Pengembangan Media Pembelajaran Pada Materi Pecahan Berbasis Etnomatematika

Karmila Ayu Lestari [1] *, Azmidar[2]

[1] Agama Islam Negeri Parepare, Soreang, Jl. Amal Bakti No. 8, Bukit Harapan, Kec. Soreang, Kota Parepare, Silawesi Selatan

[2]Agama Islam Negeri Parepare, Soreang, Jl. Amal Bakti No. 8, Bukit Harapan, Kec. Soreang, Kota Parepare, Silawesi Selatan

* Korespondensi Penulis. E-mail: krmylaayuu0602@gmail.com, Telp: +6285242518898

Abstrak

Dengan menggunakan metode etnomatematika, penelitian ini berupaya untuk membuat dan menilai kualitas materi pembelajaran tentang pecahan, khususnya pecahan senilai, yang terkait dengan budaya lokal. Lima langkah model pengembangan ADDIE analisis, desain, pengembangan, implementasi, dan evaluasidigunakan dalam penelitian ini bersama dengan teknik Penelitian dan Pengembangan (R&D). Sebagai metode kontekstual untuk mempelajari pecahan senilai, media papan pecahan yang mewakili bentuk kue tradisional Bugis katirisala (persegi panjang), sikaporo (segi enam), dan cucuru' bayao (lingkaran) dibuat. Dengan persentase 83,33% dari ahli materi dan 96,66% dari ahli media, hasil validasi ahli menunjukkan bahwa media yang dikembangkan memiliki tingkat validitas yang tinggi dan masuk dalam kategori "sangat valid". Sementara itu, hasil uji praktikalitas dari survei guru dan siswa menunjukkan bahwa media ini bermanfaat, dengan kategori praktis sebesar 79,76% dari siswa dan kategori sangat praktis sebesar 100% dari guru. Terkait efikasi, nilai N-Gain sebesar 0,88 menunjukkan bahwa hasil belajar siswa meningkat ke kategori "tinggi", yang menunjukkan bahwa media ini berhasil membantu siswa memahami konsep pecahan. Berdasarkan informasi yang diperoleh, dapat dikatakan bahwa bahan ajar papan pecahan yang dibuat dengan menggunakan etnomatematika telah memenuhi syarat validitas, kegunaan, dan kemanjuran serta layak digunakan dalam kurikulum matematika sekolah dasar.

Keyword: *Research and Development*, ADDIE, Papan pecahan.

Abstract

Using ethnomathematics method, this study attempts to create and assess the quality of learning materials about fractions, especially equivalent fractions, related to local culture. The five steps of ADDIE development modelanalysis, design, development, implementation, and evaluation—are used in this study along with Research and Development (R&D) techniques. As a contextual method for learning equivalent fractions, fraction board media representing the shape of traditional Bugis cakes katirisala (rectangle), sikaporo (hexagon), and cucuru' bayao (circle) are created. With a percentage of 83.33% from material experts and 96.66% from media experts, the results of expert validation indicate that the developed media has a high level of validity and is included in the "very valid" category. Meanwhile, the results of the practicality test from the teacher and student surveys indicate that this media is useful, with a practical category of 79.76% from students and a very practical category of 100% from teachers. Regarding efficacy, the N-Gain value of 0.88 indicates that student learning outcomes have increased to the "high" category, indicating that this media has succeeded in helping students understand the concept of fractions. Based on the information obtained, it can be said that the fraction board teaching material made using ethnomathematics has met the requirements of validity, usability, and efficacy and is suitable for use in the elementary school mathematics curriculum.

Keyword: *Research and Development, ADDIE, Fractional board.*

INTRODUCTION

Education is a basic need of every individual to contribute to the progress of the nation, as mandated in Law No. 20 of 2003 concerning the National Education System (Franciscus Xaverius Wartoyo, 2022).

