



Development of Ethnomathematics-Based Adventure Pocket Book with Nusantara Cultural Context to Enhance Numeracy Literacy

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Abstract

Students' numeracy literacy skills are still not optimal, as students tend to rely on procedural problem-solving and experience difficulties in analyzing mathematical problems in real-world contexts. In addition, there is currently a lack of teaching innovations that integrate ethnomathematics and pocket books to enhance numeracy literacy. This study aims to develop an ethnomathematics pocket book with an adventure theme in the Nusantara culture to enhance students' numeracy literacy. This study uses the 4D (Define, Design, Develop, and Disseminate) development model. The research subjects consisted of 31 seventh-grade students at a public junior high school in Semarang. Data were collected through interviews, tests, and questionnaires, and analyzed both descriptively and qualitatively. Interviews were used to obtain information, tests were used to measure students' numeracy literacy, and questionnaires were used to measure level of feasibility, readability, and student response. The results show the pocket book received a score of 91,05% on the feasibility test meeting the very feasible, a score of 87.84% on the readability meeting the easy to understand, and received a score of 96% on the student response meeting the excellent response. Pocket book also effectively enhance numeracy literacy based on the result of the individual completeness test and proportional level of mastery. The results of this development demonstrate that the adventure-themed ethnomathematics pocket book in Nusantara culture is capable of supporting the enhance of numeracy literacy and is feasible for application in mathematics learning. This research developed an ethnomathematics-based adventure pocket book set in the cultural context of the Nusantara, contributes to cultural innovation in mathematics, encouraging students' cognitive development.

Keywords: Ethnomathematics; Numeracy Literacy; Pocket Book.

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Abstrak

Kemampuan literasi numerasi siswa masih belum optimal, karena siswa cenderung bergantung pada penyelesaian masalah secara prosedural dan mengalami kesulitan dalam menganalisis permasalahan matematika pada konteks kehidupan nyata. Selain itu, saat ini masih kurang inovasi pembelajaran yang mengintegrasikan etnomatematika dan pocket book untuk mengembangkan literasi numerasi. Penelitian ini bertujuan untuk mengembangkan pocket book etnomatematika bernuansa petualangan di budaya Nusantara untuk meningkatkan literasi numerasi siswa. Penelitian ini menggunakan model pengembangan 4D (Define, Design, Develop, and Disseminate). Subjek penelitian terdiri dari 31 siswa kelas VII SMP Negeri yang berlokasi di Kota Semarang. Data dikumpulkan menggunakan wawancara, tes, kuisioner dan dianalisis secara deskriptif kualitatif dan kuantitatif. Hasilnya menunjukkan bahwa buku saku tersebut memperoleh skor 91,05% pada uji kelayakan yang memenuhi kriteria sangat layak, skor 87,84% pada uji keterbacaan yang memenuhi kriteria mudah dipahami, dan memperoleh skor 96% pada respons siswa yang memenuhi kriteria respons sangat baik. Buku saku juga secara efektif meningkatkan literasi numerasi siswa berdasarkan hasil ketuntasan rata-rata dan ketuntasan proporsi. Hasil pengembangan ini menunjukkan bahwa pocket book etnomatematika bernuansa petualangan di budaya Nusantara mampu mendukung pengembangan literasi numerasi dan layak untuk diterapkan dalam pembelajaran matematika. Penelitian ini mengembangkan buku saku petualangan berbasis etnomatematika berlatar budaya Nusantara yang berkontribusi terhadap inovasi budaya dalam matematika yang mendorong perkembangan kognitif siswa.

INTRODUCTION

Numeracy literacy is one of the key competencies in 21st century education, particularly within the Foundational Literacies aspect identified by the World Economic Forum (2015). This ability enables students to use numbers, symbols, and quantitative reasoning to analyze information and solve contextual problems in everyday life across various disciplines (Bairy & Inamdar, 2026; Gal, 2024; OECD, 2023). It is a measure of students' ability to apply numerical concepts, numbers, symbols, and information in their cognitive development (Nichols, 2025). Numeracy is not merely the ability to perform calculations, but also encompasses the capacity to understand, interpret, and apply mathematical concepts in real-life contexts, enabling students to solve everyday problems logically and critically (Rosita et al., 2026). However, numeracy literacy among students remains a significant concern. Previous studies have shown that students still experience difficulties in formulating, interpreting, and solving contextual mathematical problems (Kappassova et al., 2025). In addition, several studies have emphasized

that meaningful and contextual learning integrated with numeracy activities can effectively enhance students' numeracy skills by connecting mathematical concepts to real-life situations (Rosita et al., 2026). Studies on ethnomathematics-based learning also revealed that integrating local cultural contexts into mathematics instruction can improve students' conceptual understanding, mathematical literacy, and learning engagement through more meaningful learning experiences (Sopamena et al., 2026). These findings indicate that current learning approaches are still not effective in helping students enhance numeracy literacy skills, so more innovative and contextual learning solutions are needed.

