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Development of Ethnomathematics-Based Mathematical Teaching Materials at the Makassar 99 Kubah Mosque in Facilitating Student Learning Independence

Abstract

Student learning outcomes are still low so students need to have learning independence. For this reason, the application of ethnomathematics is carried out to support independent learning. This research aims to develop ethnomathematics teaching materials for the Makasar 99 dome mosque to facilitate students' independent learning. The development of teaching materials is carried out using the 4D model (Define, Design, Develop, and Disseminate). The trial implementation used a one-shot case study which was conducted on 25 students of the Mathematics Education Study Program at UIN Alauddin Makassar. Data were collected using questionnaires, observations, and tests. The collected data were analyzed using quantitative techniques to determine the validity, practicality, and effectiveness of the developed teaching materials. Some of the advantages of the developed e-module include: (1) Facilitating student learning independence, (2) Easily accessible to students, (3) Using PBL-based learning activities and scientific approaches. With these advantages, the developed teaching materials meet valid, practical, and effective criteria. By meeting these criteria, the developed teaching materials can be used to improve student abilities. However, with the limited samples and materials in these teaching materials, further research can be carried out by expanding the range of materials and samples.

Keywords: ethnomathematics; learning independence; R&D.

Abstrak

Hasil belajar *mahasiswa masih rendah sehingga mahasiswa perlu memiliki kemandirian belajar. Untuk itu, penerapan etnomatematika dilakukan untuk mendukung kemandirian belajar. Penelitian ini bertujuan untuk mengembangkan bahan ajar etnomatematika masjid kubah Makasar untuk memfasilitasi kemandirian belajar mahasiswa. Pengembangan bahan ajar dilalkukan dengan menggunakan model 4D (Define, Design, Develop, dan Desseminate). Pelaksanaan uji coba menggunakan one-shout case study yang dilakukan pada mahasiswa prodi Pendidikan matematika UIN Alauddin Makassar sebanyak 25 orang. Data dikumpulkan dengan menggunakan angket, observasi, dan tes. Data yang terkumpul dianalisis dengan Teknik kuantitaif untuk mengetahui validitas, praktikalitas, dan efektivitas bahan ajar yang dikembangkan. Beberapa keunggulan dari e-modul yang dikembangkan antara lain: (1) Memfasilitasi kemandirian belajar mahasiswa, (2) Mudah diakses oleh mahasiswa, (3) Menggunakan aktivitas pembelajaran berbasis PBL dan pendekatan saintifik. Dengan keunggulan tersebut, bahan ajar yang dikembangkan memenuhi kriteria valid, praktis, dan efektif. Dengan memenuhi kriteria tersebut, bahan ajar dikembangkan dapat digunakan dalam peningkatan kemampuan mahasiswa. Namun demikian, dengan adanya keterbatasan sampel dan materi pada bahan ajar tersebut, maka penelitian selanjutnya dapat dilakukan dengan memperluas cakupan materi dan sampel.*

INTRODUCTION

One of the tasks of the Mathematics Education Study Program is to prepare prospective teachers who have pedagogical abilities and the ability to teach mathematics material (Sumarni, Darhim, & Fatimah, 2021). Several factors influence teacher readiness, namely sense-making, ownership, and agency (Rulyansah, Asmarani, Mariati, & Rahmawati, 2021). Teachers must have good quality to form good quality human resources (Hafinda, 2022). Therefore, knowledge of material content, especially mathematics, is important for students of the Mathematics Education Study Program to master.

Mathematics expertise courses provided in higher education mathematics education study programs are more abstract, or more difficult to learn (Aristika, Darhim, Juandi, & Kusnandi, 2021; Yensy, Sasongko, Kristiawan, Apryani, & Hidayatulloh, 2022) so that innovative learning is indispensable. Learning mathematics is expected not only to logically construct mathematical concepts and construct students' abstract cognition, but it

is necessary to apply mathematical concepts in culture which are new activities that need to be carried out (Sarwoedi, Marinka, Febriani, & Wirne, 2018). One of the realities of life that students encounter in their daily lives is mathematics in culture or ethnomathematics (Lakapu, Fernandez, Djong, Fernandez, & Gracia, 2020). For example, the process of learning mathematics by integrating local culture (Marsigit, Condromukti, Setiana, & Hardianti, 2020; Nelawati, Meriyati, Putra, & Simatupang, 2013; Fajriyah, 2018). The principles of ethnomathematics are based on the knowledge possessed by students, as well as the background of the playing environment in content and methods of learning (Nelawati, Meriyati, Putra, & Simatupang, 2013). Therefore, ethnomathematics-based teaching materials are seen as an innovation in learning mathematics.

