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Development of Ethnomathematics-Based Questions on Relations and Functions

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Abstrak

Pembelajaran matematika diharapkan dapat dikaitkan dengan budaya yang sering disebut dengan etnomatematika. Bajan ajar yang berbasis dengan etnomatematika sudah bisa ditemukan baik berupa modul dan LKPD, namun belum banyak ditemukan soal-soal yang berbasis etnomatematika pada materi tertentu terkhusus untuk materi relasi dan fungsi. Penelitian ini bertujuan untuk menghasilkan soal etnomatematika yang valid dan praktis untuk materi relasi dan fungsi. Jenis penelitian yang digunakan adalah penelitian pengembangan atau *research and devolepment* dari model yang dikembangkan oleh Tjeerd Plomp yang terdiri dari tiga yaitu: *Preliminary research, Prototyping stage, Assessmentphase.* Subjek penelitian ini adalah siswa kelas VIII MTs. Instrumen yang digunakan dalam penelitian ini adalah lembar wawancara, lembar angket dan tes. Kriteria penilaian dari pengembangan produk tersebut adalah dilihat dari kevalidan dan praktikalitas produk. Berdasarkan hasil validasi terhadap soal berbasis etnomatematika dinyatakan valid oleh para validator dengan berpatokan pada kriteria kevalidan lebih besar dari 0,9. Dari hasil analisis validasi para validator, menunjukkan bahwa soal tersebut valid berdasarkan aspek isi, bahasa dan budaya. Selain itu hasil penelitian juga menunjukan bahwa soal yang dikembangkan memenuhi kriteria praktis. Hasil analisis data angket praktikalitas peserta didik diperoleh hasil persentase rata-rata 72,12 %.
Kata kunci: Pengembangan Soal, Relasi dan Fungsi, Etnomatematika

Abstract

Mathematics learning is expected to be linked to culture, known as Ethnomathematics. Although ethnomathematics-based teaching materials can be found in modules and worksheets, there are few ethnomathematics-based questions on the specific material, particularly relations and functions. This research aims to generate valid and practical ethnomathematics questions for the material on relationships and functions. Tjeerd Plomp's research and development methodology was used in this study, which consists of three stages: preliminary research, prototyping, and assessment. The participants in this study were eighth-grade Islamic junior high school students. This study's instruments included interview sheets, questionnaires, and tests. The validity and practicality of the product are the product's evaluation criteria for development. The validators declared the questions valid based on a validity criterion greater than 0.9 based on the validation. As a result, the questions are valid regarding content, language, and culture. Furthermore, the analysis demonstrates that the questions developed meet practical criteria. The student practicality questionnaire data analysis revealed that each indicator's percentage ranged between 82.14% and 92.8%.
Keywords: Problem Development, Relations, Functions, Ethnomathematics.

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INTRODUCTION

An educator must be able to conduct evaluations, both during the learning process and when assessing learning outcomes. Learning evaluation is a professional competency of an educator. This competency corresponds to the teacher's ability assessment instrument, one of which is conducting a learning evaluation (Asrul et al., 2014). Educators can also use evaluation to identify weak points and quickly find solutions to make things better in the future.

The success of learning programs is always measured in terms of learning outcomes, which are achieved by asking students questions about the material they have submitted (L,I, 2019). As an educational evaluation tool, questions are essential, and teachers will always use them to assess students' abilities. Providing varied and interesting questions is also necessary for classroom learning, such as practice, sample, and test questions. Teachers can use them as a question bank that facilitates learning. Mathematical problems commonly found in schools must be given an innovative twist with something that will capture students' attention.

Many mathematics problems can be found in books and on the internet, but they cannot meet the needs of students. Mathematical problems are intended to assess students' abilities while also increasing students' interest in working on these questions. The development of ethnomathematics questions also varies, intending to create mathematical questions that can be used to measure students' problem-solving abilities using ethnomathematics-based level 4 PISA model mathematics questions (Nuryenisa et al., 2022). HOTS questions based on the ethnomathematics culture of Jambi can boost student learning motivation (Kamid et al., 2021). Learning mathematics through Ethnomathematics makes it easier for students to understand the material. This statement is consistent with research findings that learning through Ethnomathematics can help students understand mathematical concepts in transformation material (Shofiyati, 2020). Ethnomathematics-based teaching materials also improve students' problem-solving abilities (Imswatama & Lukman, 2018). Teaching materials based on Ethnomathematics, such as modules and worksheets, can help students understand the concept of circles and geometric shapes (Ayuningtyas & Setiana, 2019; Oktarina et al., 2019) and improve students' communication skills (Juni Tamara et al., 2021). Students who use ethnomathematics-based worksheets learn better than students who do not use ethnomathematics-based worksheets (Imswatama & Lukman, 2018). According to the study's findings, questions and teaching materials based on Ethnomathematics assisted students in understanding mathematical concepts in specific materials.

Data obtained in the field based on interviews with three mathematics teachers at MTS Mualimin Bangkinang, SMPN 1 Bangkinang Kota, and SMPN 1 Salo revealed that in the online learning process, the teacher sent questions to be solved by students. These questions were obtained from mathematics books or worksheets. However, the teacher stated that innovation was still required for questions that could evaluate the process of online mathematics learning.