Education reform in Indonesia is a must to face global challenges and meet the needs of a growing society, involving various aspects ranging from curriculum, teaching methods, to professional development of teachers. One of the main projects in this reform, the Independent Curriculum program, is to give teachers and students the freedom to choose instructional methodologies that suit their unique needs and local contexts, thereby increasing the adaptability and creativity of the learning process (Sibuea, 2020). In addition, the quality of educators is also a crucial factor; Training programs such as Teacher Driving aim to improve teachers' competence in teaching and leading in the classroom, improve the learning environment and provide comprehensive assistance for student growth. Educational infrastructure must also be considered, especially in remote areas that often lack basic facilities such as proper classrooms and access to information technology (Wahyudi et al., 2022). By focusing on relevant curriculum, teacher quality development, infrastructure improvement, equitable access to education, and quality evaluation, it is hoped that the national education system can produce the next generation of the nation who are competent and ready to compete at the global level (Suncaka, 2023)

From primary education to higher education, Indonesian education is carried out gradually, using a variety of resources tailored to the relevant curriculum. Students are exposed to various courses at the elementary level, including mathematics, natural sciences (IPA), social sciences (IPS), religious education and ethics, Indonesian, physical education, health, and cultural arts and crafts. In addition, the inclusion of subjects such as English, Mathematics, Science, Social Studies, Pancasila, and Civics Education deepens the curriculum at the Junior High School (SMP) level. Students can choose a specialization based on their interests and skills at the Senior High School (SMA) and Vocational High School (SMK) levels, such as Natural Sciences or Social Sciences, with additional instruction in Indonesian history and other art subjects (Susilaningtiyas & Fatmawati, 2021). The university hosts the latter level, which offers a number of more specialized educational programs, such as diploma, bachelor's, master's, doctoral, and specialist education. (Bagaskara, n.d.)

The ideal conditions of mathematics education involve various aspects that support each other to create an effective learning environment. First, the curriculum must be relevant and flexible, updated regularly to reflect the latest developments in education and real-world needs, and integrate mathematical concepts with other disciplines and practical applications.

Providing students with the skills to understand and apply mathematical concepts in daily life is one of the main goals of mathematics education in Indonesia. Because mathematics serves as the basis for studying more complex subjects at the next level of education, understanding mathematics, especially basic concepts such as fractions, becomes very important. However, in reality, many students still have difficulty understanding the concept of fractions. In addition to affecting their academic achievement in mathematics, these challenges can hinder the growth of critical thinking and reasoning skills necessary for higher education (Fathonah et al., 2023). Fractions are an important component of mathematics that is often applied in a variety of real-world situations, including financial management, comparison, and measurement. Failure of students to understand this material will result in a knowledge gap that can reduce the overall quality of learning (Annisah et al., 2021). To overcome these challenges, a unique and creative learning methodology is needed. A more engaging, contextual, and fun teaching method may be the answer to improving students' understanding of fractional concepts. It is hoped that this work will strengthen students' conceptual understanding and increase their drive to learn, preparing them for exposure to increasingly challenging math content in the future.

Innovative approaches to learning involve new strategies and techniques to enhance students' learning experience and understanding. According to the philosophy of education, one of them is the creation of learning media, such as the Dual Coding Theory put forward by Allan Paivio. Thus, the development of learning media is not only an innovative approach, but also a strategy supported by strong

educational theories to improve student understanding (Cahyadi, 2019).

The ethnomathematics-based approach is one that is getting more and more attention in the creation of educational materials. This approach aims to integrate elements of local culture into mathematics learning, so that learners can understand mathematical concepts through a context that is closer to their lives. Ethnomathematics not only studies mathematics as an abstract discipline, but also examines how cultural values, daily practices, and works of art in a society contain mathematical elements that can be used as a meaningful learning resource (Susilaningtiyas & Fatmawati, 2021).

Ethnomathematics emphasizes that the understanding and use of mathematics is greatly influenced by cultural background, so the concept of mathematics can vary from one community to another (Nurdeni et al., 2022). These studies often explore how societies apply mathematics in everyday practice, such as in trade, agriculture, architecture, and crafts. By integrating ethnomathematics in education, teachers can create material that is more relevant and engaging to students, relating mathematical concepts to their own experiences and cultures. In addition, ethnomathematics also helps to appreciate the diversity of mathematical ways of thinking and practice in different cultures, thereby enriching students' understanding of mathematics globally (Serepinah & Nurhasanah, 2023).

A fragment is a part of something whole. This part is marked by arsiran, so it is known as a numerator (Heruman, 2012). In fractional lessons, we learn about numerators and denominators, each of which represents the basic value of the fraction itself. Fractional numbers consist of numerators and denominators. In this number, the numerator is usually pronounced first, then followed by the denominator. When mentioning a fractional number, we need to insert the word "per" between the numerator and the denominator. For example, for the number 3/5, we pronounce it as "three-fifths". In our daily lives, we often share food or goods with our friends, children, or neighbors.

In the context of mathematics learning, fractional boards serve as a very effective learning medium to help students understand the concept of fractions. These tools are usually made of wood or other materials and are divided into parts that show the fractions of a whole.

