AKSIOMA: Jurnal Program Studi Pendidikan Matematika ISSN 2089-8703 (Print)
Volume 14, No. 1, 2025, 246 – 261 ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

DEVELOPMENT OF ETHNOMATHEMATICS-BASED NUMERACY LITERACY TASKS USING PACU JALUR LOPEK TRADITION CONTEXT FOR ELEMENTARY STUDENTS

Lara Oktarisa[1*], Zetra Hainul Putra[2], Erlisnawati[3], Muhammad Fendrik[4]

[1*,2,3] Universitas Riau, Pekanbaru, Indonesia
*Corresponding author. Universitas Riau, 28293, Pekanbaru, Indonesia.
E-mail: *lara.oktarisa5212@student.unri.ac.id* [1*)]
zetra.hainul.putra@lecturer.unri.ac.id [2)]
erlisnawati@lecturer.unri.ac.id [3)]
muhammad.fendrik@lecturer.unri.ac.id [4)]

Received 15 May 2024; Received in revised form 28 February 2025; Accepted 29 April 2025

Abstrak

Matematika merupakan mata pelajaran yang wajib diajarkan di setiap tingkat pendidikan, termasuk sekolah dasar. Namun, banyak siswa menganggapnya sulit karena bersifat abstrak dan kurang terhubung dengan kehidupan sehari-hari. Selain itu, rendahnya literasi numerasi siswa turut menjadi faktor yang menghambat pemahaman mereka terhadap konsep matematika. Berdasarkan observasi di SDN 026 Pulau Banjar Kari, ditemukan bahwa siswa mengalami kesulitan dalam menyelesaikan soal numerasi yang menuntut kemampuan analisis dan pemecahan masalah. Oleh karena itu, penelitian ini bertujuan mengembangkan soal literasi numerasi berbasis etnomatematika pada tradisi pacu jalur lopek untuk siswa sekolah dasar fase B. Penelitian ini menggunakan metode Research and Development (R&D) dengan model pengembangan 4D, yaitu define, design, develop, dan disseminate. Soal yang dikembangkan diuji coba pada skala kecil (4 siswa) dan skala luas (35 siswa). Analisis data menggunakan Aiken V dan Rasch Model. Hasil validasi ahli menunjukkan nilai 0,910 (sangat valid), sementara uji coba siswa menghasilkan 22 soal valid dari 24 soal dengan reliabilitas 0,79 (kategori bagus). Dengan demikian, soal literasi numerasi berbasis etnomatematika ini memenuhi kriteria valid dan reliabel untuk siswa sekolah dasar fase B.

Kata kunci: Aiken V, Etnomatematika, Literasi Numerasi, Matematika, Rasch Model

Abstract

Mathematics is a subject that must be taught at every level of education, including elementary school. However, many students find it difficult because it is abstract and lacks connection to everyday life. In addition, students' low numeracy literacy is also a factor that hinders their understanding of mathematical concepts. Based on observations at SDN 026 Pulau Banjar Kari, it was found that students have difficulty in solving numeracy problems that require analysis and problem solving skills. Therefore, this study aims to develop ethnomathematics-based numeracy literacy questions on the pacu jalur lopek tradition for phase B elementary school students. This research used the Research and Development (R&D) method with the 4D development model, namely define, design, develop, and disseminate. The developed questions were tested on a small scale (4 students) and a wide scale (35 students). Data analysis used Aiken V and Rasch Model. The results of expert validation showed a value of 0.910 (very valid), while student trials resulted in 22 valid questions out of 24 questions with a reliability of 0.79 (good category). Thus, this ethnomathematics-based numeracy literacy question meets the valid and reliable criteria for phase B primary school students.

***Keywords**: Aiken V, Ethnomathematics, Numeracy Literacy, Mathematics, Rasch Model*

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

INTRODUCTION

Numeracy literacy is a fundamental skill that is very important for students in facing the challenges of everyday life. This ability not only plays a role in solving math problems, but also in understanding quantitative information, making logical decisions, and thinking critically in various contexts. Numeracy literacy helps students to interpret data, analyze patterns and solve problems effectively. However, compared to other nations, Indonesian students' numeracy literacy skills remain low, according to the findings of international tests like the 2018 Program for International Student Assessment (PISA). This condition shows that there is still a gap between the importance of numeracy literacy and the achievements obtained by students.

Reading literacy and numerical literacy are essential skills that are highly useful in their application in society (Munthahana et al., 2023). Currently, students' numerical literacy skills have not developed optimally. This aligns with the latest results of the 2021 Programme for International Student Assessment (PISA) test, which indicate that Indonesia's mathematics score remains below the average score of OECD member countries (Utama et al., 2023). Despite its crucial role, many students still struggle to understand mathematical concepts, primarily due to the lack of connection between mathematical theory and real-life applications. This disconnection makes it difficult for students to apply what they have learned, ultimately affecting their ability to solve problems that require critical thinking and analytical skills. Consequently, strengthening numeracy literacy is essential to support students' learning and help them overcome challenges in mathematics.

The ethnomathematics approach is one method that has been shown to be successful in raising students' numeracy literacy. This method makes connections between local culture and mathematical ideas to increase students' interest and comprehension of the subject matter. Some previous studies have shown that by using cultural contexts in mathematics learning, students can more easily connect theory with real practices in everyday life. Ethnomathematics provides a more contextual, relevant and interesting learning experience for students, so that it can improve their understanding of numeracy literacy.

Based on these problems, this research aims to develop ethnomathematics-based numeracy literacy questions in the context of the Pacu Jalur Lopek tradition for phase B primary school students. By integrating local culture in mathematics learning, it is expected that the questions developed can improve students' understanding of numeracy literacy and provide a more interesting and meaningful learning experience. In addition, this approach also aims to preserve local culture through education, so that students not only gain a better understanding in mathematics, but also get to know and appreciate their local culture.