Based on this information, it is necessary to create mathematical questions that teachers can use. Using cultural content, also known as Ethnomathematics, is one of the innovations that can be made in problem development. Culture refers to all human knowledge as social beings, which is used to understand the environment and their experiences, and which guides their behavior (Fajriyah, 2018). Ethnomathematics is a type of mathematics influenced or based on culture. According to D "Ambrosio (Yulianti Maulida, 2016), Ethnomathematics studies in mathematics learning can cover a wide range of topics. Ethnomathematics applies mathematical concepts to various mathematical activities, such as grouping activities, counting, measuring, designing buildings or tools, playing, determining locations, and so on. According to (Marsigit et al., 2014), Ethnomathematics encompasses all aspects of a group's cultural identity, including language, codes, values, jargon, beliefs, food and clothing, habits, and physical characteristics. Mathematics encompasses a wide range of arithmetic, classification, sorting, conclusion, and modeling.

Ethnomathematics can be an alternative to instilling noble cultural values eroding in this modernization era (Wahyuni et al., 2013). Modernization is the product of scientific and technological advancement, which is still ongoing. The degradation of these noble cultural values, according to Wahyuni, is caused by a lack of application and awareness of the importance of cultural values in society, particularly among the younger generation or students. Based on existing cultural values, developing a platform to bridge the cultivation of national character in education is vital. The application of Ethnomathematics is one method. Furthermore, by incorporating Ethnomathematics into education, particularly mathematics education, students can better grasp mathematics (Situmorang, A. S., & Naibaho, 2020) and their culture, making it easier for educators to instill cultural values in participants. Cultural values that are part of the national character are implanted in them early.

Because the findings of this study would be used in schools throughout Riau Province, particularly in Kampar Regency, the researcher chose Riau Malay Culture to produce mathematical problems. Preserving Malay culture entails reintroducing historical and cultural values and incorporating cultural components into school or educational disciplines. So far, learning environments have shaped students into mere objects that accept information from

teachers, which is a difficult barrier to overcome (Putri et al., 2019). Students will indirectly understand the Riau Malay culture by learning ethnomathematics-based mathematics. Most of what pupils learn in school does not correspond to their encounters. As a result, learning mathematics must provide substance or a bridge between mathematics in the ordinary world and local culture. Learning results can be influenced by worksheets or ethnomathematics-based teaching materials (Astuti et al., 2021).

Due to a pandemic and schools not allowing large numbers of students to gather, the results of this study only reached the validity and practicality stages. Hence, this research was only carried out in the validity and practicality stages.

METHODS

This research employed the research and development model developed by Tjeerd Plomp. The Plomp model consists of three stages: preliminary research, prototyping, and assessment (Plomp & Nieveen, 2013). In the preliminary research stage, a needs analysis, analysis of the availability of questions, student analysis, concept analysis, and analysis of existing teaching materials were carried out.

In the development or the prototyping stage, the researchers designed ethnomathematics-based mathematical problems. The prototype stage was focused on validity and investigated through self-evaluation and expert review. After being revised, the stage was followed by an assessment of the practicality of questions through one-to-one evaluation and a small-group trial.

In the assessment stage, a small-group trial was performed. In this activity, the ethnomathematics-based questions were tested in a small-group of six students with various learning abilities. The chosen six students were determined by the researcher, assisted by the mathematics teacher. The assessment stage aimed to assess the practicality of the developed ethnomathematics-based questions. Therefore, the evaluation stage was seen based on the product's practicality. The problem is said to be practical if the user has no difficulty understanding and solving the ethnomathematics-based questions. If the results are not practical, then it is necessary to revise the questions developed so that questions are valid and practical.

The instruments used in this research were interview sheets, questionnaires, and tests. Interviews were used as a data collection technique if the researchers wanted to conduct a preliminary study to find problems that must be studied. The questionnaire is a data collection technique carried out by giving respondents a set of questions or written statements to answer.

The test is a method of giving students a series of questions or exercises to measure their abilities, knowledge, and skills in solving problems. The research subjects were eighth-grade students.

The descriptive data analysis technique was employed in this study to examine the data after validation by revising depending on the validator's notes. The findings of this analysis will be used to revise the researcher's ethnomathematics-based mathematical problems. The questionnaire analysis technique employed a formula to compute the proportion of replies for each category and aspect. The following formula was employed to calculate the percentage of answers for each category and aspect.:

$$K_{ij} = \frac{The\ number\ of\ responses\ to\ the\ i-th\ aspect\ jth\ category}{The\ maximum\ number\ of\ responses\ to\ the\ i-th\ aspect\ \ jth\ category} \times 100\%$$

RESEARCH FINDINGS

The construction of mathematical problems on relations and functions based on Ethnomathematics resulted in 25 items corresponding to competency achievement indicators. The stages or activities for developing ethnomathematics-based mathematics for the relations and functions material of the eighth grade of junior high school are as follows.

Preliminary Research

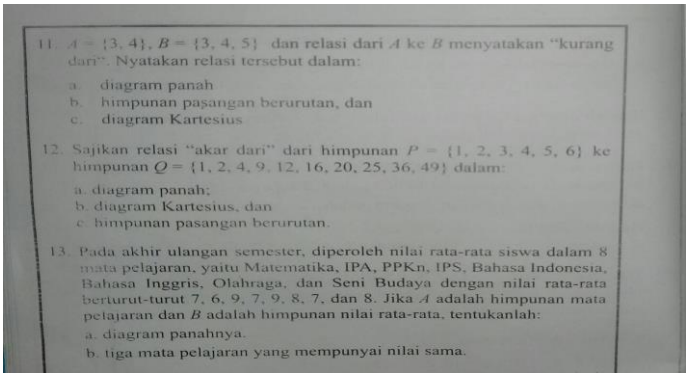
Based on preliminary research, the prototype in the form of ethnomathematics-based mathematics questions was created. The preliminary research stage seeks to identify and specify the learning requirements for prototype development. At this stage, the needs, student characteristics, curriculum, concept, and question availability analysis were carried out. This research was carried out to produce prototypes required by students and teachers. The following are the analysis results:

Need Analysis Results

A needs analysis is one method of gathering information for the initial report. Needs analysis is critical for obtaining information about the components required to develop a product. According to information and interviews with mathematics teachers, many students had a limited understanding of mathematical concepts because a learning process that can develop the ability to understand students' mathematical concepts has not been implemented. Furthermore, there were no questions as an evaluation tool designed specifically to aid students' mathematical problem-solving abilities.

