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Ethnomathematics-based Fraction Number E-Modules for Prospective Elementary School Teachers

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ABSTRAK

Pecahan merupakan salah satu materi yang cukup sulit untuk dipahami, tidak hanya bagi siswa tetapi juga mahasiswa calon guru MI. Masalah dalam memahami pecahan seringkali muncul karena kurangnya keterkaitan dengan kehidupan sehari-hari. Penelitian ini bertujuan untuk mengembangkan e-modul bilangan pecahan berbasis etnomatematika. Jenis penelitian ini yaitu pengembangan dengan menggunakan model ADDIE yang dibatasi sampai tahap pengembangan. Subjek yang terlibat dalam penelitian ini yaitu para ahli yang terdiri dari ahli materi dan ahli media serta 12 orang mahasiswa semester 2 kelas A sebagai subjek uji coba kelompok kecil. Pengumpulan data dalam penelitian dilakukan melalui observasi, wawancara dan angket dengan instrumen penelitian berupa lembar validasi modul, lembar angket respon dan soal tes. Data yang diperoleh kemudian dianalisis dengan menggunakan analisis deskriptif kualitatif dan deskriptif kuantitatif. Hasil yang diperoleh dari penelitian pengembangan ini sebagai berikut: (1) validitas e-modul bilangan pecahan berbasis etnomatematika dinyatakan valid dengan hasil review ahli materi 97,93% dan hasil review ahli media 96,66%, (2) kepraktisan e-modul bilangan pecahan berbasis etnomatematika berdasarkan respon mahasiswa dinyatakan praktis yaitu dengan hasil uji 90,21% Berdasarkan hasil tersebut dapat ditarik kesimpulan bahwa bahan ajar e-modul bilangan pecahan berbasis etnomatematika yang dikembangkan berada dalam kualifikasi valid dan praktis.

ABSTRACT

Fractions are one of the materials that could be clearer to understand for students and prospective MI teacher students. Problems in understanding fractions often arise due to the need for more connection with everyday life. This research aims to develop ethnomathematics-based fractional number e-modules. This research type uses the ADDIE model, which is limited to the development stage. The subjects involved in this study were experts consisting of material experts and media experts, as well as twelve students in second-semester class A as small group test subjects. Data collection in the study was carried out through observation, interviews, and questionnaires with research instruments in the form of module validation sheets, response questionnaires, and test questions. The data obtained were then analyzed using qualitative descriptive and quantitative descriptive analysis. The results obtained from this development research are as follows: (1) the validity of the ethnomathematics-based fractional number e-module was declared valid with the results of the material expert review of 97.93% and the results of the media expert review of 96.66%, (2) the practicality of ethnomathematics-based fractional number e-module based on student responses is declared practical, namely with test results of 90.21% Based on these results, it can be concluded that the ethnomathematics-based fraction number e-module teaching materials developed are valid and practical qualifications.

1. INTRODUCTION

Mathematics is one of the most important subjects in the educational curriculum worldwide. Mathematics is a tool for measuring, calculating, and solving problems in everyday life and a gateway to many fields of science and technology (Li & Schoenfeld, 2019; Nurjannah et al., 2020). Therefore, understanding mathematical concepts from an early age, especially at the elementary school level, is very important because mathematics is a science that requires understanding, not just memorization (Afriyanti

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et al., 2018; Hidayat et al., 2020). This aims to support students in thinking critically, logically, and systematically when solving problems in everyday life (Gijsbers et al., 2020; H. A. Putri et al., 2022).

One of the mathematics topics taught in elementary school is fractions (Saryanti, 2023; Sujana, 2022). Fractions are a mathematical concept that can be a challenge. Both students and teachers Lisnani (2019) revealed that fractions are more difficult than integers. Several researchers also revealed that the difficulty in understanding fractions is felt by students, teachers, and prospective elementary school teachers (Cendekiawaty, 2020; Putra et al., 2021; Toluk-Uçar, 2009). The difficulty of prospective elementary school teachers understanding fraction material can be a serious problem in the learning process. This is because teachers are the main determinants of the nature and quality of student learning (Clarke, 2018; Murdiana et al., 2020). If the teacher himself has difficulty understanding fractions, then this can also hurt students' understanding later. For this reason, educational institutions are required to develop instructional learning in higher education that can strengthen the knowledge of prospective elementary school teachers (Julaeha et al., 2021; Putra et al., 2021).