Mathematics education in elementary school aims to equip students with practical skills for higher education and everyday life. It emphasizes logical, critical, and innovative thinking, fostering perseverance in problem-solving (Setiawan et al., 2023). Additionally, mathematics plays a crucial role in shaping systematic and rational thinking, enabling students to adapt to changes and apply mathematical concepts in various scientific fields (Panjaitan & Zuhri, 2020). Thus,

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

mathematics is essential for developing analytical, creative, and collaborative problem-solving skills to address present and future challenges (Nilimaa, 2023).

Numeracy literacy is essential for applying mathematics to real-life problems, and students must acquire at least basic numeracy skills at different educational levels (Harsono et al., 2023). Integrating local culture into mathematics education can help improve these skills. According to Law No. 5 of 2017 on the Advancement of Culture, cultural development aims to strengthen resilience and promote Indonesia's cultural heritage globally through protection, development, utilization, and promotion efforts.

Ethnomathematics has grown and developed within a particular culture (Cesaria et al., 2022). This concept has emerged and evolved in Indonesia as an alternative to creating conventional and less contextual mathematical learning tools (Abdullah, 2017). The knowledge of mathematics education can be incorporated into regional cultural customs through ethnomathematics (Cimen, 2014).

Based on the information above, it can be concluded that ethnomathematics reflects the relationship between mathematics and culture. Culture-based mathematics education needs to be studied and developed because it supports contextual learning. The mathematics curriculum has not yet incorporated local culture. Traditional games are one way to modify it. Nonetheless, it is imperative to preserve traditional and classic games that hold cultural significance and ancestral legacy (Cesaria et al., 2022).

According to D'Ambrosio (1985), ethnomathematics is a mathematical cultural practice where culture manifests itself through jargon, codes, and symbols. In this context, practices such as calculation, measurement, classification, ordering, drawing conclusions, modeling, and so on are forms of ethnomathematics studies. Ethnomathematics can be utilized to develop contextual mathematics education to enhance numeracy and character education (Widiantari et al., 2022).

The low numeracy literacy of students is influenced by several key factors. First, the lack of innovation in presenting mathematics material, which remains theoretical and lacks contextual relevance, makes it difficult for students to grasp the concepts. Second, the limited variety of problems provided by teachers, which are primarily sourced from textbooks and student worksheets (LKS) without being connected to real-life experiences, further hinders students' understanding. Third, the underutilization of local culture as a learning medium, despite its potential to make mathematical concepts more concrete and engaging.

Interviews with teachers at SDN 026 Desa Pulau Banjar Kari revealed that practice exercises in school are predominantly taken from textbooks and LKS, without additional contextualized learning materials. To address this issue, this study developed numeracy literacy questions based on ethnomathematics, specifically incorporating the Pacu Jalur Lopek tradition. According to local community leaders, Pacu Jalur Lopek is a long-standing cultural tradition in Kenegrian Kari, Kuantan Tengah District, Kuantan Singingi Regency, Riau Province. This annual event, held to celebrate Indonesia's Independence Day, involves boat races using traditional canoes called "Jalur," which measure 20–30 meters in length and 1–1.5 meters in diameter, carrying

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

approximately 50–60 participants. By integrating this cultural heritage into mathematical learning, the development of numeracy literacy questions based on the Pacu Jalur Lopek tradition aims to enhance students' numeracy skills and foster a more positive perception of mathematics.

This research aims to develop ethnomathematics-based numeracy literacy questions in the context of the Pacu Jalur Lopek tradition for phase B primary school students, with the goal of strengthening their numeracy literacy skills and fostering a more positive perception of mathematics. The main justification for this research is the low numeracy literacy of Indonesian students, as reflected in international assessments such as PISA 2018, which is largely due to the abstract nature of mathematics and its lack of connection to real-life experiences, making it difficult for students to grasp concepts and solve analytical and problem-solving tasks. The ethnomathematics approach was chosen as it has been proven to enhance student understanding by linking mathematical concepts with local culture, making learning more contextual, relevant, and engaging. By incorporating the Pacu Jalur Lopek tradition, students are expected to gain a deeper understanding of numeracy concepts through experiences closely related to their daily lives.

METHODS

The Research and Development (R&D) approach is used in this study to design new products, evaluate the effectiveness of existing things, and create and manufacture new product improvements. This study used the 4D (Define, Design, Develop, and Disseminate) development methodology.

The development of ethnomathematics-based numeracy literacy questions in the Pacu Jalur Lopek tradition uses the 4D model, which consists of four stages as follows:

1. Defining

Determine learning needs by analyzing teacher needs, materials, and student characteristics at SDN 026 Banjar Kari Island. Curriculum analysis is carried out to ensure questions are in accordance with learning outcomes.

2. Design

Designing questions based on the results of the analysis with stages:

a. Determining materials and learning outcomes
b. Developing question grids
c. Collecting references
d. Designing question format
e. Preparing the answer key

3. Development

a. Initial Draft Preparation: Develop questions according to Bloom's taxonomy (C1-C6) and numeracy literacy components based on the Pacu Jalur Lopek culture.
b. Expert Validation: Questions were tested by mathematics and language experts to ensure feasibility.
c. Field Test: The questions were tested on small groups (4 students) and received responses from teachers and students through questionnaires.

4. Dissemination

The questions were tested more widely on 35 students to measure their validity and reliability. This stage ensures that the questions developed are feasible, practical, and appropriate to the local cultural context.

This research was conducted at SDN 026 Pulau Banjar Kari, Kuantan Tengah District, Kuantan Singing Regency, Riau Province. The author

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

chose this location because the Pacu Jalur Lopek tradition originates from Kenegerian Kari. The research was carried out from the preparation stage to the implementation stage from February to May 2021.