Questions can be used as an evaluation tool to determine students' learning difficulties, specifically the students' weaknesses, and strengths in mastering each learning material. Therefore, the questions must be pertinent to the learning process's objectives.

Questions from textbooks and worksheets are common evaluation tools teachers use in schools. The textbook used is one provided by the government. Figure 1 shows a sample of the questions from the textbook.


11. $A = \{3, 4\}$, $B = \{3, 4, 5\}$ dan relasi dari A ke B menyatakan "kurang dari". Nyatakan relasi tersebut dalam:
a. diagram panah
b. himpunan pasangan berurutan, dan
c. diagram Kartesius

12. Sajikan relasi "akar dari" dari himpunan $P = \{1, 2, 3, 4, 5, 6\}$ ke himpunan $Q = \{1, 2, 4, 9, 12, 16, 20, 25, 36, 49\}$ dalam:
a. diagram panah;
b. diagram Kartesius, dan
c. himpunan pasangan berurutan.

13. Pada akhir ulangan semester, diperoleh nilai rata-rata siswa dalam 8 mata pelajaran, yaitu Matematika, IPA, PPKn, IPS, Bahasa Indonesia, Bahasa Inggris, Olahraga, dan Seni Budaya dengan nilai rata-rata berturut-turut 7, 6, 9, 7, 9, 8, 7, dan 8. Jika A adalah himpunan mata pelajaran dan B adalah himpunan nilai rata-rata, tentukanlah:
a. diagram panahnya.
b. tiga mata pelajaran yang mempunyai nilai sama.

Figure 1. The Question in the Textbook

The book's questions are broad in scope. The questions provided are of the routine variety. There are some questions in the form of comprehension concepts, but these questions are too complex for students to understand. The available questions are also limited in both quantity and variety. The context of the questions used is also general, and the teacher does not have time to create varied questions due to the numerous assignments. The teacher has also never created questions with varying content; instead, the teacher usually only changes the number of available questions. Thus, to sharpen students' mathematical abilities, teachers require questions as an assessment tool that can facilitate and develop students' conceptual understanding.

One possible solution to this problem is to include non-standard questions about Kampar Malay culture. Ethnomatematics-based questions are real-world inquiries that are framed following the truth. As a result, with ethnomathematics-based questions, students will find it easier to solve problems while learning about Kampar Malay culture. Furthermore, students are allowed to apply their conceptual understanding skills to problem-solving.

Student Analysis

Student analysis aims to identify the characteristics and needs of MTS Mualimin Bangkinang students. The students whose characteristics were examined were from the eighth grade. According to interviews with mathematics teachers, the eighth-grade students who served as research subjects ranged in age from 13 to 14. According to Piaget's theory, the cognitive development of children around 13 has entered the formal operational stage, which is

the final stage. The child can reason at this stage without having to deal with objects or experience direct events (Alhaddad, 2012).

Children at the formal operational stage can solve problems and reason using abstract objects. Concrete objects are no longer required (Zulfah et al., 2018). Children at that age have the characteristics of being able to solve the problems given, so they can try new things related to solving real problems. Students require learning that allows them to explore their abilities because each child has a different level of ability. Therefore, it is necessary to provide problems that enable them to use their level of knowledge.

Students also learn about the cultures that exist in their area. However, they only hear the names and have no idea what they mean. In Kampar Regency, for example, the term siaacuang is used. Students have heard the term, but they are unsure of what it is or what it is used for.

Curriculum Analysis

Curriculum analysis is performed to determine whether the material taught follows the recommended competencies. Curriculum analysis for junior high school mathematics is based on the 2013 curriculum, which is an annex to the Regulation of the Ministry of Education and Culture Number 37 of 2018. Core competencies (KI), basic competencies (KD), competency achievement indicators (IPK), and learning materials are all important considerations. The curriculum includes four competencies: (1) spiritual attitude competence, (2) social attitude competence, (3) knowledge, and (4) skills. Only knowledge and skill competencies contain basic competencies. This curriculum analysis was obtained through school-related curriculum interviews. According to the research findings, MTS Mualimin Bangkinang used the 2013 curriculum.

At this stage, a study was conducted on the 2013 curriculum for the mathematics subject in the first semester of the eighth grade of junior high school, which included number patterns, Cartesian coordinates, relations and functions, straight line equations, and two variable linear equation systems. This analysis was used to develop questions based on Ethnomathematics. The questions developed referred to the established basic competencies and competency achievement indicators. All designed indicators were adapted to the basic competencies and indicators of concept understanding, but they cannot be separated from real-life content.

The results of elaborating learning indicators for core competencies in the materials on relations and functions tested can be seen in Table 1.

Table 1. The Formulation of Competence Achievement Indicators

Basic Competences	Competence Achievement Indicators
3.3 Describe and state relations and functions using various representations (words, tables, graphs, diagrams, and equations).	3.3.1 Explain examples of daily activities related to relations and functions. 3.3.2 Explain some of the relations that occur between the two sets. 3.3.3 Explain the various functions based on their characteristics. 3.3.4 Explaining function values and function graphs on Cartesian coordinates.
4.3 Solve problems related to relations and functions by using various representations.	4.3.1 Solve problems related to relations and functions by using various representations.