Based on observations in mathematics education study programs, it is known that ethnomathematics-based teaching materials are still limited. The results of student mathematics learning show that more than 30% of students have not mastered the material being tested, so that student learning outcomes are relatively low. This can result in the goal of the mathematics education study program not being achieved, namely preparing competent teacher candidates. Therefore, it is hoped that students will have independent learning. Learning independence can be understood as the characteristics, behaviors, and skills possessed by students to complete their learning activities either alone or with the help of others such as teachers or parents. This is in line with the statement of Prayekti (2018) which states that independent learning is a student's skill in independent learning without depending on others. Independent learning is based on one's desire and willingness to determine the type of learning that he thinks is effective and apply it. Students are free to use learning styles, learning speed, explore interests, and develop their talents according to the students' abilities (Mulyono et al., 2018). This behavior is carried out with the student's awareness without depending on other people (Khasanah & Lestari, 2021). The willingness of students to study independently is very important to maintain the learning efforts that are being made. According to Guntur, Muchyidin, dan Wianarso (2017), independent learning will give birth to the personality of students independently. This independence can be demonstrated by the extent to which one sets goals, selects the material to be studied, manages the learning experience, and evaluates learning (Mulyono, 2017). Students who manage their way of learning usually show a high sense of self-efficacy. To support students in independent learning, teaching materials are needed, in this case, ethnomathematics-based teaching materials.

Ethnomathematics or ethnomathematics consists of three-word origins, namely "ethno", "mathema", and "tics". In the social and cultural context, the meaning of the word "ethno" is a code of behavior, language, myth, or symbol. Mathema means explaining, knowing, understanding, and doing activities. Tics or the origin of the word techne is defined as a technique. According to Sarwoedi, Marinka, Febriani, dan Wirne (2018), ethnomathematics is an activity that involves the culture of the surrounding area in learning mathematics so that the mathematical concepts studied can be easily understood. Thus, ethnomathematics can also be referred to as a learning approach. An approach that is directly related to local culture in daily activities makes it easier for students to understand the material.

Limited teaching materials will make it difficult for teachers to achieve

learning goals (Aisyah, Noviyanti, & Triyanto, 2020). So, it is important to develop teaching materials based on ethnomathematics. Much research has been done on ethnomathematics before, including Sundanese ethnomathematics (Muhtadi, Charitas, dan Prahmana, 2017); ethnomathematics of Yogyakarta culture (Risdiyanti, Charitas, dan Prahmana, 2018); ethnomathematics of the Tongkonan Toraja traditional house (Tandililing, 2015); ethnomathematics research was also carried out at the traditional houses of Malacca Regency, namely the Manunis Ka'umnais traditional house (Mar, Mamoh, dan Amsikan, 2021); Bugis Pinrang ethnomathematics explores and reviews the concept of traditional Bugis agricultural tools in Pinrang Regency which contains ethnomathematics concepts (Akbar, Haidar, & Hidayati, 2021). However, no one has used the context of the Makassar 99 Dome Mosque.

In general, the 99 Dome Mosque is in Makassar City in South Sulawesi Province, which was built in 2017 and inaugurated in 2022. Currently, it is the newest icon in South Sulawesi Province, located in the Tanjung Bunga Makassar Center Point Of Indonesia (CPI) area. The mosque building also consists of 2 floors. The mosque with a building area of 72 meters x 45 meters can accommodate around 13 thousand worshippers. This proper building of Muslim worship has three parts that can be used by the congregation. The prayer room can accommodate 3,880 worshipers, the mezzanine room can accommodate 1,005 worshippers. The holy grounds hold 8,190 worshippers. This mosque has a philosophical adjustment and meaning attached to its name. The 99 domes are taken from Asmaul Husna which are the names of Allah (Aras, Syuaib, Tahir, Ananda, & Muharram, 2022).