Based on the results of observations and interviews with mathematics lecturers and PGMI UIN Sunan Kalijaga Yogyakarta students, researchers found that mathematics learning on fractions material could have been more meaningful. Mathematics learning activities should have utilized existing technology to teach fractions material. In addition, researchers also highlighted that the teaching resources used by students discussed more symbolic fractions than contextual fractions related to everyday life and culture. This shows the need for more cultural integration to support meaningful mathematics learning for prospective elementary school teachers in understanding fractions material. Using flexible and easily accessible technology-based teaching materials anywhere has not yet been implemented. As a result, the provision of PGMI students as prospective teachers skilled in using technology to answer curriculum demands still needs to be improved. In fact, of the many studies on teaching fractions, some involve the use of technology (Verbruggen, 2021; Wijaya et al., 2020) and the integration of cultural approaches, namely Ethnomathematics (Anriana et al., 2023; Sunzuma, 2022).

Practically, education cannot be separated from cultural values; both complement and support each other. If education changes, then culture also changes. In other words, education and culture influence each other and provide a reciprocal relationship that leads to change (Siregar & Dewi, 2022; Widyastuti, 2021). Therefore, integrating culture with learning materials will provide meaningful learning and indirectly play a role in preserving the culture. Therefore, the solution to this problem is to apply culture-based learning in mathematics. Applying culture in mathematics learning is one alternative to teaching meaningful mathematics and introducing and preserving culture to students (Nur et al., 2020; Rahmawati et al., 2023). Implementing culture-based learning in mathematics is called Ethnomathematics (D'Ambrosio, 1985; Fajriyah, 2018; Iswara et al., 2022; Rahmawati et al., 2023).

Ethnomathematics provides meaningful learning through cultural integration while building knowledge about Ethnomathematics for prospective elementary school teachers. In this case, there needs to be media and efforts to realize this. Students will understand more easily if they can relate to past concepts or experiences (Prihastari et al., 2023; Yolanda & Wahyuni, 2020). Researchers (Sunzuma, 2020) also revealed in his research that teachers argue that the ethnomathematics approach should be integrated into teaching and recommend that teachers be trained to use the ethnomathematics approach when teaching. Facilitating meaningful learning based on Ethnomathematics on fraction material can be done by utilizing learning media in the form of technology. Researchers also believe using technology to learn mathematics is necessary to optimize learning (Darmayanti et al., 2022; Rasvani & Wulandari, 2021). One is through an e-module based on traditional food ethnomathematics that presents meaningful learning and is close to students' daily activities.

Learning mathematics using the context of traditional food ethnomathematics can help and increase the insight of prospective elementary school/MI teacher students in understanding the concept of fractions. Several researchers also revealed findings and exploration of traditional food ethnomathematics that can potentially be a source of mathematics learning (Asma & Kadir, 2022; Dalimunthe et al., 2022; Fitriyani et al., 2022). The findings report that traditional food is involved in learning mathematics, one of which is the concept of geometry. So far, ethnomathematics studies of traditional food on fractional material have yet to be widely found. Therefore, developing an e-module on the Ethnomathematics of traditional food on fractional material is much needed because the goals of future mathematics education need to get more attention that refers to the relationship between mathematics education and practices (communities, institutions, ...) such as home, continuing education and work (Bakker et al., 2021; Hidayati & Prahmana, 2022).

Based on this, in this study, the researcher integrated Indonesian culture in the form of traditional food with fractional number material for PGMI UIN Sunan Kalijaga Yogyakarta students. This study and its integration are presented through an ethnomathematics-based fractional number e-module that is easily

accessed and understood by prospective MI teacher students. The development of this e-module is very important because, so far, studies on Ethnomathematics have involved more geometric concepts in their findings. For example, (Kadir 2022) research explored the Ethnomathematics found in making traditional Cangkuning cakes in the Bugis community, which involves the mathematical concepts of geometric solids, similarity, and comparison.