Based on the analysis of the curriculum content in Table 1, the composition of the basic competencies with indicators is appropriate. Before solving a problem, students are expected to be able to explain and determine the problem given.

Concept Analysis

Concept analysis can help determine the materials or content needed to create ethnomathematics-based mathematical problems. The material used for the research was the eighth-grade material on relations and functions. Figure 2 depicts the findings of a concept analysis of the material in a mathematics book published by the Ministry of Education and Culture of the Republic of Indonesia in 2017 (Revised Edition: 2017).

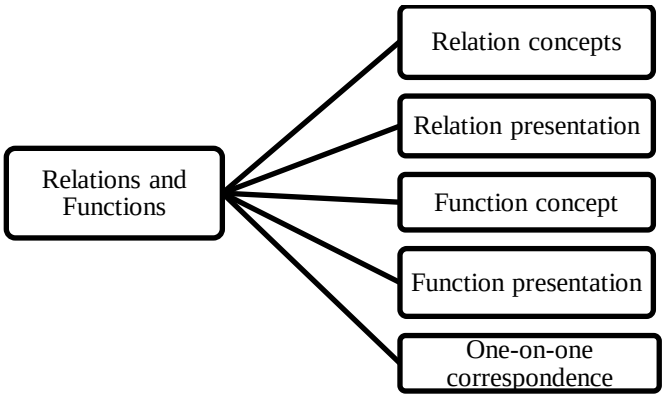
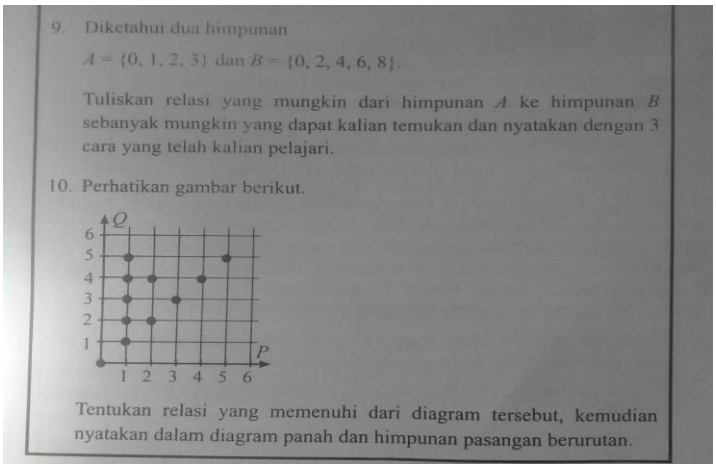


Figure 2. The Concept Map of Relations and Functions

The result of the Pre-existing Questions

The mathematics problems commonly used by teachers come from mathematics textbooks. The sample questions are shown in Figure 3.


9. Diketahui dua himpunan
$A = \{0, 1, 2, 3\}$ dan $B = \{0, 2, 4, 6, 8\}$.

Tuliskan relasi yang mungkin dari himpunan A ke himpunan B sebanyak mungkin yang dapat kalian temukan dan nyatakan dengan 3 cara yang telah kalian pelajari.

10. Perhatikan gambar berikut.

Tentukan relasi yang memenuhi dari diagram tersebut, kemudian nyatakan dalam diagram panah dan himpunan pasangan berurutan.

Figure 3. The Questions on the Concept of Relations for the Eighth-grade Junior High School Students

In Figure 3, two questions are related to the material concept of relations. The questions presented can already measure the ability to understand the concept of student relations. However, the questions presented are general, namely, related to numbers.

Prototyping Stage

The design results carried out at this stage are called prototype 1. The prototype formation stage uses formative evaluation, which includes self-evaluation, expert evaluation, and one-on-one evaluation.

The result of Self-Evaluation

The researcher then examined the completed problem designs using a self-evaluation sheet. Self-evaluation involves evaluating questions created by the researchers themselves. The goal is to double-check the completeness of the components contained in the construct validity questions. A self-evaluation sheet was used to observe the questions. The aspects observed in the questions were typing errors, punctuation accuracy, and a sentence's meaning clarity.

Prototype 1 was created based on the results of the self-evaluation. The ethnomathematics-based questions were generated using the basic competency, competency achievement indicators, and problems from everyday life. The errors discovered are as follows:

1. Adding information to each question.
2. Typing errors in questions 1 and 11.
3. Wrong punctuation in question 8.

4. Text size errors in questions 22 and 23.

In Figure 4, the errors based on the Enhanced Spelling of the Indonesian Language (EYD) were present in questions 1, 6, 9, and 10.

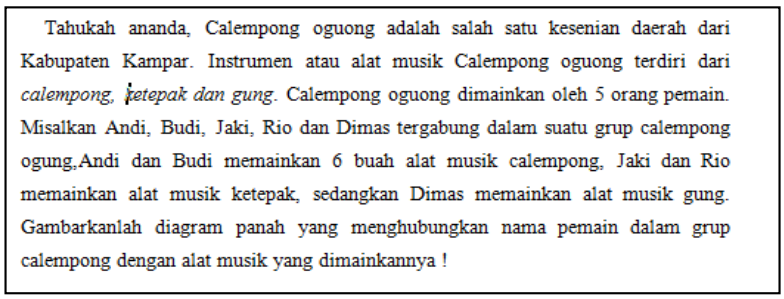

Tahukah ananda, Calempong oguong adalah salah satu kesenian daerah dari Kabupaten Kampar. Instrumen atau alat musik Calempong oguong terdiri dari *calempong, ketepak dan gung*. Calempong oguong dimainkan oleh 5 orang pemain. Misalkan Andi, Budi, Jaki, Rio dan Dimas tergabung dalam suatu grup calempong ogung,Andi dan Budi memainkan 6 buah alat musik calempong, Jaki dan Rio memainkan alat musik ketepak, sedangkan Dimas memainkan alat musik gung. Gambarkanlah diagram panah yang menghubungkan nama pemain dalam grup calempong dengan alat musik yang dimainkannya !