This study involved mathematics, cultural, and language experts, teachers, and students from four elementary schools. Expert validation was conducted to assess the feasibility of the ethnomathematics-based numeracy literacy questions before field testing. Teachers and students were also the subjects of the study because the questions were used in mathematics lessons, so their contributions were significant in responding to the use of numeracy literacy questions based on the Pacu Jalur Lopek tradition.

In this research and development, the data collected consisted of quantitative data (validation scores of numeracy literacy questions) and qualitative data (observations, interviews, and trial questionnaires).

Data Collection Instrument

In this case, the validation questionnaire used for the development of ethnomathematics-based numeracy literacy questions in the Pacu Jalur Lopek tradition is a product validation assessment sheet. This validation sheet has been adapted and modified according to the needs of the ethnomathematics-based numeracy literacy questions in the Pacu Jalur Lopek tradition. The questionnaire instruments presented are expert validation, teacher response, and student response sheets.

Data Analysis Techniques

Rasch model analysis and descriptive analysis are two data analysis methods employed in this investigation. The descriptive analysis technique applied consists of qualitative descriptive analysis and quantitative descriptive analysis. Qualitative data in this research contains suggestions or inputs from interviews with students and teachers to determine the respondents' opinions. This data is used for consideration when revising the questions developed by the researcher. Meanwhile, quantitative data consists of product quality assessments obtained from validation sheets provided to subject matter experts and product trial sheets given to students.

Product Validation Data Analysis

Validity in research is about how accurately a method measures or approaches the actual value or concept being studied. It describes how trustworthy the research results are. The obtained validity is crucial as it ensures that the research findings can be used appropriately and interpreted, enabling stakeholders to use the study findings to inform their decision-making (Bans-Akutey & Tiimub, 2021).

Validation testing of the product uses the Aiken V formulation. Aiken V is a formula that calculates validity based on evaluating items by a group of experts and how well the items represent the measured criteria (Setianingrum et al., 2023). Aiken V can be used to evaluate the effectiveness of validator assessments on an item, enabling us to determine the content validity of the article (Angel-Cuervo et al., 2024). Aiken V is a convenient and easy-to-use method for evaluating the responses provided by assessors. Its calculation is simple and easy to understand (Nurjanah et al., 2023).

The Aiken V formula for validity (Sumarni et al., 2024) is:

$$eV = \frac{\sum s}{n(c-1)} \quad \ldots(1)$$

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

Keterangan :
eV : Aiken V Index
∑s : Scores assigned to each evaluator minus the lowest score in the category used
N : Number of evaluators
c : Highest Validity Rank

The following assessment criteria determine the content validity score: (1) Scores ranging from 0.00 to 0.20 can be classified as significantly less valid; (2) Scores between 0.21 and 0.40 can be categorized as less valid; (3) Scores between 0.41 and 0.60 can be classified as moderately valid; (4) Scores ranging from 0.61 to 0.80 can be classified as valid; and (5) Scores between 0.81 and 1.00 can be categorized as highly valid (Xie et al., 2024).

Product Trial Data Analysis

The ethnomathematics-based numeracy literacy test items can be considered practical if the trial results show that teachers' and students' responses fall within the 61% to 100% range. This indicates that the product can be used for classroom learning.

Data Analysis Using Rasch Model

One kind of Rasch model created especially for rating scale data is the Rasch Rating Scale Model. Andrich came up with this model in 1978. Because it can examine the connection between the degree of agreement with the statement and the likelihood of responding to each item, this model works well with rating scale data, such as Likert scale data (Zamir et al., 2022). By analyzing the fit statistics for each item, the Rasch model analysis determines the order in which the items are adjusted (Lim et al., 2022). The Rasch model evaluates an item's quality based on the following standards (Chan et al., 2021 ; Maryati et al., 2019 ; Ocy et al., 2023).

1. Accepted Outfit mean square (MNSQ) value: 0.5 < MNSQ < 1.5
2. Accepted standard Outfit Z-value (ZSTD): -2.0 < ZSTD < +2.0
3. Accepted Point Measure Correlation (Pt Mean Corr) Value: 0.4 < Pt Measure Corr < 0.85

Items that do not meet all three conditions mentioned above are considered "not suitable" and must be replaced; however, if an item meets at least two of these requirements, it is still considered "suitable" or in a satisfactory condition (Meeter, 2021). Table 1 lists the reliability criteria (Martyushev et al., 2023).

Tabel 1. The categories of item reliability values

Item	Criteria
<0,67	Weak
0,67 – 0,80	Fair
0,80 – 0,90	Good
0,91 – 0,94	Very Good
>0,94	Excellent

Rasch modeling using Ministep software was used to examine the data from a large-scale experiment with 30 students in order to ascertain the validity and reliability of the test questions that were created. Wright Map Analysis, Item Measure Difficulty Level Analysis, Item Fit Analysis, and Test Item Reliability Analysis are among the analyses that are predicated on the Rasch model.

RESULTS

Stage 1: Define

This stage is conducted to determine the initial steps before developing numeracy questions. The define stage is divided into two analyses: needs analysis and concept

AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 14, No. 1, 2025, 246 – 261
ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

analysis. In the needs analysis, interviews were conducted with teachers at SDN O26 Pulau Banjar Kari in January 2023. The interview results consisted of exercise questions given to students based on the student textbook and several other sources, such as the student workbook. The questions were then developed using Bloom's Taxonomy levels C1 to C6. Meanwhile, concept analysis was conducted using materials corresponding to the mathematical and numeracy literacy component domains by estimating and calculating integers.