Fraction boards offer a clear visualization of the parts of a whole, making it easier for students to understand how fractions work. Using this board, students can perform physical manipulations, such as sliding or picking up certain parts, which allows them to see firsthand how fractions can be added or subtracted.

In addition, fraction boards are also useful for demonstrating other concepts, such as comparing fractions, identifying equivalent fractions, and understanding how to convert fractions to decimals. By integrating fractional boards in learning, students will have an interactive and engaging experience, which supports their understanding of the material (Mutiara et al., 2023).

In addition, the development of ethnomathematics-based learning media aims to improve teachers' ability to teach. With interesting and relevant media, teachers can more easily convey material and create an active classroom atmosphere. This is expected to have a positive impact on the quality of mathematics education in schools, especially in culturally rich areas.

From the perspective of education policy, this research is in line with the government's efforts to improve the quality of education in Indonesia. The current curriculum emphasizes the importance of cultural context in learning, so this research supports the implementation of a curriculum based on local wisdom (Asma & Kadir, 2022).

Previous research has shown that the use of culture-based educational materials can improve students' understanding of mathematical ideas. Research by (Rekysika & Haryanto, 2019), for example, shows that snake and ladder learning materials are useful in helping students in recognizing number and number operations, especially for children who previously struggled with related cognitive problems. Research by (Hidayati et al., 2023) which concludes that algebraic block aids help in conveying material in the form of concrete shapes or objects, through a block in the form of a flat banguin can lead to the realization of the abstract matheiri. Research by (Ikhtiyariyah, 2023) with the title "Development of Ethnomathematics-Based Visual Novel Game Learning on Mathematical Reasoning Ability in Fractional Materials" concluded that the method of making ethnomathematics-based game novel visual novel learning media for mathematical reasoning skills in fractional material provided very valid results, according to the assessment of media expert validators (88%), and material experts (90%).

The results of initial observations at SD Muhammadiyah 2 Parepare show that the use of learning media in the mathematics teaching and learning process is still relatively low. Teachers tend to more often apply lecture methods and give written assignments without being supported by concrete or interactive media. This results in the passive nature of students who are less actively involved in learning, and easily lose focus, especially when studying abstract material, such as fractions. The limited learning media that

can visualize mathematical concepts makes it difficult for students to understand the material thoroughly.

Based on previous observations and research results, the researcher seeks to develop learning media that can increase student activeness during the teaching and learning process. Through this approach, students are expected to see the relevance of mathematics in their daily lives, so that it can encourage them to be more motivated in learning. This is the background for the researcher in choosing this topic as the title of the research. The problem of fractional learning media is a fairly common issue, but until now the best solution has not been found. At SD Muhammadiyah 2 Parepare, the use of media in teaching mathematics is still relatively minimal. Therefore, teachers as educators experience difficulties in delivering material to students when they have not utilized appropriate learning media. This certainly affects students' understanding of the material taught. Without media, students may find it difficult to understand the lessons being delivered. On the other hand, with the use of media in mathematics learning, students will find it easier to understand the concepts that the teacher wants to convey. The researcher chose the title "Development of Learning Media on Ethnomathematics-Based Fractional Materials" for this study, with the hope that the developed media will be an effective tool in attracting attention and increasing student involvement in mathematics learning activities.

METHOD (15%)

According to (Okpatrioka, 2023), this research is classified as "development research" or development research, which is also known as "R&D" (Research and Development). ADDIE's development methodology was chosen for its adaptability nature and focus on continuous assessment, which guarantees that the final learning material meets the criteria of validity, effectiveness, and practicality.

This research follows five main stages of the ADDIE development model. Data were collected for the analysis stage at SD Muhammadiyah 2 Parepare through observation and interviews. The research findings show that because math teaching tends to be more textual and less contextual, students are less motivated to study the subject. Therefore, interesting and relevant learning media is needed, especially those that raise the concept of fractions and local cultural values. At the design stage, media design is prepared systematically including material preparation, skill development, and fractional board design. The development stage includes designing the structure and content of the media, validation by media and material experts, and revision based on the input received. Furthermore, at the implementation stage, limited and extensive trials were carried out to assess the effectiveness and involvement of students in the use of media. Finally, the evaluation stage is carried out to assess the feasibility and benefits of learning media as a whole based on the results of validation and trials that have been carried out.

To collect research data, researchers used various tools to assess the validity, usability, and effectiveness of the fractional board media that had been developed. The assessment instruments used by the researcher are questionnaires, tests and documentation.