Figure 4. Errors based on the Enhanced Spelling of the Indonesian Language

The sentences in the problem were corrected after the self-evaluation. The word "Calempong oguong" was transformed into "Calempong Oguong," and the first letter of the musical instrument's name was capitalized. Based on the self-evaluation results, prototype 1 of the designed ethnomathematics-based questions was revised. The revision results were then discussed with the assigned experts.

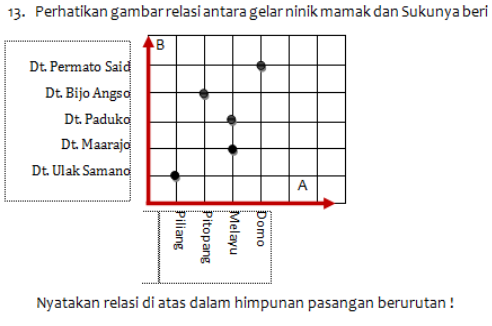
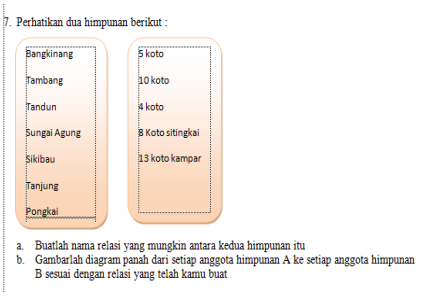
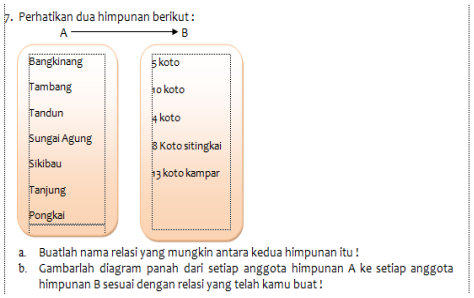
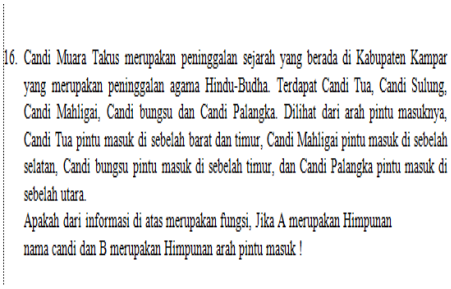
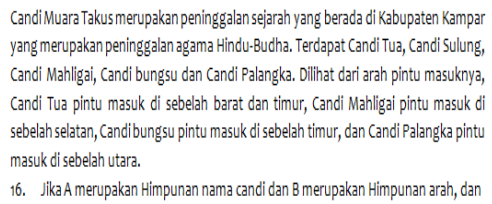
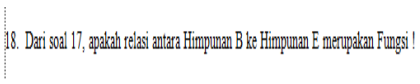
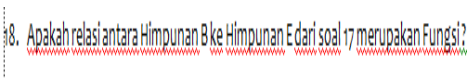
Expert Reviews

Experts completed this stage. The expert validators examined and evaluated the developed questions. The experts or validators suggested revising the question design. The validation process is used to determine the validity of the developed product. The questions were validated by five experts, who included three mathematics lecturers, a language lecturer, and a cultural expert.

All questions were declared valid by the three material experts. However, all the questions developed met the validity criteria, and several components needed to be revised to improve the questions. Table 2 shows the expert recommendations.

Table 2. Validators' Suggestion for the Ethnomathematics Questions

No	Suggestion	After Revision
Material Aspects		
1	Correct the writing of sentences in question 1. The writing is as follows "By looking at the example of the limo koto family tree chart, make a family tree of your mother's family! Then determine what forms of relations can be made.	Corrected writing of sentences in question 1 "Make a family tree from your mother's family by looking at the example of the Limo Koto family tree chart above. Then determine

		what types of relationships can be made?"
2	Add sentences for question 13.	Added sentences on question 13.
		
3	Add a symbol for the set in problem no 7.	Added set symbol in question 7.
		
4	Correct the writing of question 16 according to the proper Indonesian spelling.	Corrected spelling:
		
Language Aspects		
5	Correct the writing of sentences according to Indonesian spelling in question 18.	Corrections were made to the sentences according to the Indonesian spelling in question 18.
		

6	Correct the part that needs to be bolded in question 3. 3. Buatlah bentuk relasi hubungan mamak dan kemenakan dari silsilah keluarga diatas pada himpunan pasangan berurutan dengan aturan relasi *"mamak dari"* !	The part that needs to be bolded in question 3 after being corrected. 3. Buatlah bentuk relasi hubungan **mamak dan kemenakan** dari silsilah keluarga diatas pada himpunan pasangan berurutan dengan aturan relasi "*mamak dari*" !
Cultural Aspects		
8	Correct writing the name of the building in question 1. 16. Candi Muara Takus merupakan peninggalan sejarah yang berada di Kabupaten Kampar yang merupakan peninggalan agama Hindu-Budha. Terdapat Candi Tua, Candi Sulung, Candi Mahligai, Candi bungsu dan Candi Palangka. Dilihat dari arah pintu masuknya, Candi Tua pintu masuk di sebelah barat dan timur, Candi Mahligai pintu masuk di sebelah selatan, Candi bungsu pintu masuk di sebelah timur, dan Candi Palangka pintu masuk di sebelah utara. Apakah dari informasi di atas merupakan fungsi, Jika A merupakan Himpunan nama candi dan B merupakan Himpunan arah pintu masuk !	Improvements to writing the name of the building in question 16. Candi Muara Takus merupakan peninggalan sejarah yang berada di Kabupaten Kampar yang merupakan peninggalan agama Hindu-Budha. Terdapat Candi Tua, Candi Mahligai, Candi bungsu dan Candi Palangka. Dilihat dari arah pintu masuknya, Candi Tua pintu masuk di sebelah barat dan timur, Candi Mahligai pintu masuk di sebelah selatan, Candi bungsu pintu masuk di sebelah timur, dan Candi Palangka pintu masuk di sebelah utara. 16. Jika A merupakan Himpunan nama candi dan B merupakan Himpunan arah, dan relasi yang menghubungkan antara himpunan A dan B adalah "pintu masuknya" Apakah relasi dari imformasi di atas merupakan fungsi?

