasks that are given instructions to be able to complete them. The activity sheet is adapted to the material studied for flat shapes. There are 5 activities, namely, activity 1, regarding the introduction of straight lines and how to draw straight lines; Activity 2, regarding the shape of a triangle and how to draw a triangle; Activity 3, regarding the introduction of various triangles and sticking the name of the triangle according to the picture; activities 4 and 5 regarding thickening the dotted lines into square and rectangular flat shapes, equipped with games to group flat shapes according to the number of sides, angles and corner points and arrange batik puzzles.

3.4 Expert validation

The module that has been developed will be validated by module experts. This is done to get suggestions and values for the modules that have been developed. Various comments and suggestions were obtained from the validators to get the validity and perfection of the product. Table 2 is an assessment of the three experts based on the questionnaire instrument used with the recapitulation.

Table 2 Module expert aspects recapitulation results

No	Aspect	Validator 1	Validator 2	Validator 3
1.	Content Qualification	15	15	16
2.	Presentation Qualification	25	29	32
3.	Language Qualifications	10	9	11
	Average	83%	88%	99%
	Average Total	90%		
	Criteria	Very good		

Based on Table 2, the module based on ethnomathematics of flat building materials that module experts in the material aspect have assessed obtained an average product validation score from the results of validator 1's assessment of 83%, the results of validator 2's assessment of 88% and the results of validator 3's assessment of 99% with an average total percentage of 90%. Based on the data conversion guidelines, the development of ethnomathematics-based modules in the material aspect by validator 1, validator 2 and validator 3 is included in the "very good" category.

Based on Table 3, the ethnomathematics-based module on flat building material that has been

evaluated by module experts in the display aspect obtains an average product validity value of 90% from the assessment results of validator 1, the assessment results from validator 2 are 93%, and the assessment results from validator 3 are 98% with an average total percentage of 93%. Based on the data conversion guidelines contained in Chapter III, the development of ethnomathematics-based modules in the display aspect by members 1, 2 and 3 are included in the "very good" criteria.

Table 3 Module expert view aspects recapitulation results

No	Aspect	Validator 1	Validator 2	Validator 3
1.	Module Usage	6	6	8
2.	Content Qualification	18	19	19
3.	Presentation Qualification	18	18	20
4.	Module Design	19	20	20
	Average	90%	93%	98%
	Average Total	93%		
	Criteria	Very good		

Based on Table 4, the ethnomathematics-based module on flat building material validated by 3 (three) experts obtained an average second aspect score of 91% with "very good" criteria. The ethnomathematics module that has been developed can help students understand math in a more relevant, engaging, and meaningful way. The module encourages the development of students' identity and social skills while enhancing academic knowledge by incorporating cultural components.

Table 4 Summary results of material aspects and module expert display aspects

No	Aspect	Validator 1	Validator 2	Validator 3	Nilai Rata-Rata
1.	Material Aspect	83%	88%	99%	90%
2.	View Aspect	90%	93%	98%	93%
	Average of Two Aspects	87%	90%	98%	91%
	Criteria	Very good	Very good	Very good	Very good

3.5 Design revision

The product was improved based on various suggestions and input from the module expert validator. Then, the ethnomathematics-based module on flat building materials of class II was revised. After the revision, the results of the ethnomathematics-based module on flat construction materials will be perfect and can be used by the pupils to learn.

3.6 Product trials

The test phase will be carried out on May 8, 2024, by filling out the lift/questionnaire and attempting to implement an ethnomathematics-based module in Class II SD to determine its effectiveness. The trial in the classroom begins with the introduction of the researcher and the delivery of the objective. The material delivered in the module is a triangle with a square flat construction. (see in Table 5)

Table 5 Results of the students' assessment of the overall aspects

No	Aspect	Score	Percentage
1.	Facilities	87	91%
2.	Material Compatibility	21	88%
3.	Disconnecting	68	94%
4.	Utility	23	96%
	Average	199	92%
	Criteria		Very Effective

The elevator evaluation of the students for the ethnomathematics-based module on flat building materials obtained a final percentage of 92% with the criterion "Very Good".

3.7 Revision of product trial results

Modules based on ethnomathematics on flat building materials are appropriate when meeting some existing criteria. Module qualifications are obtained from assessment by module expert

validation, class II teacher, and student response test. There are some suggestions, inputs, and comments regarding the results of the lifting and implementation. However, from the suggestions, input, and comments given, the researchers do not make a product revision against a single point; they use it as an evaluation if they are going to develop a product module.