International studies show that the numeracy literacy of students in Indonesia is low when compared to the average score internationally. Based on the results of the 2022 PISA, only 18% of Indonesian students were able to reach level 2, meaning students have a basic understanding of functional relationships and can solve problems involving simple ratios and interpret the results correctly. Based on the results of a preliminary study conducted by researchers at a junior high

school in Semarang City involving seventh-grade students, a gap was found between expectations and actual outcomes in numeracy literacy. Students only solved problems according to formulas and procedures demonstrated by teachers and were not accustomed to analyzing information in real-world contexts (Munahefi et al., 2024). Students with moderate and low numeracy abilities often face challenges in understanding contextual problems, processing information, constructing mathematical models, and explaining as well as evaluating solutions (Amelia et al., 2025). Interviews with teachers revealed that students' difficulties stemmed from learning resources being challenging to understand and uninteresting. Statements by other researchers support these preliminary study findings. Students have difficulty understanding complex information, analyzing, and solving mathematical problems (Munahefi et al., 2024; Setiawan et al., 2024). Students only solve problems according to the formulas and procedures exemplified by the teacher. They are not going through the process of analyzing information in a real context (Hutauruk & Ardiansyah, 2024). In contextual mathematics learning, students are encouraged to analyze problems systematically while developing critical, creative, and analytical thinking skills (Mardiansyah et al., 2025). The mathematics learning process plays an important role in enhancing numeracy literacy skills. Therefore, innovative and contextual learning approaches are needed to support the enhance of students' numeracy literacy skills.

One approach that can support numeracy literacy development is ethnomathematics-based learning, which integrates cultural contexts into mathematical activities. There is a need to

develop an understanding of the learning process and environment based on numeracy literacy (Abuya et al., 2025). Because culturally close socio-cultural activities and relationships shape a person's cognitive structure or how the environment influences the way they think and act (Crawford, 1996). This perspective aligns with Vygotsky's learning theory, which states that cognitive development is constructed through social interaction and culturally meaningful learning experiences. Ethnomathematics is the science that studies how culture in society enters into mathematical practices (D'Ambrosio, 2016, 1985). Ethnomathematics offers a concrete bridge between cultural context and numeracy literacy development. Through ethnomathematics, students can better understand and solve mathematical problems in real-life situations, thereby supporting the development of numeracy literacy (Rahardjo et al., 2025). Ethnomathematics provides a space for students to think and process mathematical ideas through cultural practices and experiences (Zito & Albanese, 2025). Furthermore, ethnomathematics enhances the quality of learning by making mathematical content more relevant, engaging, and closely related to students' experiences (Nasrum et al., 2025). Mathematics is not only a logistical and systematic lesson but also a real contextual pressure to achieve quality mathematics (Machaba & Motseki, 2026). To support the implementation of ethnomathematics-based learning, innovative, and contextual learning media are needed to enhance students' numeracy literacy.

Given that numeracy literacy requires contextual and engaging learning experiences, an appropriate media is needed to deliver ethnomathematics-

based content effectively. Pocket books serve this purpose because they are compact, accessible, and capable of presenting contextualized ethnomathematics material in a student friendly format. Although pocket books have limitations due to their paper-based nature, integrating cultural context and technology can enhance their appeal and effectiveness (Marsigit et al., 2025). The results of research conducted by Istiqomah et al. (2025) indicate that pocket book learning media based on local wisdom can improve students' understanding of mathematical concepts. Pocket books have proven to be an effective and practical medium for mathematics learning (Putri et al., 2024). So, in order to enhance numeracy literacy, pocket books can be used as a means of implementing ethnomathematics and providing challenging learning activities. The concept and stages of adventure-based learning in Indonesian culture can be seen more clearly in (Hutaeruk et al., 2024). The effectiveness of ethnomathematics and pocket book media in supporting mathematics learning has also been demonstrated in several previous studies.

Previous research implementing ethnomathematics or pocket books showed positive results on numeracy literacy. Augmented reality-based ethnomathematics can enhance numeracy literacy (Pramulia et al., 2025). In addition, pocket book media with local wisdom can be a means of delivering mathematical concepts and optimizing student learning outcomes (Istiqomah et al., 2025). The integration of ethnomathematics provides new learning experiences and increases student learning motivation (Sopamena et al., 2026). Furthermore, previous studies emphasized that ethnomathematics plays an important role in helping

students understand, express, and apply mathematical concepts through cultural contexts. The implementation of ethnomathematics in Indonesia is also considered closely related to cultural growth and educational contexts, highlighting the importance of integrating Indonesian cultural elements into mathematics learning to create more meaningful and inclusive learning experiences (Wulandari et al., 2024). Based on previous research findings, there has been no research that focuses on the development of pocket books with Nusantara culture and adventure activities in enhance numeracy literacy. Therefore, there is a research gap that can be filled by developing ethnomathematics-based pocket books with adventure activities in Nusantara culture to enhance numeracy literacy. Furthermore, the novelty of this research will raise the Nusantara culture, consisting of the cultures of Java Island, Sumatra Island, Kalimantan Island, Sulawesi Island, and Papua Island, which will then be explored on musical instruments, traditional clothing, and traditional houses (Hutaeruk et al., 2024, 2025) and also the adventure based learning integrated into a pocket book to enhance numeracy literacy. The development of ethnomathematics-based adventure pocket book is also supported by relevant learning theories, particularly Vygotsky's theory of cognitive development.