Based on the findings of the validity analysis of the ethnomathematics-based questions, it is possible to conclude that the ethnomathematics-based questions are valid, with characteristics such as the questions produced meeting the established criteria with a valid value of 0.96. This question's criteria must include a brief description of Kampar Malay culture and the correct answer related to the current situation.

The Results of One-to-One Evaluation

Furthermore, the revised questions, called prototype 3, were tested for practicality. The practicality test aimed to determine the questions' benefits, ease of use, and time efficiency. The ethnomathematics-based mathematics questions declared valid by experts were tested on three students with heterogeneous abilities (low, moderate, and high). The image of the activities in the one-on-one evaluation can be seen in Figure 5.

Figure 5. The One-to-One Activity

During the one-on-one evaluation, the students were asked to work on 12 questions for 90 minutes and then continued at the next meeting for 13 more questions. While the students were working on the questions, the researchers observed them by making field notes. From the observations, information was obtained that the students were very clearly not familiar with story questions based on the insufficient duration. Therefore, the researchers gave students an additional 30 minutes. After students finished working on the questions, they were asked to fill out a questionnaire by paying attention to the clarity of the instructions for using the questions, the context of the problem, the pictures, and the command sentences for the questions.

Based on the results of the student questionnaire, information was obtained that the context of the questions presented was familiar to them. The instructions for working on the questions were clear, and the contents of the question were learned, although many forgot. Thus, they had difficulty solving the questions. Furthermore, they stated that there were many difficult questions. They suggested that the number of questions should be reduced.

After the students worked on the questions, they were asked to fill out the questionnaire provided. The student response questionnaires aimed to assess the practicality of the questions. The results of the student questionnaire were in the practical to very practical categories. The summary of student response data is presented in Table 3.

Table 3. The Results of the Questionnaire Analysis

No	Name	Items							Total	P	Criteria
		1	2	3	4	5	6	7			
1	**ND**	4	3	3	3	3	4	3	23	82,14	P
2	**RY**	4	4	3	4	3	4	3	25	89,2	P
3	**AM**	4	4	4	4	3	4	3	26	92,8	VP

The result of the Small-group trial

The small-group trial was conducted in MTS Mualimin Bangkinang on eighth-grade students. Six students with ranged abilities were subjected to the trial of prototype 3. The students were given valid and practical questions based on the one-to-one evaluation stage. Figure 6 depicts a sample of the small-group trial activities.

Figure 6. The Small-Group Trial Activities

The material tested in this small-group trial was identical to that used in the one-on-one evaluation. The ethnomathematics-based questions were posed to the six students by the researchers. The trial lasted three days, depending on the number of tests. During the implementation, the researchers observed the difficulties encountered while working on the problem to determine whether or not the problem needed to be corrected. The students were asked to provide general comments about the questions at the end of the trial.

After working on the questions, students were asked to complete a questionnaire with general comments about the test questions. Appendix 8 of the practicality questionnaire contains an example of the contents of a student questionnaire. Table 4 displays the results obtained.

Table 4. The Results of the Questionnaire on the Small-Group Trial

No	Assessed Aspects	Practicality Value	Category
1	The instructions for the question are clear and easy to understand.	83,33 %	Very practical
2	The language used in the questions is clear and easy to understand.	66,66 %	Moderately practical
3	The questions contain problems that can be found in everyday life.	79,91 %	Practical
4	The material contained in the questions has already been studied.	83,33 %	Very practical
5	The terms in the questions are easy to understand.	70,83 %	Practical
6	The pictures, tables, and graphs in the questions are clear and easy to understand.	66.66 %	Moderately practical
7	The time allotted is sufficient to work on the questions.	54,16 %	Moderately practical
Average Practicality Value		**72,12 %**	**Practical**

Based on Table 4, the overall percentage value is 72.12% in the practical category. Therefore, ethnomathematics-based mathematics questions can facilitate the student's understanding of concepts.

Based on these results, the questions' instructions and language are clear and easy to understand. The context of the problems can be found in everyday life. Junior high school students have studied the materials contained in the questions. The terms in the questions are understandable. Furthermore, the questions' pictures, tables, and graphics are clear and easy to understand. Lastly, the time allotment for working on the questions is adequate. The most difficult questions, in the opinion of most students, were questions 4, 5, and 8. The questions that were quite easy were question 3.

The results of the small-group trial practicality questionnaire data analysis, the percentages obtained for each indicator were between 54.16% - 83.33%. The summary of student responses is presented in Table 5.

Table 5. The Results of the Questionnaire in the Small-Group Trial

No	Name	Score	Practicality Value	Criteria
1	IA	18	64.2	CP
2	CW	24	85.7	SP
3	AF	21	75	P
4	AH	19	67.8	CP
5	RH	19	67.8	CP
6	RA	23	82	P

Although the students' questionnaire yielded practical to very practical categories, several components needed to be revised to improve the questions. Table 6 shows the results of the revised small-group trial questions.