Stage 2: Design

This stage involves designing instruments to be used for 4th-grade mathematics learning materials. The items created are based on the components of numeracy literacy and domains within mathematical literacy, and their difficulty levels are adjusted according to Bloom's Taxonomy. The initial step in preparation begins with the question grid to determine the scope of the questions to be created and as a reference or guideline in developing numeracy literacy questions based on ethnomathematics, then adjusted to the context of Malay Riau culture. Table 2 explains the design of numeracy literacy items consisting of 24 questions from 3 folktales of Malay Riau Culture.

Table 2. Designing Numeracy Literacy Questions

No.	Title	Question Item
1	Pacu Jalur Lopek	1,2,3,4,5,6,7,8,9,10
2	Unique Terms in Pacu Jalur Lopek	11,12,13,14,15,16,17,18,19,20
3	The Waiting Ritual for the Racing Lane	21,22,23,24

The distribution of question items in the question grid can be seen in Table 3.

Table 3. Cognitive levels of the question items

No.	Question Level Classification	Question Item
1	C - 1 Knowledge	1,2,11,17,16,21,22
2	C - 2 Understanding	3,4,5,16,20
3	C – 3 Application	8,13,23,24
4	C – 4 Analysis	7,10,15
5	C – 5 Evaluate	6,9,14,19
6	C – 6 Create	12,18

Table 3 explains the items based on their cognitive levels using Bloom's taxonomy. The lowest level of questions is C-1, with seven items. Subsequently, the most challenging level is C-6, with two items.

Table 4. Numeracy Literacy Component Question Item

No	Numeracy Literacy Component	Question Item
1	Estimating and calculating with whole numbers	3, 4, 15, 20, 24
2	Using fractions, decimals, percenta-ges, and ratios	16
3	Recognizing patterns and relationships	1, 2, 6, 9, 11, 12, 19, 22, 23
4	Using spatial reasoning	7, 9, 14, 15, 16, 17, 18
5	Using measurements	8, 13, 24
6	Interpreting statistical information	10

Table 4 explains the items based on the numeracy literacy components, according to the Ministry of Education and Culture in 2017. The items are adjusted to the numeracy literacy components, totaling 24 questions. Estimating and calculating with whole numbers.

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

Table 5. Mathematical literacy

No	Domains in mathematical literacy	Question Item
1	Numbers	3,4,5,6,7,9,14,15,16,20
2	Measurement Geometry	8,13,18,24
3	Algebra	-
4	Data and uncertainty	10, 17, 19

Table 5 explains the domains of mathematical literacy. The items are adjusted to cover number, geometry, measurement, data, and uncertainty topics. Algebraic material is not included in numeracy literacy questions because it is separate from the fourth-grade curriculum. This aligns with the theory that mathematical learning will develop optimally through high-quality interactions. An interaction is considered high-quality if the material provided is familiar to students, making it easier for them to understand. One way to achieve this is by observing students' cultures (Nuh & Dardiri, 2017).

Stage 3: Develop

Product testing and expert validation were done at this point in the development process. Three experts conducted the validation, the results of which are shown in Table 6.

Table 6. Expert validation results

Aspects	Scor	Validity
Construction	0,870	Very Valid
Language	0,861	Very Valid
Riau Malay Culture	1	Very Valid
Average	**0,910**	**Very Valid**

Based on the results in Table 6, the average of all aspects is 0.910, which is also categorized as high (>0.80). From these calculations, it can be concluded that the validation analysis results from all experts indicate that ethnomathematics-based numeracy literacy questions in the Pacu Lopek tradition are valid for testing students.

The testing on students was conducted on a small scale involving four students. Table 7 shows the results of the small-scale testing performed on these students.

Table 7. Small Scale Test Results

No	Responden	Correct Answer
1	Student 1	20
2	Student 2	20
3	Student 3	19
4	Student 4	17

Table 7 shows that students can work on numeracy literacy questions well, although not all questions can be answered correctly. A questionnaire was given to pupils at the traditional "pacu jalur lopek" event to assess how they responded to numeracy literacy questions based on ethnomathematics following a brief trial. Table 8 displays the findings from the students' questionnaire answers.

Table 8. Results of Small Scale Test Student Response

No	Assessment Aspect	Score presentation	Category
1	Visible	81,25%	Very Good
2	Interesting	100%	Very Good
3	Simple	84,37%	Very Good
4	Usefull	93,75%	Very Good
Overall Average		**89,84%**	**Very Good**

Based on the results of Table 8, students' responses obtained an overall average of 89.84%, categorized as very good. Four students answered numeracy literacy questions very well in a small-scale trial. The researcher's queries are appropriate for subsequent phases of the pertinent research, which is in line with

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

earlier studies that show that an instrument's validation results are considered acceptable if they show good validity (Sa'diyyah et al., 2021).

Stage 4: Disseminate

This study was disseminated by testing the questions to 35 students, consisting of 18 male and 17 female students.

Person-Item Map

The results of the person-item map analysis can be seen in Figure 1.