This research is also relevant to Vygotsky's learning theory, which states that children's cognitive development can be achieved by facilitating their zone of proximal development. Students learn through social interactions with peers and by seeking guidance from teachers. Adventure activities within Indonesian culture will maximize students' knowledge potential. This theory is implemented through a pocket book

based on ethnomathematics in Nusantara culture, which will help students more easily understand the material and train them to solve everyday problems. The research question in this study is how the process of developing a pocket book based on ethnomathematics and adventure in Indonesian culture is feasible, easy to understand, able to enhance students' numeracy literacy, and gets a positive response. This research will contribute by increasing insight regarding the implementation of ethnomathematics in learning, providing innovative learning resources that optimize students' cognitive abilities, and can practically be a reference for teachers to enhance students' numeracy literacy.

METHOD

The research method used is the Research and Development (RnD) with the 4D model (Thiagarajan *et al.*, 1974). The 4D model consists of four stages, namely (1) define stage is the initial stage of analyzing information to identify and determine the needs required in planning open materials, (2) design stage is the stage that aims to design the initial design of the teaching materials to be developed, (3) develop stage is the stage to test the feasibility, readability, and effectiveness of the pocket book on numeracy literacy and student responses to the pocket book, and (4) disseminate stage is the final stage carried out by disseminating the developed product. The stages of the 4D model are presented in Figure 1.



Figure 1. The Stages of the 4D Development Model

This study employs a mixed-methods embedded design that combines quantitative and qualitative approaches in research and development method. The qualitative approach in this study was carried out to describe the needs of students and teachers and analyze the needs of pocket book design. The quantitative approach in this study used Experimental Design with the One-shot Case Study type, namely by providing treatment (treatment) to one experimental group and then analyzing the results (Mukhid, 2021; Sugiyono, 2020).

Participants

This study was conducted at a public junior high school in Semarang City, Central Java. The subjects of this study were seventh graders in the 2023/2024 academic year. The sampling technique used in this study was cluster random sampling, which is the random selection of samples from groups. The research sample will be selected randomly from one class among the total number of seventh-grade classes at public junior high school in Semarang. The feasibility of the pocket book will be validated by one expert (lecturer) and two practitioners (junior high school mathematics teachers). The readability test will involve 37 eighth-grade junior high school students, as they have previously studied the material and are therefore able to evaluate the clarity and comprehensibility of the content. Meanwhile, student responses to the use of the pocket book will be obtained from 31 seventh-grade junior high school students as the primary target users of the developed product.

Instrument

The instruments used in this study consisted of interview guidelines, questionnaires, and a numeracy literacy

test. Interview guidelines were used during the define and design stages to obtain information about student and teacher needs. Three questionnaires were developed: a feasibility questionnaire, a readability questionnaire, and a student response questionnaire. The pocket book feasibility aspect refers to the National Education Standards Agency (BSNP) in the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 8 of 2016 concerning Books Used by Educational Units, which includes content feasibility, presentation feasibility, grammar feasibility, and graphic feasibility (Kemdikbud, 2016). The readability aspect used in this study refers to (1) the use of language that is easy to understand, (2) the use of font type and size to facilitate understanding of the material, (3) appropriate spacing, (4) errors in the writing of the book, (5) presentation of illustrations, (6) attractive and appealing presentation of the book that is appropriate for the material and the age of the reader, (7) the writing style used, (8) the density of ideas and information in the book, (9) the use of standard Indonesian grammar, and (10) the systematic presentation of material (Ardiansyah *et al.*, 2021). The aspects of student response to pocket books include (1) complete, engaging, and easy-to-understand presentation, (2) suitability of teaching materials to student needs, and (3) assistance in developing student abilities, which will be developed into 10 questions by the researcher (Suhartatik *et al.*, 2026).

Researchers developed numeracy literacy test instruments that one expert and one practitioner validated to ensure that the instruments measured what they were intended to measure. The mathematical literacy test questions contain ethnomathematics contextual problems on flat building materials. The

numeracy literacy test questions in Figure 2 are based on the numeracy literacy indicators according to Han *et al.* (2017) namely (1) analyzing information displayed in various forms (graphs, tables, sections, diagrams, and so on), (2) using various kinds of numbers and symbols related to basic mathematics to solve problems in various contexts of daily life, and (3) interpreting the results of the analysis to predict and make decisions.



Figure 2. Mathematical Literacy Posttest

Data Collection

The data collection techniques used were interviews, questionnaires, and tests. Interviews were conducted using interview guidelines to obtain information as the first step of the research in the define and design stages. Then, the questionnaires used were feasibility questionnaires, readability questionnaires, and student response questionnaires to see the level of feasibility, readability, and student response at the development stage. Tests were conducted by administering numeracy literacy tests to students to measure whether the pocket book developed was able to enhance their numeracy literacy, as indicated by the average score and the proportion of correct answers.