Table 6. The Revision Result in the Small-Group Tial

No	Revised Aspects	Before Revision	After Revision
1	Corrections and additions to the sentence question 2	Question 2 before revision: 2. From the chart above, make some examples of possible relations!	Question 2 after revision: 2. Make some examples of possible relationships based on the chart above!
2	Improvements to the problems presented	Question 4 before revision: Suppose A is the set of mothers { Amai Nita, Mak Ongah, Mak Udo, and Amai	Question 4 after revision: Suppose A is the set of mothers { Amai Nita, Mak Ongah, Mak Udo, and Amai Rifda }, and B is the set of children {

	in question 4	Rifda }, and B is the set of children { Beni, Sinta, Tari, Rika, Nova, Bayu, Eki, Roman, Riska, and Reno}. a. Express it in successive arrow diagrams with the relation "mother of"! b. Express it in an arrow diagram with the relation "Children of"!	Beni, Sinta, Tari, Rika, Nova, Bayu, Eki, Roman, Riska, and Reno}. a. Express it in successive arrow diagrams with the relation "mother of"! b. Represent in an arrow diagram with the relation “Children of”!
3	Improvement of statement sentences in question 5	Question 5 before revision: For example, the members of set A are { 5 koto in the middle, 8 koto sitingkai} and the members of set B are {Kuok, Salo, Bangkinang, Air Tiris, Rumbio, Pedadih, Kotuo, Sungai Asam, Sungai Siriole/Sarik, Lubuk Agung, Sungai Rambai, Koto, Prambanan}. Make a relation between sets A and B in the set of ordered pairs!	Question 5 after revision: For example, A = the set of Countries whose members are { 5 koto in the middle, 8 koto sitingkai} and B = the set of Regions whose members are { Kuok, Salo, Bangkinang, Air Tiris, Rumbio, Pedadih, Kotuo, Sungai Asam, Sungai Siriole/Sarik, Lubuk Agung, Rambai River, Koto, Prambanan}. Make a relation between sets A and B in the set of ordered pairs!

DISCUSSION

The Validity of the Ethnomathematics-based Questions

Ethnomathematics-based mathematics questions are said to meet content validity if they were developed following student characteristics, question development theory, and Kampar cultural themes. The content validity of a validity test is obtained after analyzing, tracing, or testing the content contained in the test. According to (Anas, 2005), Content validity is defined in terms of the test's content as a measuring tool, specifically, the extent to which the test, as a measuring tool for students, has been able to represent representatively of the entire material or even the lessons that should be tested (tested).

Suppose the questions developed follow the provisions, such as the suitability of the context with the predetermined presentation. This ethnomathematics-based mathematics problem is said to have fulfilled content validity (van den Akker, 1999). These provisions state that the ethnomathematics-based mathematics questions are valid if they meet the specified content, language, and cultural aspects. Expert judgment was used to evaluate the content, language, and cultural validity. The validation results determined that the ethnomathematics-

based mathematics questions satisfied the predetermined content, language, and cultural aspects. The validation results of the questions for the content aspect are categorized as valid. Based on the item analysis results, 25 valid ethnomathematics-based questions were created. The findings of this study are consistent with previous research in that the questions developed yielded valid answers (Kamid et al., 2021; Nuryenisa et al., 2022).

The Practicality of the Ethnomathematics-based Question

If the test activities are completed within the time allotted, and the student shows motivation and interest in the questions, the questions can be declared practical. One-on-one and small-group trials were used to determine the practicality of the questions. According to the results of student evaluations, it can be concluded that ethnomathematics-based math questions are practical (Purwanto, 2009) and (Nieveen, 1999). This finding is supported by the percentage gains of 82.14% - 92.8% for one-on-one evaluation and 54.16% - 83.33% for small-group trial. The questions designed have met the practical criteria, according to the practicality questionnaire distributed to students. These questions allow students to investigate their ability to comprehend mathematical concepts. These ethnomathematics-based questions entice students to work on them, the time for administering the test is appropriate, the instructions for using the questions are clear, and the sentence questions adhere to Indonesian writing rules. As a result, the test instrument meets the criteria for a good test instrument in terms of validity and practicality. The findings of this study are consistent with previous research in that the questions developed have practical utility (Kamid et al., 2021; Nuryenisa et al., 2022).

CONCLUSION

According to the research findings, the validators declared that the ethnomathematics-based math questions are valid with validity criteria greater than 0.9. The analysis of the validation results reveals that the questions are valid regarding content, language, and culture. Furthermore, the research produced questions that meet practical criteria. Following the one-to-one evaluation, the practicality of ethnomathematics-based mathematics problems was determined.

Interpretations were obtained from practical to very practical categories based on the practicality questionnaire data analysis of students on the one-on-one evaluation. The percentage results for each indicator ranged between 82.14% and 92.8%. Furthermore, the practicality questionnaire data results on the small-group trial are mixed. The percentage results

for each indicator ranged from 54.16% to 83.33%. The findings of these responses indicated that the ethnomathematics-based questions were practical.

REFERENCES

Alhaddad, I. (2012). Penerapan Teori Perkembangan Mental Piaget Pada Konsep Kekekalan Panjang. *Infinity Journal*, *1*(1), 31. https://doi.org/10.22460/infinity.v1i1.5

Anas, S. (2005). *Pengantar Evalusai Pendidikan*. *63*(2), 1–3. http://forschungsunion.de/pdf/industrie_4_0_umsetzungsempfehlungen.pdf%0Ahttps://www.dfki.de/fileadmin/user_upload/import/9744_171012-KI-Gipfelpapier-online.pdf%0Ahttps://www.bitkom.org/ sites/default/files/ pdf/Presse/Anhaenge-an-PIs/ 2018/180607 -Bitkom-KPM

Asrul, Ananda, R., & Rosinta. (2014). Evaluasi Pembajalaran. In *Ciptapustaka Media*.