4 Discussion

4.1 Module development

This research produced a module based on ethnomathematics on flat building materials of class II by taking elements of the Batik culture, traditional custom houses and traditional Indonesian food. The ethnomathematics-based module product is available in electronic form with a barcode scan to make it easier for students to learn independently at home, as the ethnography-based modulus in printed form is only limited. The research was conducted to determine the validity and effectiveness of ethnomathematics-based modules. Research conducted using the ADDIE development model consists of five stages: analysis, design, development, implementation, and evaluation. Preliminary research data is taken from phase analysis. The analytical stages used are needs analysis and material analysis with interviews and observations of class teachers. The result is that the learning resources used in the learning process have not varied and only use printed teaching materials, LKS, learning videos that are not interesting and not in demand for pupils, and the lack of local cultural relevance in learning mathematics flat building materials. To generate interest in learning maths flat building material, there is a need to develop exciting and interactive modules to support the learning process. The material analysis identifies the primary material and selects the relevant material.

After finding the problem at the analysis stage and then moving on to the design stage, an ethnomathematics-based module product design is carried out on triangular and rectangular plane material according to the results of the analysis stage that has been carried out. What is done in the design stage is designing the content of the module material, selecting software for module development, designing the content and structure of the module, and creating research instruments. The material is designed through *Microsoft Word*. The module developed is equipped with student learning activities. These activities are in the middle of the material so students stay energized while studying. Activity 1 is about introducing straight lines and how to draw straight lines; Activity 2 is about triangle shapes and how to draw triangles; Activity 3 is about introducing various types of triangles and attaching the name of the triangle according to the picture; Activities 4 and 5 are about thickening dotted lines into square and rectangular flat shapes, equipped with games for grouping flat shapes according to the number of sides, angles and vertices and putting together batik puzzles. There are 2 competency tests in the module after the material ends. Competency test 1 consists of 5 questions covering squares, rectangles and sides of triangles. Meanwhile, competency test 2 consists of 3 multiple-choice questions and 2 short answer questions covering triangles, squares, rectangles and drawing shapes.

The software used to design the module is the Canva application. The Canva application makes it easy to design a module, presentation material or pamphlet (Rosalinda & Pamela, 2023). The module's appearance is designed using brown, which is related to culture, and with the Core Bandi Face typeface. The animations are engaging and do not bore students learning about flat shapes. In line with the statement (Wijayanti & Waitaby, 2024), learning products must be attractive so students do not get bored during the learning process. The online module provided is designed using the Anyflip application.

Assisted ethnomathematics-based module *Canva.* This can attract students' attention with a beautiful and beneficial appearance. Siregar and Sitorus (2021) state that educators must know and be able to use technology to create exciting and creative procedures or teaching methods in learning process activities, like creating a learning product using the Canva application. Various images, colours, materials, activities, games, puzzles, and competency tests are arranged to determine students' understanding. By the opinion of (Hayu et al., 2023), research shows that the module is exciting and helpful in understanding mathematical material, especially those related to quadrilaterals and triangles.

4.2 Module validity analysis

In the material aspect, there are aspects of 1) content suitability with indicators of material breadth by CP, learning objectives, and ATP with a percentage of 96% in the "very good" category, 2) suitability of presentation with indicators of learning flat building material and

facts of concepts that have ethnomathematical nuances with a percentage of 90% in the "very good" category, 3) linguistic suitability with indicators of linguistic, communicative, and easy to understand with a percentage of 83% in the "outstanding" category. Thus, the lowest percentage is in the aspect of language suitability. The lowest percentage result is in the aspect of language appropriateness. The language used in the module instructions could be more transparent and communicative. For example, in the "Let's Draw" activity, you are only invited to stretch the rope and fold colourful paper without knowing what the purpose is. After the revision, we found clear enough instructions: "Try stretching the rope that has been provided." Then, underneath is a description that the shape obtained from stretching the rope is called a straight line.

In the display aspect, there are aspects of 1) the use of modules with indicators of module efficiency, ease of use and understanding with a percentage of 83% with a category of "very good", 2) feasibility of content with indicators of visual illustrations, image layout, relevance to the material, and adequacy of illustrations with a percentage of 93% with a category of "very good", 3) feasibility of presentation with indicators of technical quality, font, readability, language choice and size with a percentage of 93% with a category of "very good", 4) module design with indicators of visual principles, selection of print colours, finishing touches and uniqueness with a percentage of 98% with a category of "very good". Thus, the lowest percentage is in the aspect of using the module. In using the module, there are points of ease in understanding the contents of the ethnomathematics-based module with a validation result of 83%. This aspect is low because there is an inaccuracy in the Learning Objective Flow Indicator and the need for sentence improvement, and there is a mismatch between the relationship between the batik image and the caption. For example, the ethnomathematics connection to the elliptical kawung batik motif does not match the triangular and rectangular flat shapes.