The strength of this study lies in its innovative approach to integrating Ethnomathematics with fraction learning through traditional food-based e-modules. This approach makes learning more meaningful and relevant for student teachers and helps preserve local culture. By utilizing technology, this e-module offers high flexibility and accessibility, allowing for more effective and engaging learning. The weaknesses of this study may be related to challenges in implementation, such as the availability and readiness of technology in all educational institutions and the need for additional training for lecturers and students in using this e-module optimally. In addition, the limitations of previous studies that focused more on geometric concepts than fractions may require more trials and validation in the context of fraction learning. The novelty of this study lies in the direct integration of local culture into mathematics learning, an approach that has yet to be widely explored in the context of fractions. Using traditional food as a learning context also offers a unique way to relate mathematical concepts to students' daily experiences, which can improve their understanding and practical application of the material being taught. Therefore, the development of this e-module is expected to be a source of independent learning that can provide knowledge and understanding of the relationship between traditional food and the concept of fraction material for student elementary school teachers in universities. In addition, it is one way that can be done to answer the general problems of education so far, namely the lack of meaning in mathematics learning experienced by students and as a provision of knowledge for prospective elementary school teachers for service in educational units later.

2. METHOD

This research is a development study developed using the ADDIE model, which is limited to the development stage. The ADDIE model comprises analysis, design, development, implementation, and evaluation (Syahrial et al., 2019; Ulum et al., 2020). The stages of the ADDIE model development research can be seen in Figure 1. The explanation for each stage is as follows: 1) Analysis stage: at this stage, the researcher analyzes the need for the development of mathematics learning media through the results of observations and interviews with lecturers of Basic Mathematics courses and students. 2) Design stage: at this stage, the researcher designs and prepares the design of teaching materials to be developed. 3) Development stage: at this stage, the ethnomathematics e-module is compiled with a scientific approach by CPL (Graduate Learning Outcomes), CP-MK (Course Learning Outcomes), indicators, introduction, module content, evaluation, bibliography, and answer keys. After the module has been compiled, experts carry out an assessment. The experts consist of 2 people, namely material experts and media experts.

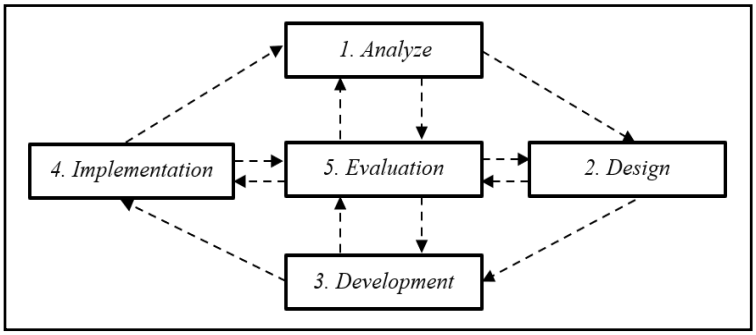

Figure 1. Stages of ADDIE Model Development
(Source: Sugihartini & Yudiana, 2018)

The subjects involved in this study were one material expert, one media expert, and second-semester UIN Sunan Kalijaga Yogyakarta students in 2022/2023. The subjects of the small group trial were carried out by taking 12 second-semester students of class A PGMI UIN Sunan Kalijaga Yogyakarta. The data in this study were collected through observation, interviews, questionnaires, and tests. The research instruments used in data collection in this study were module validation sheets and response questionnaire sheets. The expert assessment technique was carried out by providing a validation questionnaire. After being assessed, the researcher improved the ethnomathematics e-module on fraction material according to

the suggestions given by the material and media experts. Then, a revised initial design was obtained. Furthermore, improvements were made to make the teaching materials more systematic and high-quality. The grid of the material expert, media expert, and student response instruments is presented in Table 1, Table 2, and Table 3.