Techniques Data analysis from this study to find learning media that meets valid, practical, and effective criteria. The methods used by the researcher in this developmental study are:

1. Expert validation data analysis

The purpose of this study is to evaluate the validity of learning media based on appearance, completeness, materials that are in accordance with KD, and characteristics of fractional boards. The validation was carried out by two lecturers from IAIN Parepare and a teacher from SD Muhammadiyah 2 Parepare using a Likert scale questionnaire (1-4). The percentage of validity is calculated based on expert judgment for each of the following components:

$$Y = \frac{\sum x}{\sum xi} \times 100\%$$

Information:
Y = Product validation test value
$\sum$x = Value obtained
$\sum$Xi = Value maximum

Analysis of the percentage calculation obtained then compared to the feasibility level of the product used (Sugiyono, 2024)

Table 1. Product Eligibility Categories

Presentase	Kualifikasi	Eligibility Criteria
82% < score≤ 100%	HighlyValid	Highly feasible
63% < score≤ 82%	Valid	Proper
43% < score≤ 63%	Invalid	Not eligible
25% < score≤43%	Invalid	Very unworthy

Based on the percentage obtained from the validation questionnaire, a questionnaire is considered valid if it reaches the criteria between 64% to 100% of the total elements of the experts' assessment. If the questionnaire is declared invalid, it needs to be revised to meet the validity criteria.
Data Analysis of the Practicality of Learning Media

2. Data Analysis of the Practicality of Learning Media

Practicality analysis was carried out by questionnaires from students and teachers regarding the suitability of products and learning media. Students recorded their experiences using the fraction board, while the teacher observed the application of the media and provided responses through questionnaires.

a. Analysis for student response questionnaire data

The formula used to calculate the presentation of student responses based on the data that has been collected is:

$$x_i = \frac{total\ score\ obtained}{skor\ maksimal} \times 100\%$$

Information:
x_i = Student response

To calculate the average score of the student response questionnaire assessment, it is done in the following way:

$$x = \frac{\sum x}{n} \times 100\%$$

x = average student response

$\sum$x = total student response scores

n = many students

b. Analysis for teacher response questionnaire data

The practicality of teaching materials, both products and learning materials, can be assessed through the analysis of teacher observation data using the following formula:

$$kor\ tanggapan\ guru\ \% = \frac{jumlah\ skor\ yang\ dicapai}{skor\ maksimal} \times 100\%$$

Learning media is considered practical if it meets the percentage standards described in the following

table (Alfie Ridho et al., 2023):

Presentase	Kualifikasi
82% < score≤ 100%	Very Practical
63% < score≤ 82%	Practical
43% < score≤ 63%	Less Practical
25% < score≤43%	Very Impractical

Table 2. Practicality Assessment Criteria

If the results of the survey of students and teachers reach 64%-100%, the media is considered practical and receives a positive response. However, if it is below 64%, the media is declared ineffective for learning.

c. Effectiveness data analysis

The evaluation of the effectiveness of the fractional board was carried out by the N-Gain test, comparing the results of the pretest and posttest. This approach is in line with Sugiyono's view on the importance of data analysis to assess student learning progress.

$$N - Gain = \frac{skor\ posttest - skor\ pretest}{skor\ ideal - skor\ pretest}$$

The division of categories obtained from the results of N-Gain can be seen in the following table (Kurnia, 2023):

N-value – *Gain*	Category
G > 0,7	Tall
0,3 < G ≤ 0,7	Keep
G ≤ 0,3	Low

Table 3. N-Gain Score Distribution

Data source: Irvan Yusuf and Sri Wahyuni Widyaningsih (2022)

RESULTS AND DISCUSSION

1. Development of learning media on ernomathematics-based fractional materials with the ADDIE model.

In accordance with the guidelines of the Elementary School (SD/MI) curriculum, this study makes learning materials in the form of fractional boards containing information about equivalent fractions. The five main steps of the ADDIE model—analysis, design, development, implementation, and evaluation—are used in the creation of this media. (Laukum et al., 2024). Each stage in the ADDIE model has been systematically implemented to ensure the effectiveness of the learning media developed.

a. Results of the Analysis Stage

At this point, investigators conducted the first examination at SD Muhammadiyah 2 Parepare class IV. The results of this preliminary investigation are used to determine next actions to address current issues. The following items are obtained during the analysis phase to identify the problem:

1) Situation analysis

Situation analysis is a very important first step in this study, which aims to understand the real conditions in the field, especially in the context of mathematics learning in grade IV of SD Muhammadiyah 2 Parepare. The researcher made direct observations of the learning process in this

classroom, including the interaction between teachers and students, the teaching methods used, and the overall classroom atmosphere. From these observations, it was found that mathematics learning is more dominated by lecture methods conducted by teachers. While this method can convey information well, it does not encourage active student engagement.