Based on this description, the average obtained from all aspects of the validation results assessment is 91%, in the "very good" category. This is supported by the research conducted by Putri et al. (2023), which obtained overall results with an average validity score above 90% in the very valid category. The research results from (Mariska and Rahmatina, 2022) also show that the module developed obtained a validation result percentage of 91.64% in the "very good" category. Apart from that, it is also supported by the research results of Sunedi and Tasya Poetri Syaharani, which obtained an average overall validity value of 86.74% in the valid category (Sunedi & Syaharani, 2023). Based on this description, the module that has been developed is valid for use as teaching material to support the learning process.

4.3 Module practical analysis

The trial phase was carried out on May 8 2024, by filling out a questionnaire and trying to implement an ethnomathematics-based module in class II elementary school to determine the effectiveness of the module that had been developed. The trial in the classroom begins with an introduction from the researcher and conveys the objectives. The material presented in the module is triangular and quadrilateral figures. So that all students can use this module, one class is divided into 6 groups because ethnomathematics-based modules in printed form are only available in limited quantities. So that when working on the activities in the module, students are expected to work together and take turns working on the activity sheets. This ethnomathematics-based module is also available in electronic form to make it easier for students to independently repeat the material at home.

The ethnomathematics-based module was assessed by completing a student response questionnaire of four aspects. Only 6 students were required to complete the questionnaire because each group only represented one student. First, the convenience aspect with indicators of students' understanding of the ethnomathematics module scored 91% in the "very good" category. Second, the aspect of conformity with material indicators with the module teaching material indicators is realistic enough for students to get a score with a percentage of 88% in the "very good" category. Third, the attractiveness aspect with indicators of students' interest in the mathematics learning module received a score of 94% in the "very good" category. Fourth, the usefulness aspect with indicators of what students get when using ethnomathematics module teaching materials with a percentage score of 96% in the "very good" category. Based on the results per aspect, the lowest results were in the material suitability aspect.

After the students had finished using the module, the researcher asked several open questions, such as, "How do you feel when learning to use this ethnomathematics module?" "How does this module look as a whole?" "Have you ever seen and used the triangular ethnomathematics module before? and a quadrilateral like this?" The results of interviews with representatives of six students were that they were happy and liked using the teaching materials for this

ethnomathematics-based module because the design was attractive with harmonious colours, practical to use, and easy to obtain the material because it included pictures of batik, traditional houses, traditional food and concrete pictures of triangles and rectangular.

The average questionnaire score obtained from the trial for all aspects was 92% in the "very good" category. This is by the results of research (Suryaningsih & Putriyani, 2022), which stated that the results of the student response questionnaire to the ethnomathematics module developed were in the "very feasible" category with an average score of 93%. It is also supported by research results (Febriyanti & Ain, 2021), which obtained an average score based on the response questionnaire of 94.1% in the valid and feasible category.

Based on the description above, the ethnomathematics-based module on plane figures developed is very effective as a complement to teaching materials in the teaching and learning process.

5 Conclusion

Based on the research results and discussion described, the product developed is an ethnomathematics-based module on class II plane material at SD Negeri Depok 2, Sleman Regency. This research was developed using R&D research and development methods (Research and Development), which refer to the ADDIE development model. Through the research and development of ethnomathematics modules, mathematics education can become more inclusive, relevant, and responsive to diverse cultural contexts worldwide.

The validity of teaching materials for ethnomathematics-based modules on plane material from the material and appearance aspects according to validator 1, validator 2 and validator 3 received an average score for all aspects of 91% with the criteria "very good". The response of class II students at SD Negeri Depok 2 Sleman Regency to the ethnomathematics-based module on flat building materials in field trials with response questionnaires carried out by 28 (twenty-eight) students in all aspects obtained an average score of 92% with the criteria "Very good".

The conclusion that can be drawn is that the ethnomathematics-based module is valid and effective and can be used by students to help them learn mathematics material about triangles and quadrilaterals for class II SD N Depok 2 Sleman Regency. This module can continue to be developed with updates to suit student characteristics in the future. The learning products developed can continue to improve student learning resources. This module can also be developed for other learning and higher grade levels.

Conflicts of interest

The authors declare that they have no conflict of interest.

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