Table 1. Material Expert Instrument Grid

No	Aspect	Component	Item Number	Total Item
1	Content Eligibility	Compatibility of RPS and CP-MK	1, 2, 3	3
		Suitability to student needs	4, 5	2
		Suitability to teaching material needs	6, 7	2
		The truth of the substance of the matter	8	1
		Conformity with social values	9	1
		Benefits of increasing knowledge	10	1
2	Language	Readability	11, 12, 13	3
		Clarity of information	14	1
		Conformity with Indonesian language rules	15	1
		Effective and efficient use of language	16, 17	2
3	Presentation	Clarity of purpose	18	1
		Systematic presentation sequence	19	1
		Communicative	20	1
		Completeness of information	21	1
		Providing motivation	22	1
4	Graphics	Use of letters	23, 24	2
		Layout	25	1
		Use of illustrations, graphics, photos	26, 27	2
		Display design	28, 29	2
Total				**29**

Table 2. Media Expert Instrument Grid

No	Aspect	Component	Item Number	Total Item
1	Physical or Appearance	Color composition against the background	1	1
		Design appeal	2	1
		Synchronization between illustrations, graphics, and visuals	3	1
		Layout	4,5	2
2	Presentation	Systematic presentation sequence	6	1
		Accuracy of media use	7,8,9	3
		Consistency of presentation	10,11	2
3	Utilization	Ease of module use	12, 13	2
		Ease of interaction with the module	14, 15, 16	3
		Availability of examples and illustrations for understanding the material	17	1
		Facilitating teaching and learning activities	18, 19	2
4	Graphics	Use of letters	20, 21	2
		Use of illustrations	22, 23	2
		Use of color	24	1
Total				**24**

Table 3. Grid of Student Response Instruments for Ethnomathematics E-Modules

No	Aspect	Component	Item Number	Total Item
1	Presentation of Material	Clarity of Learning Objectives	1	1
		Suitability of materials and objectives	2	1
		Order of presentation of materials	3	1
		Appropriateness of media use	4	1
		Completeness of information	5, 6	2
2	Language	Readability	7, 8	2
		Clarity of information	9, 10	2

No	Aspect	Component	Item Number	Total Item
		Use of Language	11, 12, 13	3
3	Utilization	Ease of use of modules	14, 15	2
		Ease of interaction with modules	16, 17	2
		Availability of examples and illustrations of understanding materials	18	1
		Facilitating teaching and learning activities	19	1
4	Graphics	Use of letters	20, 21	2
		Use of illustrations, graphics, photos	22	1
		Layout or layout	23	1
		Display design	24	1
		Total		**24**

The data obtained in the study were then analyzed using qualitative and quantitative descriptive analysis methods. Qualitative descriptive analysis methods are methods of analyzing/processing data by systematically arranging them in sentences/words and categories regarding an object (object, symptom, certain variable) to obtain a general conclusion. Quantitative descriptive analysis methods process data by systematically arranging them in numbers and percentages regarding an object being studied to obtain a general conclusion. The data from the qualitative descriptive analysis results are then converted into a conversion table of achievement levels on a scale of 5, presented in Table 4.

Table 4. Conversion of Achievement Levels on a 5-Point Scale

Achievement Level Interval %	Qualification
90-100	Very good
80-89	Good
65-79	Enough
55-64	Poor
1-54	Very poor

(Tegeh et al. dalam N. L. P. S. U. Putri & Jayanta, 2023)

3. RESULT AND DISCUSSION

Result

The research on developing electronic module teaching materials was conducted by applying the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. However, the researcher limited the research to the development stage in this study.

Analysis Stage (Analyze)

In the first stage, the process of analyzing needs, curriculum analysis, environmental analysis, facilities, and availability of learning resources was carried out. The results of observations and interviews showed that students still needed help understanding the material on fractional numbers. Efforts to use learning media have been made. Lecturers use props in the form of fractional circles to demonstrate the value of each fractional number. However, it is not related to everyday life. Students need to learn the concept of Ethnomathematics, which can bridge formal mathematics with cultural mathematics that develops in society. The learning system still applies conventional learning centered on lecturers (teacher-centered learning). In addition, the teaching materials used are only sourced from books discussing symbolic fractions more than contextual ones. Meanwhile, the use of technology in the learning process of fractions still needs to be improved.