The purpose of this research is to develop ethnomathematics-based teaching materials at the Makassar 99 Kubah Mosque in facilitating student learning independence that meets valid, practical, and effective criteria.

METHOD

This research is Research & Development (R&D) research, to produce a product. The resulting product is tested for effectiveness in use. In this study, the product to be produced is ethnomathematics-based teaching materials at the Makassar 99 Kubah Mosque in increasing student learning independence.

The development procedure used is the 4D model (Define, Design, Develop, and Disseminate). The 4D development procedure is selected based on the characteristics and stages that are by the process of developing teaching materials. According to Rafiqah (2013), the 4D development model consists of four stages, namely (1) define, (2) design, (3) develop, and (4) disseminate.

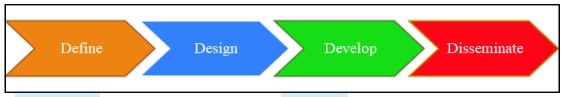

Figure 1. Thiagarajan 4D model development flow

The define stage is carried out by analyzing 5 aspects which include student problems, student needs, assignment reviews, material concept reviews, and learning objectives. With the results of this analysis, a design stage will be carried out to design the e-model accompanied by a validation sheet. The next stage is development which is carried out by developing the modules and instruments used. At this stage, revisions are also carried out based on the validator's suggestions. The final stage, namely dissemination, is carried out to determine the practicality and effectiveness of the e-module that has

been developed.

The trial implementation uses an approach by collecting data only once, this design is called a one-shot case study. The test subjects were 25 students of the Mathematics Education Study Program at UIN Alauddin Makassar.

Data collection techniques are methods or methods used by researchers in gathering the required information. In this study, data were collected using several methods, namely questionnaires, observations, and tests. Research instruments are tools that are selected and used by researchers in data collection activities to make data collection more systematic and easier. In this study, the tools used were (a) questionnaires, which consisted of student response questionnaires and lecturer response questionnaires; (b) observation sheets, which consist of observation sheets of student activities, the implementation of teaching materials, and the teacher's ability to manage learning; (c) learning outcomes test; and (d) teaching material validation sheet.

Data analysis techniques using quantitative techniques. Quantitative techniques are carried out to determine the validity, practicality, and effectiveness of teaching materials developed based on ethnomathematics in increasing student learning independence. This is the opinion of Nieveen (1999), that quality teaching materials are teaching materials that meet the criteria of 1) valid (validity), 2) practical (practically), and 3) effective (effectiveness). The validity of the product being developed is assessed on the validation of the content and construction of the product. While the practicality is based on the evaluation of product implementation in the field. The effectiveness is based on product evaluation in terms of its benefits and functions (Lakapu, Fernandez, Djong, Fernandez, Gracia, & Gawa, 2020; Arsyad, 2016).

RESULTS AND DISCUSSION

Results

Based on the research objectives, the discussion that will be described in this study is the process of developing and quality of ethnomathematics-based teaching materials at the Makassar 99 Kubah Mosque in increasing student learning independence.

Define

At this definition stage, 5 aspects are analyzed, namely the reasons for student problems, reviews of student needs, reviews of assignments, reviews of material concepts, and learning objectives. The results of the analysis are described as follows:

Student problems

Based on the results of interviews with students, it is known that the problems faced by students in learning are limited learning resources, examples of questions that are less varied, and abstract learning materials. The interviews conducted were semi-structured and lasted approximately 15 minutes per student.

Student needs

As for the needs of students expressed by PK, AN, and SM subjects, among others, learning resources in the form of e-modules, learning that is more fun, and questions that have varying levels of difficulty. Following are the results of the interview.

R : In the plane and space analytical geometry lecture, what do you need most?

PK : Currently the module used is still an old edition and does not yet have an online version

AN : *Classroom learning should be more varied*

SM : *In the module you can add questions from easy to difficult*

Task analysis

Competencies that need to be learned by students to improve their learning outcomes, based on a study of the Semester Learning Plan (RPS) for Field and Spatial Analytical Geometry courses include providing worksheets and structured assignments that can help students achieve learning objectives.