Data Analysis

The data analysis techniques used are descriptive, qualitative, and quantitative. Qualitative analysis will be based on the results of interviews and suggestions contained in the questionnaire. Then, quantitative analysis will be based on statistical test results, namely the one-

sample t-test to see the average completeness of more than KKTP, and the z-test for the proportion of average completeness of more than KKTP of more than 70%. Researchers must conduct a normality test on the previously obtained mathematical literacy data to determine whether it comes from a normally distributed population based on a significant value of $p > 0.05$. The results of the feasibility questionnaire, readability questionnaire, and student response questionnaire will be analyzed based on the average score and level. The score for each statement in the feasibility questionnaire and readability questionnaire uses a 1-4 Likert scale with the following descriptions: "1" Very Poor, "2" Poor, "3" Fair, "4" Very Good. The scores for each statement/indicator of each aspect of the student response questionnaire use the Guttman scale, namely "1" Yes and "0" No. The final value of the statement items is calculated using the formula where P is the percentage score using the formula:

$$P = \frac{\text{Score}}{\text{Score Maximum}} \times 100\%$$

Ethnomathematics-based adventure pocket book with Nusantara cultural context d is considered to have passed the feasibility test, readability test, and student response test if the average score percentage is greater than or equal to 85%. If the average score percentage is less than or equal to 85%, the pocket book needs to be revised and revalidated (Raivo & Ardiansyah, 2024; Setiawan et al., 2024). The criteria and levels for each questionnaire can be seen in the following Table 1.

Table 1. Feasibility Test, Readability Test, Student Response Test Level Criteria

Level	Criteria
$1\% < P \leq 50\%$	Not feasible/Difficult to

	understand/Bad
$50\% < P \leq 70\%$	Fairly feasible/ Less understand/Enough
$70\% < P \leq 85\%$	Feasible/ Pretty easy to understand/Good
$85\% < P \leq 100\%$	Very feasible/ Easy to understand/Very good

RESULT AND DISCUSSION

Results

This study focuses on answering the research question of developing an Ethnomathematics-Based Adventure Pocket Book with a Nusantara Cultural Context. The development process will follow the 4D development stages, namely define, design, develop, and disseminate.

Define

Front-end analysis results

A front-end analysis was conducted to identify the fundamental issues that were taken into consideration in developing the initial design of the pocket book. To identify the issues, a preliminary study and interviews with mathematics teachers were conducted. The problems identified were then analyzed to find solutions that meet the needs of teachers and students. Factors contributing to the suboptimal numeracy literacy of students included facilities, limited learning resources, and learning activities that did not optimize students' numeracy literacy. In addition, students were rarely given non-routine math problems. In these schools, learning resources that provide numeracy and literacy questions are rarely used. This means that learning usually focuses only on mathematical understanding. Teachers have also not implemented ethnomathematics in their teaching. Based on these factors, innovation in the form of learning media oriented towards student numeracy literacy is needed. Due

to the limitations of learning media that have not integrated ethnomathematics and engaging learning through adventure, this solution can address the existing problems. Therefore, the development of an ethnomathematics-based adventure pocket book with a Nusantara cultural context is needed to enhance student numeracy literacy.

Students' analysis results

Student analysis activities aimed to identify student characteristics and needs in mathematics learning. Interviews were conducted with three seventh-grade students representing different ability levels. Based on the interviews, several important findings were identified. First, two of three students relied only on textbooks as learning resources, with no additional learning media used during mathematics lessons. Second, students experienced difficulties in understanding the material because the explanations in the textbooks were considered too complex and abstract. Third, students explained that the teacher's instructional approach mainly focused on explaining formulas followed by repetitive practice exercises, resulting in limited opportunities for active exploration and reasoning. Fourth, all students showed interest in mathematics learning integrated with cultural contexts because it was considered more relatable to their daily lives. Fifth, students admitted feeling bored with conventional classroom activities and expressed enthusiasm toward the idea of adventure activities in learning. These findings became an important foundation for developing a pocket book that aligns with students' characteristics and learning needs. Based on this analysis, the proposed solution was to utilize cultural contexts familiar to students and present mathematical problem solving in a meaningful and

contextual manner. Therefore, an ethnomathematics based adventure pocket book with a Nusantara cultural context was developed as an innovative learning medium that is both engaging and accessible for students.

Task analysis results

Task analysis was conducted to determine the form of assessment for students that focused on numeracy literacy. This was done to establish the abilities that students must fulfill in relation to these skills. By conducting task analysis, researchers gained an overview of the assessment required in mathematics learning as contained in the development of the pocket book. Students will be given the challenge of solving numeracy literacy problems on each island mentioned in the introduction above. Next, students will present their work and cross-check it. The problems will be presented in QR codes and then worked on gradually according to the order of the Nusantara. Students will first solve puzzles and then work on numeracy literacy problems about each island. This assessment is called an adventure mission, which contains numeracy literacy problems on flat shapes and integrated with the Nusantara culture.

Concept analysis results

Researchers conducted concept analysis to identify teaching materials. Concept analysis activities were carried out to identify concepts or materials to be taught to students, which were then structured into learning materials. The material selected for development in the pocket book was flat shapes, measurement elements, and the main topics of triangles and quadrilaterals. The development of questions and materials based on geometry (flat shapes) was represented through culture, such as traditional musical instruments, traditional houses,

and patterns on traditional clothing. This was also in line with the learning outcomes for grade VII in the Kurikulum Merdeka.