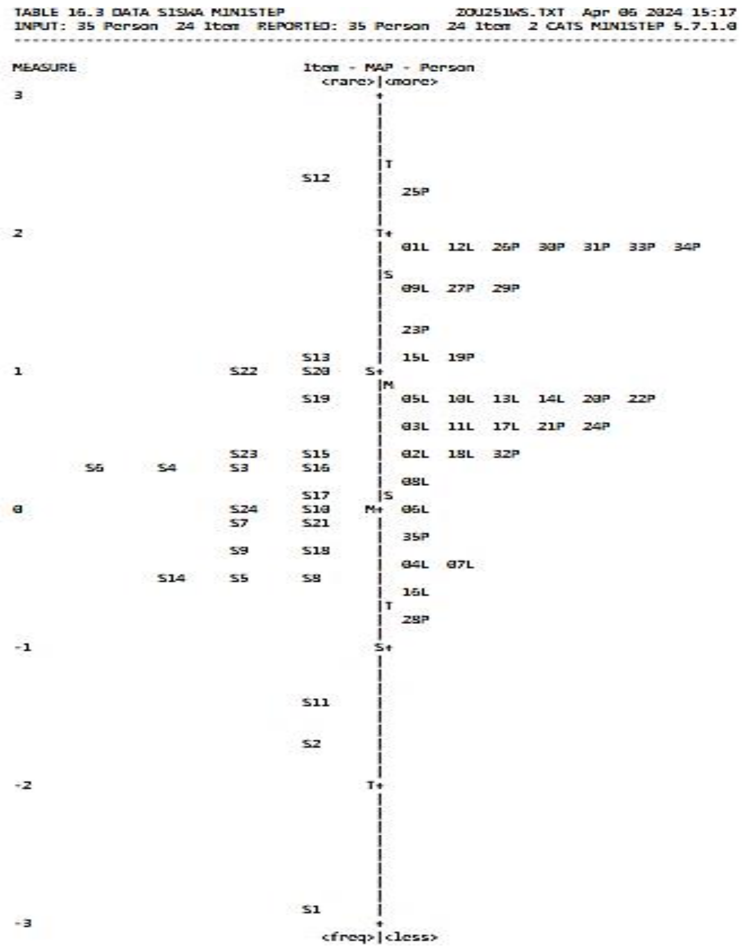

Figure 1. Person-Item Map Analysis

Figure 1 explains that there is one student with high ability, namely 25P (Student number 25, Female). Meanwhile, the student with the lowest ability is 28P (Student number 28, Female). In addition, the question with the highest level of difficulty is S12 (Question number 12). Recognizing patterns and relationships, students are asked to calculate how many paint cans will be used to decorate the awning. Meanwhile, the lowest one is S1 (Question number 1), which relates to literacy activities, where students are asked to answer why the tradition is called "pacu jalur lopek" based on the previous text.

Item Measure

Item measure analysis can be seen in Figure 2.

AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 14, No. 1, 2025, 246 – 261

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

TABLE 13.1 DATA SISWA MINISTEP ZOU251WS.TXT Apr 06 2024 15:17
INPUT: 35 Person 24 Item REPORTED: 35 Person 24 Item 2 CATS MINISTEP 5.7.1.0

Person: REAL SEP.: 1.18 REL.: .58 ... Item: REAL SEP.: 1.95 REL.: .79

Item STATISTICS: MEASURE ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	JMLE MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item
12	7	35	2.44	.44	1.40	1.56	2.08	2.36	-.34	.28	80.0	79.9	S12
13	16	35	1.09	.36	1.17	1.36	1.12	.85	.17	.35	48.6	65.6	S13
20	17	35	.95	.36	1.32	2.48	1.34	2.23	-.02	.35	45.7	65.0	S20
22	17	35	.95	.36	.92	-.62	.92	-.51	.44	.35	80.0	65.0	S22
19	18	35	.82	.36	.83	-1.48	.80	-1.47	.56	.36	71.4	64.4	S19
15	21	35	.43	.37	1.07	.58	1.11	.72	.25	.35	65.7	66.7	S15
23	21	35	.43	.37	.72	-2.29	.66	-2.30	.69	.35	77.1	66.7	S23
3	22	35	.29	.37	1.15	1.03	1.09	.52	.20	.35	60.0	68.3	S3
4	22	35	.29	.37	1.00	.05	.97	-.10	.36	.35	71.4	68.3	S4
6	22	35	.29	.37	1.00	.05	1.06	.36	.33	.35	65.7	68.3	S6
16	22	35	.29	.37	.84	-1.18	.77	-1.29	.56	.35	65.7	68.3	S16
17	23	35	.15	.38	1.09	.63	.97	-.08	.28	.34	54.3	69.9	S17
10	24	35	.00	.39	.94	-.34	.91	-.34	.42	.34	71.4	71.6	S10
24	24	35	.00	.39	.83	-1.04	.72	-1.33	.57	.34	71.4	71.6	S24
7	25	35	-.15	.40	1.18	1.02	1.13	.57	.13	.33	62.9	73.5	S7
21	25	35	-.15	.40	.85	-.79	.74	-1.04	.52	.33	80.0	73.5	S21
9	26	35	-.31	.41	.83	-.84	.73	-.98	.54	.32	85.7	75.4	S9
18	26	35	-.31	.41	1.07	.40	.98	.01	.27	.32	74.3	75.4	S18
5	27	35	-.49	.42	1.15	.70	1.24	.79	.12	.31	71.4	77.6	S5
8	27	35	-.49	.42	1.02	.18	1.39	1.20	.18	.31	82.9	77.6	S8
14	27	35	-.49	.42	.73	-1.27	.75	-.76	.60	.31	82.9	77.6	S14
11	31	35	-1.39	.55	.91	-.10	.58	-.70	.41	.24	88.6	88.5	S11
2	32	35	-1.73	.62	.95	.06	.71	-.24	.31	.22	91.4	91.4	S2
1	34	35	-2.94	1.02	1.01	.33	.70	.17	.14	.13	97.1	97.1	S1
MEAN	23.2	35.0	.00	.43	1.00	.02	.98	-.06			72.7	73.6	
P.SD	5.6	.0	1.02	.14	.17	1.07	.32	1.10			12.6	8.4	

Figure 2. Item measure analysis

Based on Figure 2, it is known that the entry number indicates the sequential number of the items arranged according to their level of difficulty, which is measured based on the score value. The item section explains the items that have been previously included. The items have been arranged sequentially based on the logit value, starting from the highest (Question number 12) to the lowest (Question number 1). A high logit value indicates a high level of difficulty for the question. This is supported by the total score in the second column, which shows that question number 12 was answered correctly by seven respondents with a logit value of 2.44. Compared to question number 1, which was answered correctly by 34 respondents.