21 Based on the results of the analysis of Course Learning Outcomes (CPMK), the learning objectives are formulated as follows: a) understand the definition of a coordinate system in a plane, change elbow/cartesian coordinates to polar coordinates and vice versa, calculate the distance of two points in a plane, b) determine the equation of a line which passes through one point and two points, shows the position of the two lines, and applies the Hesse normal equation, c) draws a circle, along with its elements, d) finds the equation of the circle, and the equation of the tangent line to the circle, e) draws a parabola, along with its elements, f) find the equation of the parabola, as well as the equation of the tangent to the parabola.

Material concept

The material in the Field and Spatial Analytical Geometry course will relate to the culture of the Makassar 99 Dome Mosque, namely coordinates on planes, straight-line equations, circles, and parabolas.

Design

The design phase begins with designing e-modules that will be developed such as making templates, consisting of several module components namely titles, module usage instructions, concept maps, CPMK, sub-CPMK (learning objectives), module material, evaluation, and answer keys, then the contents of the module use activities according to the syntax of Problem-Based learning.

Furthermore, designing data collection instruments consisting of validation sheets, lecturer and student response questionnaires, module use observation sheets, learning management observation sheets, and student activity observation sheets, as well as learning achievement tests.

Develop

At this stage, 2 development items were carried out, namely module development and research instrument development. Therefore, the two items are described as follows:

Module development

The developed module consists of 4 learning activities, complemented by module activities based on Problem-Based Learning (PBL) learning models and scientific approaches. The e-module is published on the page:

https://pubhtml5.com/qbhle/aqvv/.

Development of research instruments

The data collection instrument, which is still in the form of a fully developed grid, consists of a) validation sheets including e-module assessments, assessment sheets for the implementation of the use of e-modules, assessment sheets for learning management observation sheets, assessment for student activity observation sheets, assessment for lecturer response questionnaires and students, as well as assessment of learning outcomes tests, b)

the observation sheet of the implementation of the use of e-modules contains 10 statements consisting of the dimensions of the scientific approach and the dimensions of PBL syntax found in e-module activities, c) the observation sheet of learning management contains 16 statements consisting of management according to PBL syntax, and class atmosphere, d) student activity observation sheets containing 10 statements consisting of individual activities in groups and individual activities, e) lecturer and student response questionnaires including 10 statements related to responses to e-modules, f) learning achievement test consists of 5 essay questions.

Furthermore, the modules and instruments developed were validated by experts, namely two lecturers from the Mathematics Education Study Program. The suggestions from the two validators are as shown at Table 1.

Table 1. Revision Suggestions from Validators

Validated product	Revision Suggestions	
	Validator I	**Validator II**
E-module	• The e-module is made based on ethnomathematics, but there is no clear connection between the material and the ethno included, so it is necessary to clarify the location of ethnomathematics in the e-module. In addition, the circle image taken from the 99 Dome Mosque Lights, it is better to look for more relevant circle images. • It is better if it is equipped with ethnomathematics-based competency questions/tests, then a separate answer is made in the form of a solution description that can be used by other lecturers who wish to teach analytic geometry courses in the field of	• We recommend that the end of each learning activity be accompanied by a Competency Test which is also based on ethnomathematics. • Some pictures need to be corrected (for example in figure 1.3, figure 1.6, figure 1.7, graph 2.4, etc.). • Typing of symbols that need to be corrected (eg the position of the β angle in Figure 2.4, etc.).
Research instrument	• It is necessary to clarify for the observer the meaning of the syntax of the PBL written • The sentences "enthusiastic student" and "enthusiastic lecturer" should be accompanied by sentences • Pay attention in advance to the objectives of the lecture to be achieved. Preferably represent all Course Achievements	• Need a description of each aspect observed

Based on the suggestions from the validator, revisions were made to the developed modules and instruments. The excerpts of the e-module after the revision are as follows:

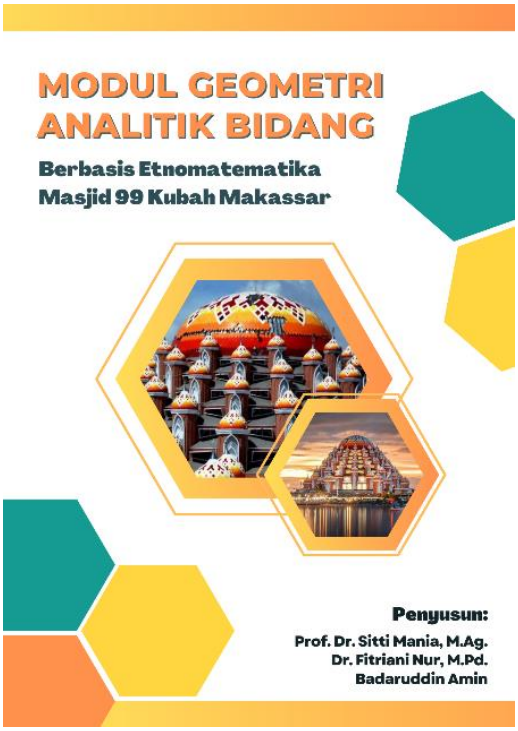

Figure 2. Cover

Figure 3. Module Contents

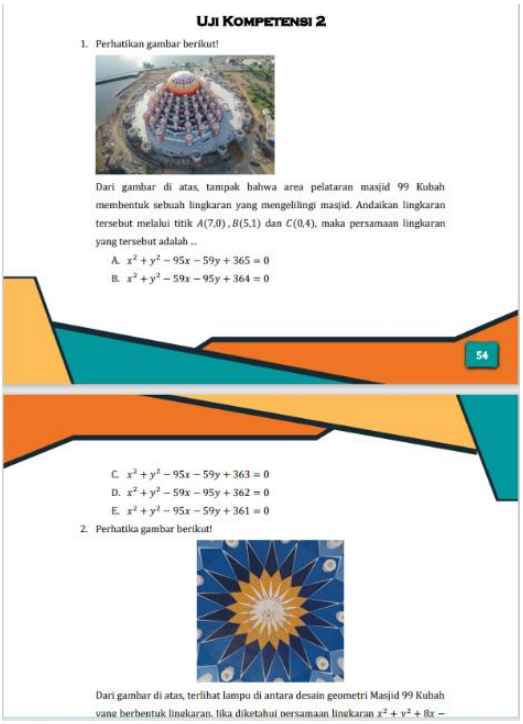

Figure 4. Competency Test Questions

After revising the suggestions from the two validators, an assessment was obtained in the valid category.

Table 2. Product Validation Results

Product	Rating Average	Category
E-module	3.42	Valid
Research instrument		
Lecturer response questionnaire	3.39	Valid
Student response questionnaire	3.39	Valid
Module usage observation sheet	3.46	Valid
Learning management observation sheet	3.55	Very valid
Student activity observation sheet	3.71	Very valid
Study result test	3.25	Valid
Overall average	3.45	Valid

Based on table 2, it is known that the average validator rating is 3.45, which indicates that the e-modules and instruments developed are in the category of valid and feasible for use in the next stage.

The final part of the development stage is a limited trial, in this case, a limited

trial was carried out on 3 students, then the following suggestions were obtained (see Table 3).

Table 3. Suggestions from Students

Subject	Suggestions
Subject A	We recommend that you provide a reference link or other source (YouTube link) so that we can better understand the material being discussed
Subject B	Examples of questions in the module are reproduced again
Subject C	It is hoped that there will be many interesting and easy-to-understand explanatory video links.

Disseminate

The dissemination stage is carried out using e-modules in learning which aims to determine the level of practicality and effectiveness of using the e-modules. The trial results are presented in Table 4.

Table 4. Summary of the Practicality and Effectiveness of Using the E-module

Quality	Criteria	Results	Conclusion
Practicality Level	Lecturer response	The overall lecturer response was 95% in the positive category	Based on the results of the analysis of the lecturer's response questionnaire and the results of the analysis of the implementation of the use of e-modules, it shows that the ethnomathematics-based e-modules of the Makassar 99 Kubah Mosque are practically used in learning.
	Implementation of the use of e-modules	The average implementation of the use of e-modules in learning is 1.65 which is in the fully implemented category	
Effectiveness Level	Student response	The overall student response was 89.2% in the positive category	Because the results obtained meet criteria 1-4 on the effectiveness of the e-module, normatively the ethnomathematics-based e-module of the Makassar 99 Kubah Mosque is effective in learning
	Student Activity	The percentage of student activity is 71.2% which is in the good category	
	Learning management	The average lecturer's ability to manage learning is 3.7 which is in the high category	
	Learning outcomes	classical completeness of 88%	