Formulation of learning objectives

The final analysis in the define stage is the analysis of learning objectives. The results of the analysis of students, concepts, and tasks are used as the basis for formulating learning objectives. These objectives are used as the basis for designing the pocket book. The specifications of the objectives also need to be adjusted to the predetermined learning outcomes. The following is Table 2, which shows the learning objectives and learning outcomes in the pocket book.

Table 2. Learning Objectives And Learning Outcomes Of Pocket Book

Learning Outcomes	Learning Objectives
Students can explain the proportional effects of changes in flat shapes and spatial shapes on length, angle size, area, and/or volume.	Students are able to accurately solve contextual problems related to triangular flat shapes and quadrangular flat shapes after participating in lessons using Ethnomathematics-based adventure pocket books with a Nusantara cultural context.

Design

Test standard development results

Test standards are developed to create questions for the pocket book that have been adapted to numeracy literacy indicators. The development of test standards takes into account learning objectives and material distribution. The questions in Figure 3 will train students to see from abstract to concrete forms with the help of flat shapes. The information in the questions and narratives for each island will provide new knowledge related to culture and the ability to make connections between culture and mathematics. Questions on other islands,

such as (1) Sulawesi, highlight traditional houses shaped like trapezoids and ask students to find them, (2) Sumatra highlights Gadang houses, whose windows are three different-sized squares, (3) the Java Nusantara highlights a diamond-shaped pattern on batik, (4) the Papua Nusantara highlights the tifa musical instrument, whose strings are shaped like a kite, and then asks students to find its perimeter.



Figure 3. Numeracy Literacy Question With The Context "Central Kalimantan-Talawang Traditional Weapon."

Media selection results

Based on the results of the analysis in the define stage, researchers can determine the appropriate media to use. The media chosen by the researchers is a pocket book that can be used in hard copy or soft copy form. This pocket book is specially designed to incorporate the concept of adventure into the learning process. The pocket book with the concept of adventure in the Nusantara is an innovative feature of this pocket book. Students can go on adventures on the islands of Indonesia by scanning the barcodes available in the pocket book.

Format selection results

The developed pocket book offers several format options, such as font type and size, paper size, line spacing, and attractive displays. The display formats of the developed pocket book can be seen in Table 3.

Table 3. Format Selection Of Pocket Book

No	Format Selection of Pocket Book
1	Use Brasika font for titles, Barlow Condensed for subtitles, and Montserrat for sentences.
2	Font size 8 for content, size 18 for titles, and size 9 for subtitles.
3	Paper size is A6 with a width of 10.5 cm and a length of 14.8 cm.
4	Line spacing is 1.5.
5	The attractive cover and content of the pocket book, which are associated with the nuances of the Nusantara, will be the main attraction of this pocket book.
6	The use of barcodes makes it easier to access questions on each island and adds to the appeal of this teaching material.
7	The pocket book is divided into three main sections: introduction, content, and conclusion. The introduction section consists of the cover, product description, pocket book identity, and instructions for using the pocket book. The content section consists of the adventure mission, materials, and barcodes for the Nusantara locations. The conclusion section consists of a report sheet and a barcode for submitting the report.

Initial pocket book draft results

After selecting the media and format, the next step is to design the initial draft. In this section, the initial design or draft of the pocket book developed by the researcher is presented. This initial draft will be followed by feasibility and readability tests, small-group tests to assess whether it can enhance numeracy literacy, and tests of student responses to the pocket book. This pocket book is titled "Find the Math-Nics in Nusantara." The initial draft developed by the research consists of the following sections: (a) front cover, (b) brief description of the pocket book so that students can recognize it, (c) pocket book identity containing information on grade level, phase, domain, topic, learning objectives, and meaningful understanding, (d) learning instructions containing learning steps with adventure stages, (e) adventure missions containing challenges to guess clues at each island to enter the QR code and work on numeracy literacy questions, (f) brief material on the formulas for the perimeter and area of triangles and

quadrilaterals, (g) a report sheet to write down the five numeracy literacy questions from the islands of Sumatra, Kalimantan, Java, Sulawesi, and Papua, and (h) a QR code to collect the completed report sheets. The initial draft of the pocket book is shown in Figure 4.





Figure 4. The Initial Draft of The Pocket book

Develop

The next stage that the researchers conducted was the development stage. At this stage, the researchers conducted several tests on the initial draft of the pocket book that had been developed, namely a pocket book feasibility test and a pocket book readability test. The results obtained are as follows.

Feasibility test results

Feasibility test of ethnomathematics-based adventure pocket books with a

Nusantara cultural context by a mathematics lecturer at Semarang State University (v₁), a junior high school mathematics teacher (v₂), and a master's student in Mathematics Education at Semarang State University (v₃). In this feasibility test, there were four aspects assessed, namely content feasibility, presentation feasibility, language aspects, and learning innovation aspects. The pocket book developed by the researcher was declared feasible if it met the criteria of being very feasible.