Item Fit

The results of the analysis of the suitability of the items can be seen in Figure 3.

AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 14, No. 1, 2025, 246 – 261
ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

TABLE 10.1 DATA SISWA MINISTEP ZOU251WS.TXT Apr 06 2024 15:17
INPUT: 35 Person 24 Item REPORTED: 35 Person 24 Item 2 CATS MINISTEP 5.7.1.0

Person: REAL SEP.: 1.18 REL.: .58 ... Item: REAL SEP.: 1.95 REL.: .79

Item STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	JMLE MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	Item
12	7	35	2.44	.44	1.40	1.56	2.08	2.36	-.34	.28	80.0	79.9	S12
8	27	35	-.49	.42	1.02	.18	1.39	1.20	.18	.31	82.9	77.6	S8
20	17	35	.95	.36	1.32	2.48	1.34	2.23	-.02	.35	45.7	65.0	S20
5	27	35	-.49	.42	1.15	.70	1.24	.79	.12	.31	71.4	77.6	S5
7	25	35	-.15	.40	1.18	1.02	1.13	.57	.13	.33	62.9	73.5	S7
13	16	35	1.09	.36	1.17	1.36	1.12	.85	.17	.35	48.6	65.6	S13
3	22	35	.29	.37	1.15	1.03	1.09	.52	.20	.35	60.0	68.3	S3
15	21	35	.43	.37	1.07	.58	1.11	.72	.25	.35	65.7	66.7	S15
17	23	35	.15	.38	1.09	.63	.97	-.08	.28	.34	54.3	69.9	S17
18	26	35	-.31	.41	1.07	.40	.98	.01	.27	.32	74.3	75.4	S18
6	22	35	.29	.37	1.00	.05	1.06	.36	.33	.35	65.7	68.3	S6
1	34	35	-2.94	1.02	1.01	.33	.70	.17	.14	.13	97.1	97.1	S1
4	22	35	.29	.37	1.00	.05	.97	-.10	.36	.35	71.4	68.3	S4
2	32	35	-1.73	.62	.95	.06	.71	-.24	.31	.22	91.4	91.4	S2
10	24	35	.00	.39	.94	-.34	.91	-.34	.42	.34	71.4	71.6	S10
22	17	35	.95	.36	.92	-.62	.92	-.51	.44	.35	80.0	65.0	S22
11	31	35	-1.39	.55	.91	-.10	.58	-.70	.41	.24	88.6	88.5	S11
21	25	35	-.15	.40	.85	-.79	.74	-1.04	.52	.33	80.0	73.5	S21
16	22	35	.29	.37	.84	-1.18	.77	-1.29	.56	.35	65.7	68.3	S16
9	26	35	-.31	.41	.83	-.84	.73	-.98	.54	.32	85.7	75.4	S9
19	18	35	.82	.36	.83	-1.48	.80	-1.47	.56	.36	71.4	64.4	S19
24	24	35	.00	.39	.83	-1.04	.72	-1.33	.57	.34	71.4	71.6	S24
14	27	35	-.49	.42	.73	-1.27	.75	-.76	.60	.31	82.9	77.6	S14
23	21	35	.43	.37	.72	-2.29	.66	-2.30	.69	.35	77.1	66.7	S23
MEAN	23.2	35.0	.00	.43	1.00	.02	.98	-.06			72.7	73.6	
P.SD	5.6	.0	1.02	.14	.17	1.07	.32	1.10			12.6	8.4	

Figure 3. Question Item Suitability Level

Figure 3 shows that items exceeding an MNSQ value of 1.5 and a ZSTD value of 2.0 are considered unfit. Based on the figure above, two items, namely numbers 12 and 20, could be more suitable. Therefore, this test is not valid for use in measurement. In question number 12, students are asked to calculate the number of paint cans used to decorate the awning. Question number 12 is at level C-6, indicating the highest difficulty level. In question number 20, students are asked to calculate the number of cobblers in six lanes. Question number 20 is at level C-2, requiring students' understanding to answer it.

Reliability Results

The results of question reliability can be seen in the Figure 4.

SUMMARY OF 24 MEASURED Item

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	23.2	35.0	.00	.43	1.00	.02	.98	-.06
SEM	1.2	.0	.21	.03	.04	.22	.07	.23
P.SD	5.6	.0	1.02	.14	.17	1.07	.32	1.10
S.SD	5.7	.0	1.04	.14	.17	1.09	.32	1.12
MAX.	34.0	35.0	2.44	1.02	1.40	2.48	2.08	2.36
MIN.	7.0	35.0	-2.94	.36	.72	-2.29	.58	-2.30

REAL RMSE .46 TRUE SD .91 SEPARATION 1.95 Item RELIABILITY .79
MODEL RMSE .45 TRUE SD .91 SEPARATION 2.02 Item RELIABILITY .80
S.E. OF Item MEAN = .21

Item RAW SCORE-TO-MEASURE CORRELATION = -.97
Global statistics: please see Table 44.
UMEAN=.0000 USCALE=1.0000

Figure 4. Reliability Results

According to Figure 4, the excellent category's item reliability value, or item reliability, is 0.79. As a result, the researcher's queries are

AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 14, No. 1, 2025, 246 – 261
ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

trustworthy. According to the hypothesis from earlier studies, an assessment tool (test) is deemed to have good ovality if it satisfies two requirements: accuracy or validity and reliability or trustworthiness. Therefore, it can be said that the questions that were constructed have good validity and reliability. Consequently, this test instrument can be considered suitable for use (Saadati & Celis, 2023).

Additionally, the researcher disseminated questionnaires so that the quantity of responses from the pupils could be examined. Table 9 shows the findings from the students' answers.