The results of the analysis of the self-directed learning questionnaire for mathematics education study program students at UIN Alauddin Makassar can be seen in the following table:

Table 5. Categorization of Student Learning Independence

Intervals	Frequency	Category
$111 \leq x <$ highest score	1	Very high
$99 \leq x < 111$	9	High
$88 \leq x < 99$	8	Medium
$82 \leq x < 88$	2	Low
The lowest score $\leq x < 82$	5	Very low
Average	**94**	**Medium**

Based on table 5, it is known that student learning independence is spread over five categories, and most are in the high category. That is, learning using ethnomathematics-based e-modules at the Makassar 99 Kubah Mosque can facilitate student learning independence.

The advantages of the ethnomathematics-based e-module of the Makassar 99 Kubah Mosque include: (1) Facilitate student learning independence; (2) Easily accessible to students; (3) Using PBL-based

learning activities; (4) Using activities based on a scientific approach.

Discussion

This study aims to develop mathematics teaching materials based on ethnomathematics at the Makassar 99 dome mosque in facilitating student learning independence. Community culture can be used as a medium for teaching mathematics. Pathuddin, Kamariah, dan Nawawi (2021) did this by exploring mathematical concepts such as division, congruence, and congruence, as well as triangular and hemispherical prisms through the process of making barongko as a source of contextual mathematics learning in schools. Ethnomathematics research was conducted by Charitas, Prahmana, Yunianto, Rosa, and Orey (2021) by exploring the culture of the city of Yogyakarta in the context of learning mathematics. The results of the study show that the people of Yogyakarta use mathematical modeling to determine the system of seasons and dates of birth and death. This has the potential to be used as a starting point in learning mathematics. Mar, Mamoh, dan Amsikan (2021) in exploring the mathematical concepts found in uim re'u Manunis Ka'umnais traditional house. The results of his research found that building elements such as pillars, walls, and roofs from uim re'u Manunis Ka'umnais contain mathematical concepts found in geometric material such as points, lines, plane shapes, spatial shapes, congruence, and geometric transformations (reflection).

Dosinaeng, Lakapu, Jagom, Uskono, Leton, and Djong (2020) also conducted ethnomathematics research on the culture of the Boti tribe to explore elements of geometry. Through the elements found, several mathematical abilities can be developed, including visual-spatial abilities, connection skills, and problem-solving abilities. Ethnomathematics studies were also carried out by Utami, Sayuti, dan Jailani (2019) in predicting the fate of marriage partners. The results of this study show that matchmaking using prior knowledge through Javanese Primbon is associated with the number base, remainder theorem, modulo, and alignment modulus in formal mathematics. Therefore, matchmaking using pre-knowledge through Javanese Primbon has the potential for material as a context in learning mathematics, such as the context in making ethnomathematics questions.

Sari, Somakim, dan Hartono (2018) researched the Ogan Komering Ulu traditional house in South Sumatra Province to find existing mathematical concepts through the design of the traditional house. The architecture of this existing house is one of the legacies that have specific buildings and is close to the application of mathematics, especially geometry. The results of his research explain that the shape type is specific like a pyramid shape. Not only that but the ornaments and carvings of the traditional house also form geometry. Prahmana and D'Ambrosio (2020) also conducted ethnomathematics research on Yogyakarta batik patterns. This research seeks to explore the mathematical concept of geometric transformation on Yogyakarta batik motifs. The results of this study indicate that the people of Yogyakarta have used the concept of geometric transformation in making batik patterns such as the Babon Angrem, Parang Barong, Parang Klitik, Sidomukti, Semen Bondhat, Sidoluhur, Soblog, and Sidowirasat motifs. Knowledge of the concept of geometric transformation has been used and studied by the people of the Mataram kingdom in Yogyakarta. Even though it contains mathematical content, batik has moral, historical, and philosophical values in

every style that can be felt, reflected, and applied in everyday life, such as values in leadership, good deeds, and so on. Turmudi, Susanti, Rosikhoh, and Marhayati (2021) also conducted ethnomathematics research to describe the traditional game of Malang City Tong Tong Galitong Ji or Ketchup Fried Rice in the form of mathematical concepts. The results of the study show (research novelty) that ethnomathematics elements are present in traditional TTGJ games at every stage of the game. The concept of probability also appears in stage five during the simultaneous showing of the finger.