Astuti, A., Zulfah, Z., & Rian, D. (2021). Pengembangan Lembar Kerja Peserta Didik (LKPD) Berbasis Etnomatematika pada Materi Bangun Ruang Sisi Datar Kelas VIII SMP Negeri 11 Tapung. *Jurnal Pendidikan Tambusai*, *5*(3), 9222–9231. https://doi.org/10.31004/jptam.v5i3.2452

Ayuningtyas, A. D., & Setiana, D. S. (2019). Pengembangan Bahan Ajar Matematika Berbasis Etnomatematika Kraton Yogyakarta. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *8*(1), 11–19. https://doi.org/10.24127/ajpm.v8i1.1630

Fajriyah, E. (2018). Peran etnomatematika terkait konsep matematika dalam mendukung literasi. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*, 114–119. https://journal.unnes.ac.id/sju/index.php/prisma/article/view/19589

Imswatama, A., & Lukman, H. S. (2018). Penerapan Bahan Ajar Matematika Berbasis Etnomatematika Terhadap Kemampuan Pemecahan Masalah Matematis Siswa. *Seminar Nasional Pendidikan Matematika 2018*, *01*, 92–100.

Juni Tamara, K., Astuti, R., & Saputro, M. (2021). Pengembangan Lembar Kerja Siswa Berbasis Etnomatematika pada Rumah Tradisional Melayu Bermuatan Kemampuan Komunikasi Matematis Siswa. *JUWARA: Jurnal Wawasan Dan Aksara*, *1*(1), 1–12.

Kamid, K., Saputri, R., & Hariyadi, B. (2021). Pengembangan Soal Higher Order Thinking Skills Berbasis Budaya Jambi. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(2), 1793–1806. https://doi.org/10.31004/cendekia.v5i2.678

L,I. (2019). Evaluasi Dalam Proses Pembelajaran. *Adaara: Jurnal Manajemen Pendidikan Islam*, *9*(2), 920–935. https://doi.org/10.35673/ajmpi.v9i2.427

Marsigit, Condromukti, R., Setiana, D. S., & Hardiarti, S. (2014). Pengembangan Pembelajaran Matematika Berbasis Etnomatematika. *Prosiding Seminar Nasional Etnomatnesia*, 20–38.

Nieveen, N. (1999). Prototyping to Reach Product Quality. *Design Approaches and Tools in Education and Training*, 125–135. https://doi.org/10.1007/978-94-011-4255-7_10

Nuryenisa, N., Karim, K., & Rahmita, N. (2022). Pengembangan Soal Matematika Model Pisa Level 4 Berbasis Etnomatematika Budaya Banjar Untuk Mendukung Pembelajaran Matematika Smp. *Jurmadikta*, *2*(2), 61–72. https://doi.org/10.20527/jurmadikta.v2i2.1376

Oktarina, A., Luthfiana, M., & Refianti, R. (2019). Pengembangan Lembar Kerja Siswa (LKS) Etnomatematika Berbasis Penemuan Terbimbing pada Materi Bangun Ruang Sisi Datar. *Jurnal Pendidikan Matematika (JUDIKA EDUCATION)*, *2*(2), 91–101. https://doi.org/10.31539/judika.v2i2.887

Plomp, T., & Nieveen, N. (2013). *An Introduction to Educational Design Research*. Enschede: Netherland Institute for Curriculum Development (SLO).

Purwanto, M. N. (2009). Daftar pustaka. *Prinsip-Proinsip Dan Teknik Evaluasi Pengajaran*, 2003–2005.

Putri, M. T., Setyawan, A. A., & Effendi, L. A. (2019). Pengembangan perangkat pembelajaran berbasis budaya melayu riau dengan pendekatan matematika realistik di SD Negeri 013 Rengat Barat. *Aksiomatik*, *7*(1), 79–86.

Shofiyati, N. (2020). Geometri Berbasis Etnomatematika Sebagai Inovasi Pembelejaran di Madrasah Tsanawiyah Untuk Membentuk Karakter Islami. *Jurnal Guru Inovatif*, *1*(1), 46.

Situmorang, A. S., & Naibaho, T. (2020). Etnomatematika pada Pembelajaran Matematika Tingkat SD. *Prosiding Webinar Ethnomatematics Magister Pendidikan Matematika Pascasarjana Universitas Hkbp Nommensen*, *2020*, 51–57.

van den Akker, J. (1999). Principles and Methods of Development Research. *Design Approaches and Tools in Education and Training*, 1–14. https://doi.org/10.1007/978-94-011-4255-7_1

Wahyuni, A., Aji, A., Tias, W., & Sani, B. (2013). Peran Etnomatematika dalam Membangun Karakter Bangsa: *Penguatan Peran Matematika Dan Pendidikan Matematika Untuk Indonesia Yang Lebih Baik*, *1*, 111–118.

Yulianti Maulida. (2016). *Pengembangan Bahan Ajar Berbasis Etnomatematika untuk Meningkatkan Prestasi dan Motivasi Belajar Peserta didik SMP*. *X*(2003), 1–21.

Zulfah, Fauzan, A., & Armiati. (2018). Pengembangan lembar kerja peserta didik berbasis problem based learning untuk materi matematika kelas VII. *Jurnal Pendidikan Matematika*, *12*(2), 33–46.