Table 9. Student response results of the broad scale test

No	Indicator	Average Score	Category
1	Visible	90,35%	Very Good
2	Interesting	88,57%	Very Good
3	Simple	88,21%	Very Good
4	Usefull	91,78%	Very Good
Overall Average		**89.72%**	
Description		**Very Good**	

Based on the results in Table 9, it is evident that the overall average is 89.72%, which falls within the category of excellent. Therefore, it can be concluded that the students can understand the questions developed very well. Although the students perform excellently in solving numeracy literacy questions, they still need to concentrate and focus while answering the questions to ensure a good under-standing and avoid confusion. This is because there are still some questions that students need help answering correctly.

This study shows that ethnomathematics-based numeracy literacy questions in the context of the Pacu Jalur Lopek tradition have high validity (0.910) and good reliability (0.79). Of the 24 developed questions, 22 were deemed valid. Student and teacher responses were highly positive, with readability, engagement, and usability reaching 89.72%. The ethnomathematics approach has proven effective in enhancing students' numeracy understanding as it is more contextual and relevant to their daily lives. Incorporating local culture makes students more engaged and motivated in learning mathematics. These findings align with previous studies showing that culture-based learning improves student engagement and comprehension of numeracy concepts.

These research findings are supported by previous studies (Pratama & Yelken, 2024) stating that ethnomathematics-based mathematics learning has an impact on mathematical literacy. Another study (Batiibwe, 2024) suggests that ethnomathematics-based learning provides a sustainable contribution to improving education quality when there is strong synergy between educators and the community.

The success of this study is attributed to the contextual approach that connects mathematics with local culture, expert validation ensuring question quality, and a systematic development method using the 4D model. Additionally, positive student and teacher responses indicate that the questions are more engaging and easier to understand than conventional ones. The strengths of this study include culturally relevant questions, strong academic validation, and highly positive student and teacher feedback. However, the study is limited by a small sample size (35 students), and two questions were found invalid based on the Rasch Model analysis. Furthermore, algebraic aspects were not included in the question development.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

This study contributes to the development of ethnomathematics-based learning materials to improve students' numeracy literacy while promoting local cultural heritage in education. This approach can serve as an alternative for mathematics instruction and be adapted to various cultural contexts. Future research should involve a larger sample size and expand the scope of the material.

CONCLUSION AND SUGGESTION

This study successfully developed ethnomathematics-based numeracy literacy questions in the context of the Pacu Jalur Lopek tradition that are feasible and practical for phase B elementary school students. To guarantee the quality of the questions in line with student characteristics and connections to local culture, the 4D model (Define, Design, Develop, and Disseminate) was used during the question generation process. The questions created received a score of 0.910 with a very valid category based on the findings of expert validation. The trial results showed that 22 out of 24 questions met the validity and reliability criteria with a reliability value of 0.79, which is in the good category. Student and teacher responses to the questions were also very positive, indicating that the questions were interesting, easy to understand, and in accordance with learning needs. Thus, this study proves that ethnomathematics-based numeracy literacy questions on the Pacu Jalur Lopek tradition are feasible and practical to use in learning mathematics in elementary schools, and can help improve students' understanding of numeracy concepts through a local cultural approach.

Based on the above conclusions, the researcher provides several recommendations. First, developing ethnomathematics-based numeracy literacy questions on the Pacu Jalur Lopek tradition for phase B primary school students can be an alternative for teachers in learning grade IV mathematics. It facilitates learners' understanding of mathematics in Riau Malay culture. Second, prospective teachers need to increase their knowledge of Riau Malay culture so that it is still conveyed and preserved in the future. Third, further research is recommended to test the effect of ethnomathematics-based numeracy literacy questions according to the Indonesian cultural context. Researchers are also advised to implement the question to students so that it can be tested on more respondents.

REFERENCES

Abdullah, A. S. (2017). Ethnomathematics in perspective of sundanese culture. *Journal on Mathematics Education*, *8*(1), 1–16. https://doi.org/10.22342/jme.8.1.3877.1-15

Angel-Cuervo, Z. M., Briceño-Martínez, J. J., & Bernal-Ballén, A. (2024). Validation of a questionnaire to evaluate mathematics teachers' beliefs about mathematics, teaching, and learning. *Eurasia Journal of Mathematics, Science and Technology Education*, *20*(5). https://doi.org/10.29333/ejmste/14447

Bans-Akutey, A., & Tiimub, B. M. (2021). Triangulation in Research. *Academia Letters*, *August*, 1–6. https://doi.org/10.20935/al3392

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

Cesaria, A., Fitri, D. Y., & Rahmat, W. (2022). Ethnomathematic Exploration Based on Realistic Mathematics Education (Rme) in the Traditional Game "Lore." *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(2), 1630–1639. https://doi.org/10.24127/ajpm.v11i2.4958

Chan, S. W., Looi, C. K., & Sumintono, B. (2021). Assessing computational thinking abilities among Singapore secondary students: a Rasch model measurement analysis. *Journal of Computers in Education*, *8*(2), 213–236. https://doi.org/10.1007/s40692-020-00177-2

Cimen, O. A. (2014). Discussing Ethnomathematics: Is Mathematics Culturally Dependent? *Procedia - Social and Behavioral Sciences*, *152*, 523–528. https://doi.org/10.1016/j.sbspro.2014.09.215

Harsono, A. M. B., Murti, R. C., & Cahya, R. D. (2023). Hubungan Keterampilan 4C Dan Kemampuan Literasi Numerasi Peserta Didik Dengan Hasil Belajar Matematika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(3), 3299–3308. https://doi.org/10.24127/ajpm.v12i3.7162

Batiibwe, M. S. K. (2024). The role of ethnomathematics in mathematics education: A literature review. *Asian Journal for Mathematics Education*, *3*(4), 383–405. https://doi.org/10.1177/27527263241300400