Furthermore, the researcher conducted a curriculum analysis on the RPS (Semester Learning Plan) of the Basic Mathematics course to find out information related to CPL (Graduate Learning Achievements), CP-MK (Course Learning Achievements), expected final abilities (Sub-CPPD), indicators and study materials that are required to be achieved by students. The results of this analysis are a benchmark for researchers in compiling e-module materials by the expected competencies. The fractional number material that is the reference for developing the ethnomathematics-based fractional number e-module is shown in Table 5.

Table 5. Fraction Number Material in the Semester Learning Plan (RPS)

Expected Final Competencies (Sub-CPPD)	Indicator (Id)	Study Materials
Students can understand fractional number operations and their use to solve problems and design their learning.	Students can: - Mention equivalent fractions - Make denominators the same - Add and subtract various forms of fractional numbers - Select and use appropriate learning media for addition and subtraction operations - Multiply and divide various forms of fractional numbers - Select and use appropriate learning media for multiplication and division operations	1. Definition of fractions 2. Equivalent fractions 3. Basic operations of ordinary fractions 4. Basic operations of mixed fractions

Finally, the results of the analysis show that the environment, facilities, and availability of learning resources allow for the development of electronic learning media. The facilities in question are LCD projectors, IWB (Interactive Whiteboard), wifi, and gadgets that can support meaningful learning by integrating Ethnomathematics and technology in fractional number material. Based on the three analyses in the analysis stage, an ethnomathematics-based fractional number e-module was developed for prospective elementary school teacher students to solve the existing problems.

Design Stage

The second research stage is the design stage of teaching material products. At this stage, the researcher designed an e-module for fractional numbers according to the e-module writing structure of the Ministry of National Education. Furthermore, the researcher compiled the content of the material and learning evaluation. The design of the learning content was compiled according to the achievement indicators in the fractional number material. The content of the material will be linked to the Ethnomathematics of traditional food from several regions in Indonesia.

For this reason, the researcher sought additional information on the types of traditional foods with a mathematical concept of fractional numbers. This information was obtained from various study results on ethnomathematics exploration of traditional foods, observations, and direct experiences of researchers in the field. The types of traditional foods included in the ethnomathematics-based fractional number e-module are *Kue Lapis*, *Terang Bulan*, *Bakpia*, *Lemang*, *Ketupat*, and *Wajik*. The e-module is also equipped with pictures, illustrations, and practice questions in each sub-discussion that can support understanding the fractional number material. Ultimately, the e-module has conclusions, evaluations, and answer keys.

Development Stage

After the design of the teaching materials was completed, the research continued to the third stage, namely the product development stage. The media was developed according to the design made using the Canva application. At this stage, the template and font were selected. The template chosen combined green and orange base colors, while the font used was Montserrat Classic. This font was chosen because it did not have feet or hook lines to comfort the reader. In addition, the researcher also utilized the live worksheet and Google form applications to facilitate the work on the questions on the e-module. Furthermore, the e-module that had been developed was converted into a flip PDF display using the Hyzine application to become electronic teaching materials. The results of the media development are presented in Figure 2.

Figure 2. Results of the E-Module Development Process

At this stage, an expert assessment was also conducted on the developed ethnomathematics-based fractional number e-module product. This assessment was carried out to test the product's validity, including assessments by material and media experts. The expert assessment technique was carried out by giving a questionnaire. After being assessed, the researcher revised the ethnomathematics-based fractional number e-module according to the suggestions given by material experts and media experts. Then, a revised initial design was obtained. Furthermore, a small group trial was conducted on 12 UIN Sunan Kalijaga students to test the practicality of using the developed ethnomathematics e-module. The results of the product testing are presented in Table 6 below.