Based on Table 4, the recapitulation of the pocket book test developed has a final average of 91.05%, which is classified as very feasible. Based on the feasibility aspects, it can be seen that the content feasibility aspect has a final score percentage of 85.12%, which is classified as very feasible, the presentation feasibility aspect has a final score percentage of 93.52%, which is classified as very feasible, the linguistic feasibility aspect has a final score percentage of 92.86%, which is classified as very feasible, and the learning innovation feasibility aspect has a final score percentage of 100%, which falls under the very feasible criteria. After the feasibility test, improvements were made based on suggestions and input from the validators. Table 5 shows some of the improvements made based on suggestions and input from the validators. The results of the pocket book improvements can be seen more clearly in Figure 4.

Table 4. Recapitulation of Feability Test Results

Validator	Feasibility(%)				Final Score	Criteria
	Content	Presentation	Language	Learning Inovation		
V ₁	82,14	97,22	100	100	93,29	Very Feasible
V ₂	87,5	88,89	89,29	100	89,63	Very Feasible
V ₃	85,71	94,44	89,29	100	90,24	Very Feasible
Average	85,12	93,52	92,86	100	91,05	Very Feasible

Table 5. Suggestions for Revisions and Improvements from the Pocket Book Feasibility Test

No	Validator Revision Suggestions	Revisions Made
1	The achievement of learning outcomes and learning objective needs to be reviewed.	Added information on learning achievement and adjusted to the Merdeka Curriculum guidelines.
2	The student report sheet can be expanded to more than one page. Considering that there are many questions, but only one report sheet is provided.	One page was added to the report sheet during implementation.
3	The font size can be enlarged because the media is small, making it easier for students to read and understand.	The font size was increased to 10pt.
4	It is better to use the ABCD rules for learning objectives.	Revised learning objective: "Students can accurately solve contextual problems related to triangular flat shapes and quadrangular flat shapes after participating in lessons using Ethnomathematics-based adventure pocket books with a Nusantara cultural context."
5	In the section on trapezoids and triangles, the images and area formulas do not match. In the triangle section, the base in the image is c , but in the area column, a is used instead of c . This should be corrected so that the formula matches the image, or the image should be changed to match the formula. The same applies to trapezoids.	The formula for finding the area of a trapezoid has been revised to reflect the variables and is now consistent with the formula description and image.
6	The font size should be given more attention; they should not be too large or too small. For sections that are not meant to be emphasized, the font could be standardized to create a neater appearance.	The fonts in the pocket book are divided into Brasika for titles, Barlow Condensed for subtitles, and Montserrat for sentences.

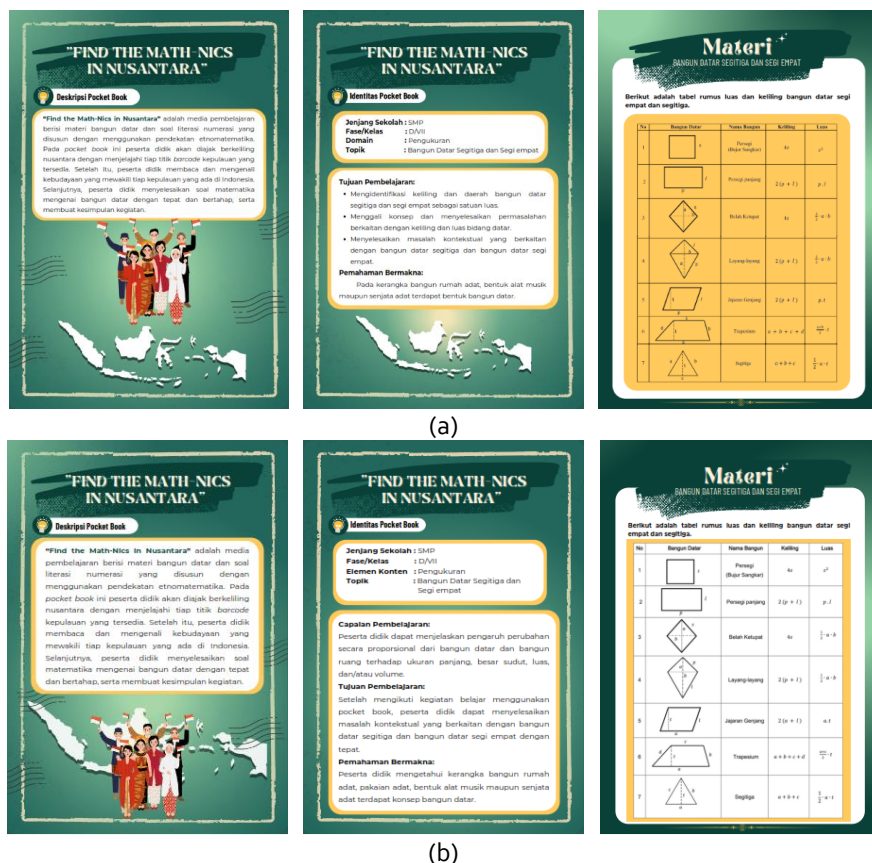


Figure 5. (a) Pocket Book Before Revision and (b) Pocket Book After Revision

Readability test results

The pocket book that was developed was tested for readability by 37 eighth-grade students at public junior high school in Tanjungpinang by filling out a questionnaire provided by the researcher. Based on the readability test results, the final average score was 87.84%, which is classified as easy to understand. From the readability test results, several comments and suggestions were also obtained from the assessors. Some of the students' comments and suggestions were (1) the pocket book has an attractive design for readers, increase the amount of material and include a few easy-to-understand questions, (2) everything is good, the illustrations are very attractive, and the sentences are easy to understand, (3) for me, this pocket book is already good, so I have no suggestions, (4) my suggestion is to add more knowledge questions and reduce long questions, and (5) the pocket book should add explanations or definitions that are easier for readers to understand.