Lim, L., Lim, S. H., & Lim, W. Y. R. (2022). A Rasch Analysis of Students' Academic Motivation toward Mathematics in an Adaptive Learning System. *Behavioral Sciences*, *12*(7). https://doi.org/10.3390/bs12070244

Martyushev, N. V., Malozyomov, B. V., Sorokova, S. N., Efremenkov, E. A., Valuev, D. V., & Qi, M. (2023). Review Models and Methods for Determining and Predicting the Reliability of Technical Systems and Transport. *Mathematics*, *11*(15), 1–31. https://doi.org/10.3390/math11153317

Maryati, Prasetyo, Z. K., Wilujeng, I., & Sumintono, B. (2019). Measuring teachers' pedagogical content knowledge using many-facet rasch model. *Cakrawala Pendidikan*, *38*(3), 452–464. https://doi.org/10.21831/cp.v38i3.26598

Meeter, M. (2021). Primary school mathematics during the COVID-19 pandemic: No evidence of learning gaps in adaptive practicing results. *Trends in Neuroscience and Education*, *25*, 100163. https://doi.org/10.1016/j.tine.2021.100163

Munthahana, J., Teguh Budiarto, M., & Wintarti, A. (2023). The Application of Ethnomathematics In Numeracy Literacy Perspective: A Literature Review Article Info ABSTRACT. *Indonesian Journal of Science and Mathematics Education*, *06*, 177–191. https://doi.org/10.24042/ijsme.v5i1.17546

Nilimaa, J. (2023). New Examination Approach for Real-World Creativity and Problem-Solving

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

Skills in Mathematics. *Trends in Higher Education*, *2*(3), 477–495. https://doi.org/10.3390/higheredu2030028

Nurjanah, S., Istiyono, E., Widihastuti, Iqbal, M., & Kamal, S. (2023). The Application of Aiken's V Method for Evaluating the Content Validity of Instruments that Measure the Implementation of Formative Assessments. *Journal of Research and Educational Research Evaluation*, *12*(3), 125–133. https://doi.org/10.15294/jere.v12i2.76451

Ocy, D. R., Rahayu, W., & Makmuri, M. (2023). Rasch Model Analysis: Development of Hots-Based Mathematical Abstraction Ability Instrument According To Riau Islands Culture. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(4), 3542–3560. https://doi.org/10.24127/ajpm.v12i4.7613

Panjaitan, B., & Zuhri. (2020). The Outcomes of Learning Mathematics in Mathematics Classroom. *Proceedings of the 1st International Conference on Education, Society, Economy, Humanity and Environment (ICESHE 2019)*, 35–41. https://doi.org/10.2991/assehr.k.200311.008

Pratama, R. A., & Yelken, T. Y. (2024). Effectiveness of ethnomathematics-based learning on students' mathematical literacy: a meta-analysis study. *Discover Education*, *3*(1). https://doi.org/10.1007/s44217-024-00309-1

Sa'diyyah, F. N., Mania, S., & Suharti. (2021). Pengembangan instrumen tes untuk mengukur kemampuan berpikir komputasi siswa. *Jurnal Pembelajaran Matematika Inovatif (JPMI)*, *4*(1), 17–26. https://doi.org/10.22460/jpmi.v4i1.17-26

Saadati, F., & Celis, S. (2023). Student Motivation in Learning Mathematics in Technical and Vocational Higher Education: Development of an Instrument. *International Journal of Education in Mathematics, Science and Technology*, *11*(1), 156–178. https://doi.org/10.46328/ijemst.2194

Setianingrum, D. A., Matahari, D. B., Jumadi, J., & Wilujeng, I. (2023). Development of Science e-Book Containing Gamelan's Local Wisdom Based on STEAM-POE to Facilitate Students' Love of Local Culture. *Jurnal Penelitian Pendidikan IPA*, *9*(6), 4791–4800. https://doi.org/10.29303/jppipa.v9i6.3760

Setiawan, D., Anggraini, I., & Hidayat, A. (2023). Problem-Based Learning Model Management on the Interest in Learning Mathemathics of Elementar School Student. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(2), 2112–2122. https://doi.org/10.24127/ajpm.v12i2.7200

Sumarni, S., Akhyar, M., Nizam, M., Widyastono, H., & Anggrainingsih (2024). Needs Analysis of Link and Match on Research Methodology Course: Student-Lecturer Based Teaching and Learning Experiences. *International Journal of Social Learning (IJSL)*, *5*(1), 19-42. https://doi.org/10.47134/ijsl.v5i1.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i1.10139

294.

Utama, F., Zaenuri, Z., & Pranoto, Y. K. sugiyono. (2023). Students Numerical Literacy Ability in Problem Based Learning With Ethnomatematics Nuances. *Prima: Jurnal Pendidikan Matematika*, *7*(2), 98–108. https://doi.org/10.31000/prima.v7i2.8387

Widiantari, N. K. K., Suparta, I. N., & Sariyasa, S. (2022). Meningkatkan Literasi Numerasi dan Pendidikan Karakter dengan E-Modul Bermuatan Etnomatematika di Era Pandemi COVID-19. *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, *10*(2), 331–343. https://doi.org/10.25273/jipm.v10i2.10218

Xie, W., Zeng, D., & Wang, Y. (2024). Support Vector Machine for Dynamic Survival Prediction With Time-Dependent Covariates. *Annals of Applied Statistics*, *18*(3), 2166–2186. https://doi.org/10.1214/24-AOAS1875

Zamir, S., Yang, Z., Wenwu, H., & Sarwar, U. (2022). Assessing the attitude and problem-based learning in mathematics through PLS-SEM modeling. *PLoS ONE*, *17*(5 May), 1–15. https://doi.org/10.1371/journal.pone.0266363