Table 6. Product Trial Results

No	Product Trial Results	Validity Results (%)	Description
1	Material expert test	97.93%	Very good
2	Media expert test	96.66%	Very good
3	Small group trial	90.21%	Very good

Table 6 shows that the developed ethnomathematics e-module product has very good qualifications, with material and media validity test results of 97.93% and 96.66%. In addition, the results of the small group trial obtained an average value of 90.21%. Thus, the developed ethnomathematics-based fractional number e-module is feasible and practical for use and teaching to prospective MI teacher students. The input, comments, and suggestions provided are used as a reference to improve this ethnomathematics-based fractional number e-module product.

Discussion

This study developed an ethnomathematics-based fractional number e-module with very good qualifications and is feasible to use and teach to PGMI students. This feasibility and practicality are influenced by several things, including the development of the e-module using the ADDIE model, which in this study was limited to the development stage. The material in the e-module is arranged clearly and structured by the CP-MK and achievement indicators contained in the Semester Learning Plan (RPS) of the PGMI Study Program, Faculty of Teacher Training and Education, UIN Sunan Kalijaga Yogyakarta. In addition, the material content in the e-module is equipped with the ethnomathematics content of traditional food, providing meaningful learning for students in understanding fractional number material. Ethnomathematics includes cultural elements in mathematics learning that can create meaningful and contextual learning for students (Disnawati & Nahak, 2019; Nurmaya, 2021).

So far, the lack of personal relevance to mathematics learning has often been cited as the main cause of negative attitudes towards mathematics learning (Clarke, 2018; Siregar & Dewi, 2022). In fact, in the world of education itself, studying the mathematical culture of a community group has a very important role, especially in learning mathematics in elementary schools (Anriana et al., 2023; Nurjannah et al., 2020). This is because Ethnomathematics can connect mathematical material with everyday life. So, every learner can see the value and benefits of learning mathematics in their own lives. Additionally, integrating Ethnomathematics in this e-module provides a conceptual understanding of fraction material for prospective elementary school teachers. This understanding is an important foundation for successful progress in elementary and secondary mathematics (Cendekiawaty, 2020; Shin & Bryant, 2015). Thus, integrating Ethnomathematics into learning is one of the effective ways to improve prospective MI teachers' knowledge and understanding of fractions.

The ethnomathematics content of traditional food presented in this e-module is Kue Lapis, Ketupat, Terang Bulan, Wajik, and Bakpia. Pieces of the cake are used as learning resources to introduce the concept of fractions, such as recognizing parts of a whole, comparing and simplifying fractions, determining equivalent fractions, and fractional number arithmetic operations. The discussion of the material in the e-module has a wider scope. It explains the problem of symbolic and contextual fractions directly connected to everyday life. Because of some problems in learning fractions, the concept of fractions has not been well defined, and the general explanation of the fraction material still needs to be improved (Cendekiawaty, 2020; Rasvani & Wulandari, 2021). Meanwhile, good mathematics learning ensures meaningful mathematics, in line with human activities, and can develop mathematical thinking about ideas rather than simply absorbing a series of static and unconnected knowledge and skills (Jitendra et al., 2016; Li & Schoenfeld, 2019).

Presentation of fractional number material in electronic modules is one of the efforts to present meaningful mathematics learning. This technology makes e-modules easy to operate and learn by students whenever and wherever they are. Several studies also report the same thing, that the operation of electronic modules is easier and can be accessed via Android, laptops, or tablets (Husnulwati et al., 2019; Kholid, 2021;

Rindaryati, 2021). In addition to being easily accessible, using pictures and visual illustrations of traditional foods in the e-module provides a concrete learning experience for the concept of fractions. Visual representations are an evidence-based practice and an excellent way to present abstract ideas in mathematics (Baiduri, 2020; Jitendra et al., 2016). Learning in this way can transfer the contents of the material easily because it starts from concrete to abstract concepts (Ediyanto et al., 2020; Ulum et al., 2020). So prospective MI teacher students find it easier to understand the material because Ethnomathematics of traditional food presents a simpler, more meaningful, and enjoyable editorial. This can certainly produce prospective elementary school teachers who understand and are more interested in studying mathematics and getting to know the culture in their area (Hidayati & Prahmana, 2022; Zaharah & Susilowati, 2020).