This research shows that culture in society can be used as a medium for learning mathematics. Ethnomathematics integration was also explained by Abi (2017) in his research which revealed that negative views of mathematics can be reduced through contextual learning because what students learn in mathematics is very different and does not find implementation of mathematical concepts. Ethnomathematics exists to connect mathematics with daily life based on local culture. Research by Acharya, Kshetree, Khanal, Panthi, & Belbase (2021) shows that teaching in the mother tongue, the contextualization of mathematics with ethnomathematics notions, and the integration of local languages as teaching tools signal an urgent need for culturally relevant mathematics in elementary and pedagogical-level curricula.

Several previous studies have also used ethnomathematics to develop students' abilities. Lortser dan Abah (2022) revealed that the children's game Amenama Man Wankyo can identify children's abilities, foster children's independence, and increase intrinsic motivation, perseverance, and self-confidence. Kiptiyah, Purwati, and Khasanah (2021) also showed an increase in learning independence and students' mathematical literacy skills with the implementation of an ethnomathematics flipped classroom with Elena's support in online learning of geometry and measurement. Ethno-mathematics research was also conducted by Irawan and Kencanawaty (2017) which showed that students were more enthusiastic about learning when applying ethnomathematics-based realistic mathematics learning. In addition, the ethnomathematics-based learning approach in his research does not only achieve the goals of learning mathematics but can also make students know and preserve Sundanese culture so that students have characters who love local culture.

To bring ethnomathematics into learning mathematics, it is necessary to make teaching materials. Ethnomathematics-based teaching materials can make students understand mathematical concepts because they use concrete objects (Ayuningtyas & Setiana, 2019). Ethnomatematics-based teaching materials are effective in increasing student activity and student achievement (Astriani et al., 2021; Suryawan & Sariyasa, 2017). Research by Imswatama and Lukman (2018) also shows that ethnomathematics-based teaching materials are effective in improving problem-solving skills and critical-thinking skills.

In this study, teaching materials were developed with an ethnomathematics approach through an exploration of the 99 dome mosques in Makassar. This mosque with its unique architecture can be a medium of learning for students in studying geometry. With these teaching materials, student independence in learning can increase. Teaching materials can increase student independence (Hasibuan et al., 2019) and make learning more meaningful (Nurhasnah et al., 2020). By using problem-based learning, students' learning process will be more meaningful. Ongoing learning will develop students'

thinking abilities. with structured PBL in solving problems, students can use the e-modules developed anywhere and anytime, so that after learning takes place in class, students can learn independently. This will support improving students' abilities. Apart from that, by using a scientific approach, the learning process that takes place in class and outside of class can be followed by students well. This also needs to be supported by the teacher's ability to direct students using the e-modules that have been developed.

Implication of Research

Teaching materials that have been developed can be used in improving student abilities. However, in this study, there are also limitations so that further research can be carried out so that ethnomathematics in learning mathematics can penetrate more broadly. Considering that the sample used in this study was only students at one university, it could be considered to research a wider sample. In addition, bearing in mind that the 99-domed mosque is structured based on the Asmaul Husna, an approach to Islamic-integrated number material can be taken.

Limitation

Based on the research that has been done, this research is limited to (1) The material presented is only related to field and spatial analytic geometry; (2) the sample used is only at one university.

CONCLUSION

The development of ethnomathematics-based teaching materials at the Makassar 99 Kubah Mosque in increasing student learning independence includes 4 stages, namely (1) define, (2) design, (3) develop, and (4) disseminate. The validity level of ethnomathematics-based teaching materials at the Makassar 99 Kubah Mosque is 3.45 which is in the valid category. The level of practicality of ethnomathematics-based teaching materials at the 99 Kubah Makassar Mosque is in the practical category, supported by positive lecturer responses and the results of the analysis of the implementation of the use of e-modules in the fully implemented category. The level of effectiveness of ethnomathematics-based teaching materials at the 99 Kubah Makassar Mosque is in the effective category, supported by positive student responses, student activity in the good category, learning management in the high category, and the percentage of students who complete their studies is 88%. The independence of learning for mathematics education study program students at UIN Alauddin Makassar is in the moderate category.

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