Effectiveness test results

This testing phase was conducted to assess whether the pocket book could enhance numeracy literacy by conducting average mastery tests and proportion mastery tests in classes that used the pocket book. The implementation phase began with the teacher conducting preliminary activities by opening the lesson, providing an introduction, asking stimulating questions, and conveying the learning objectives. Then, the teacher distributes the pocket books, and the students learn about triangles and quadrilaterals. At the end of the lesson, students take a post-test to see the effect of implementing the pocket book.

Based on the prerequisite test conducted, namely the normality test, the following results were obtained. The

normality test was conducted using the Kolmogorov-Smirnov Test through the SPSS Statistics 26 application. The normality test results obtained an *Asymp. Sig. (2-tailed)* value for the post-test score of 0,134. Because the criterion in this test is that if the significance value is $> 0,05$ then H_0 is accepted. Thus, both data sets are normally distributed.

Next, the researchers tested two hypotheses to see whether the pocket book could enhance numeracy literacy or not. In the first hypothesis test, the individual completeness test, the researchers used a one-sample t-test to determine whether the average score of students' post-test mathematical literacy had reached a minimum average score of 75. The criterion for accepting the hypothesis in this test was that if $p < .05$ then H_1 was accepted. The test results showed that the p value in the One Sample Test table was ,000 so that H_1 is accepted. This means that learning using pocket books enabled students to achieve an average of 75 with an average score ($M = 87.26$).

Next, the researcher tested the second hypothesis, namely the proportion of students who achieved mastery in the group that used pocket books. The researcher used the z-test to determine the percentage of students who achieved the minimum average score in mathematical literacy in the experimental group after implementing pocket books. The results show that the observed z_{count} is 2.86, which is greater than the critical value of 1.64 at $\alpha = .05$. The results of this proportion completeness test mean that the average number of students who passed exceeded 70% after using the pocket book. Based on these two statistical tests, the pocket book can enhance students' numeracy literacy to achieve average completeness.

Student response test results

The pocket book was then tested on 31 seventh-grade students at a public junior high school in Semarang. This stage was carried out to determine the students' response to the use of the pocket book. The results of the student response questionnaire are shown in Table 6.

Table 6. Recapitulation of Student Response Test

Students	Average Score (%)	Criteria
1 Students	75	Very Good
3 Students	83	Very Good
6 Students	92	Very Good
21 Students	100	Very Good
Average	96%	Very Good

Disseminate

This pocket book has been tested, proven, easy to understand, able to enhance student numeracy literacy, and received very good responses. The dissemination stage is the final stage, which involves distributing the developed product. There are three activities: final packaging, diffusion, and adoption. In the packaging stage, pocket book that have been measured for their achievement of development objectives are packaged and then distributed so that they can be absorbed (diffusion) and used (adoption) in schools. It has been submitted for intellectual property rights. In addition, the pocket book has been distributed through mathematics teachers who will teach flat shapes at public junior high schools in Semarang and Tanjungpinang. The researchers recommend that teachers design lessons using the concept of adventure in the Nusantara's culture to make learning more interesting and contextual.

Discussion

Feasibility of Pocket Book

In terms of content, the pocket book has a

final score of 85.12%, which is considered very good. This shows that the pocket book has fulfilled the important things to be achieved in learning. Good teaching materials must contain adequate competencies and be in line with the curriculum to achieve learning objectives (Setiawan et al., 2024). In terms of content, the pocket book that has been developed is very feasible and can train and encourage students' numeracy literacy and student engagement in learning. In terms of presentation, it has a final score percentage of 93.52%, which is very feasible. This shows that the pocket book has met the indicators of good and systematic presentation. The presentation of the pocket book, which uses cultural elements and varied designs, can attract students to engage in learning. The use of attractive images and colors will make it easier for students to remember (Raivo & Ardiansyah, 2024). The pocket book provides questions with narratives and illustrations, making learning more interesting and easier for students. In terms of language, it has a final score of 92.86%, which is considered very good. This shows that the pocket book has met the criteria for media that is systematically organized and uses language that is easy for students to understand, making it suitable in terms of language. It is important to consider the readability level of teaching materials (Setiawan et al., 2024). In terms of learning innovation, it has a final score percentage of 100%, which is feasible. This shows that the pocket book meets the indicators of novelty, integration, and student achievement. Learning requires innovation to improve students' ability to absorb learning material (Basister et al., 2025). Based on the overall results, the final percentage score is 91.05%, which is feasible. The feasibility test results are in line with previous studies. A related study

on enhance numeracy literacy through the development of ethnomathematics e-modules was deemed feasible for use with a percentage of 80,2% (Yanti Siregar et al., 2025).