In addition to the material, the development of ethnomathematics e-modules is also equipped with evaluation questions. This aims to measure the achievement of prospective MI teachers in understanding the concept of fractional numbers. The practice questions in the e-module are designed interactively so that students can work directly on them without using paper or books. Many technology applications significantly impact mathematics education (Nurmaya, 2021; Wijaya et al., 2020). One of them is through the automatic correction system used in this e-module. This system allows students to find their learning outcomes immediately after submitting the answers. The practicality of working on these interactive questions is obtained using Google Forms and Live Work Sheets. This application indirectly demonstrates to prospective MI teachers how to effectively use technology in learning. Researchers (Verbruggen, 2021) also reported that a learning approach that has the potential to support the development of early mathematics skills is the use of learning technology. This can help prospective elementary school teachers acquire important digital skills for their future.

Furthermore, the ethnomathematics e-module is also equipped with steps for using the e-module, making it easy for every reader, especially PGMI students, to use the ethnomathematics-based fraction number e-module. This convenience can also increase the motivation of prospective elementary school teachers to understand the fraction number material. This is because the ethnomathematics-based fraction number material is arranged interestingly and is in line with everyday life. This is proven by several studies that show that the development of e-modules can increase students' learning motivation (Awwaliyah et al., 2021; Oksa & Soenarto, 2020; Zaharah & Susilowati, 2020). Based on research supported by previous research results, it is known that ethnomathematics-based fractional number e-modules can provide meaningful and contextual learning for prospective elementary school teachers. E-modules can also increase the interest and enthusiasm for learning of prospective elementary school teachers and hone their skills and curiosity about fractional number material through practice questions that can stimulate their interest in improving learning outcomes and ethnomathematics knowledge. The implications of this research are very significant for various aspects of education, especially in the context of mathematics learning at the Elementary School (SD) level and training for prospective Madrasah Ibtidaiyah (MI) teachers. Developing ethnomathematics-based fractional number e-modules can be an innovative model for delivering mathematics material meaningfully and relevantly. This is expected to increase the understanding and interest of prospective teacher students in the concept of fractions so that they are more prepared and competent in teaching mathematics in the future. Using technology in the form of e-modules provides flexibility and accessibility that can improve the quality of learning, allowing students to learn independently anytime and anywhere. Integrating cultural elements in mathematics learning through Ethnomathematics enriches the teaching materials and contributes to preserving local culture, bridging formal education with students' daily lives. This implication suggests that mathematics education is about transferring abstract knowledge and connecting students with their cultural context, which can create a more comprehensive and meaningful learning experience. In addition, the results of this study also encourage educational institutions to use technology and culture-based approaches in their curriculum, which can ultimately improve the overall quality of education.

4. CONCLUSION

This study successfully developed an ethnomathematics-based fractional number e-module that has very good qualifications and is suitable for use by PGMI students. By using the ADDIE development model that focuses on the development stage, this e-module is arranged clearly and structured according to the CP-MK and achievement indicators in the Semester Learning Design (RPS) of the PGMI Study Program, Faculty of Teacher Training and Education, UIN Sunan Kalijaga Yogyakarta. Integrating traditional food ethnomathematics content in the e-module provides meaningful and contextual learning, improving students' conceptual understanding of fractional number material. Using technology in the form of easily accessible e-modules and concrete visual illustrations helps students understand abstract concepts more easily and enjoyably. Interactive evaluation through technology applications such as Google Forms and Live

Work Sheet also increases students' practicality and learning motivation. Overall, this e-module enriches the mathematics learning experience, contributes to preserving local culture, and develops important digital skills for prospective MI teachers. The results of this study indicate that ethnomathematics and technology-based approaches in mathematics learning can significantly impact the understanding, interest, and learning motivation of prospective MI teachers and encourage educational institutions to adopt similar innovative approaches in their curriculum.

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