Readability of Pocket Book

The readability test results obtained indicate that the readability score percentage is 87.84%, categorized as easy to understand. This indicates that the pocket book contains sentences, vocabulary, and paragraphs that are easy for readers to understand. The use of appropriate spacing between lines, the selection of suitable font types and sizes, and the inclusion of attractive graphics and images make the pocket book more engaging for students. The readability test results of this study align with those of previous research by Setiawan et al. (2024) which suggest that teaching materials that are easy to understand can help enhance numeracy literacy.

Impact on Numeracy Literacy

The results of testing numeracy literacy show that pocket books can enhance students' numeracy literacy. This finding cannot be separated from the contribution of contextual learning from the integration of ethnomathematics. Simple concepts with the help of ethnomathematics and pocket books encourage students to develop a sense of numbers. This approach trains students to analyze and connect numerical concepts with real-world, culture-based problem solving. Students will be trained to see abstract things as concrete with the help of ethnomathematics. This finding aligns with the results of other studies, which suggest that implementing ethnomathematics can enhance students' numeracy literacy while preserving cultural context (Pramulia et al., 2025). Students will be able to analyze, use

numerical symbols, and make conclusions with the help of ethnomathematics. Cultural learning in mathematics has been proven effective in preparing students to face real challenges. The development of e-modules with cultural contexts is effective, making learning more meaningful (Saputri et al., 2026). Teaching materials with everyday contexts can enhance understanding, not just the implementation of formulas (Beemt et al., 2023; Gal, 2024). This aligns with the findings of this study, which suggest that numeracy literacy is not only about implementing formulas but also about analyzing and interpreting real-world contexts within mathematics.

Students Responses of Pocket Book

The results of the students' response test to the teaching materials developed by the researcher showed a score of 96% with a very good rating. The pocket book can be said to have received a very good response because the learning stages were designed to be interesting. The adventure learning stages allowed students to gain new experiences and encouraged their cognitive development. In accordance with Vygotsky's theory, that the improvement of students' cognition through social interaction helps students achieve their maximum development. This finding is also in line with other studies that teaching materials that meet positive student response tests show that these teaching materials are interesting, easy to use, and useful in the learning process (Franita et al., 2024). This pocket book has a comprehensive presentation that helps students learn. The pocket book's appearance is attractive and easy to understand and suits students' learning needs to understand flat shapes.

Implication

Innovations that can be implemented to help students and teachers create interactive learning are ethnomathematics and adventure-based learning, which will make the pocket book more interesting. A pocket book designed so that students can easily carry and obtain concise and compact material. Ethnomathematics with the culture of the archipelago also becomes a new learning experience for students, making it more interesting and motivating. This solution is also in line with the opinion that students' ability to face real challenges is important for dealing with real-world problems (Bhardwaj et al., 2025). Ethnomathematics provides a space for thinking and processing mathematics that is synonymous with traditional culture (Zito & Albanese, 2025). In addition, meaningful learning with ethnomathematics trains students to solve contextual problems with a more interactive approach (Pramulia et al., 2025). Therefore, educators are advised to implement ethnomathematics in learning and can design activities using the adventure concept (Hutaeruk et al., 2024).

This study paves the way for further research. The results of the pocket book feasibility test can be used as a reference that pocket books with materials and objectives to improve other mathematical abilities can be developed. The results of the pocket book readability and student response tests show that the learning stages designed to be interesting and systematic can still be understood by students and help improve their abilities. In addition, the results of the pocket book test open up new opportunities for research on other mathematical abilities.

Limitation

However, this study also has limitations. First, the effectiveness test was only

conducted in a pre-experimental design and was not carried out comprehensively. Second, the implementation of the pocket book is still limited to one school, so the results of the study should be generalized with caution. Third, there are limitations in the cultural study in the archipelago, which only discusses the five cultures most familiar to students, so it is hoped that other cultures can be studied more widely.

CONCLUSION

This study successfully developed an ethnomathematics-based adventure pocket book with a Nusantara cultural context as an instructional medium to support students' numeracy literacy in mathematics learning. The findings demonstrate that integrating cultural context with adventure in learning can create meaningful and engaging learning experiences that bridge students' everyday cultural experiences with mathematical competencies, encouraging deeper engagement and providing structured opportunities to apply quantitative reasoning in real-life contexts. This development demonstrates that the ethnomathematics approach has strong potential as an effective and sustainable strategy for enhancing students' numeracy literacy skills, particularly in the Indonesian educational context where numeracy performance remains a significant concern, and offers a replicable model for developing contextually and culturally relevant learning materials across different regions or subjects area. Therefore, this research implies that culturally contextualized learning media can serve as an alternative solution to support mathematics learning, strengthen students' cognitive development and problem-solving abilities, and provide references for teachers in developing innovative numeracy literacy learning media. Future

studies are encouraged to examine the long-term impact of ethnomathematics-based media on numeracy literacy, extend implementation to broader student populations, and explore digital adaptations to further enhance accessibility and interactivity.

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