One of the main factors that results in a lack of student participation is the use of the lecture method (Susanti, 2024). This one-way learning makes students tend to be passive listeners, without the opportunity to interact and ask questions. This can make children less motivated and interested in learning mathematics, especially fractional material that requires a deep understanding of concepts. In addition, in the learning process, mathematics materials are only supported by package books which are the main reference (Susanti, 2024). This reliance on a single learning resource results in students not having access to different perspectives and learning methods, which are often considered rigid and unable to answer the various questions or difficulties that students face.

The lack of varied use of learning media is also an important finding in the analysis of this situation. The lack of learning media makes students not get an interactive and interesting learning experience. Media such as fractional boards, teaching aids, or digital learning technology that can improve students' understanding of fractional ideas have not been used to the maximum.

2) Analysis of the character of students

Student character analysis is an important step in understanding the dynamics of learning in grade IV of SD Muhammadiyah 2 Parepare. Through this analysis, researchers can identify the traits, interests, and needs of students that affect the mathematics learning process, especially in fractional materials. In observation, it is seen that students have diverse characters, which affects the way they interact with the subject matter.

One of the key findings of the analysis of students' character is their tendency to be passive during learning (Cahyani & Pranata, 2023). Many students seem to be less enthusiastic and do not actively participate in class discussions. This is due to a lack of intrinsic motivation to learn math, which may be due to less positive previous experiences or limited understanding of the importance of the material being taught. The majority of students have difficulty understanding the idea of mathematics, especially when it comes to fractional material, which is a complex topic and requires a deep understanding.

3) Needs analysis

Needs analysis is carried out to find out the needs of students in mathematics learning, especially in fractional materials. From the results obtained, the learning method that has been used so far is the conventional method, where the teacher explains the concept of fractions verbally and uses a whiteboard to draw fractions. This method is often time-consuming and does not always provide students with a deep understanding.

Students also have difficulty understanding and distinguishing different types of fractions, so they need more concrete media to help visualize these concepts. Fractional learning will look more interesting if it is accompanied by illustrations and examples that can be seen directly.

Learning media that is engaging, useful, and compatible with the quality of students is what is needed. Fractional boards are one of the media that respond to this difficulty. Fraction boards are resources that provide children with a clear and engaging visual representation of the concept of fractions so that they can see and engage with them directly. Students can directly control the fractions on the fraction board, which improves their comprehension.

4) Material analysis

When creating educational media, material analysis is necessary to determine appropriate content. The concept of the same fraction, which is a fraction with the same value while expressed in a different way, is referred to in the fractional material used in this study.

The ethnomathematical method, which connects mathematical ideas with regional culture, is the basis of the fractional material used in this work (Fitriyana & Mariana, 2022). In this case, the sharding board developed will use shapes that represent the traditional food of the Bugis tribe, such as Katirisala, Sikaporo, and Cucuru' Bayao cakes. This method is to provide students with a more real and significant learning experience so that they can more easily understand fractions through familiar objects. Before fourth-graders learn fractions of value, they must have some basic skills in mathematics that are foundational in understanding this concept. These skills include a basic understanding of fractions, the use of visual representations, fraction comparisons, as well as simple operations with fractions. With these skills, students will be better equipped to understand and identify fractions of value using concrete objects.

b. Design

At this design stage, the researcher prepares a systematic plan for the learning media to be developed, namely the Fraction Board media based on the traditional cake culture of the Bugis tribe. This design is visualized through a storyboard consisting of several important components. This storyboard serves as an initial guide in the media creation process so that each element is structured and aligned with the learning goals.

The design of the media layout is arranged vertically and divided into seven main parts that each have a specific function and purpose. The following is an explanation of each part of the storyboard design:

1. Baground

This section is the background of the main page of the media. The use of this background is not only aesthetically pleasing, but also to create an atmosphere that supports learning. The background will be designed with colors and visual elements that are attractive, but still comfortable for students to see, so that it can increase focus and interest in learning.

2. Heading

At the top of the media, there is a main title that indicates the topic of learning, namely fraction recognition. This title is placed in a strategic position so that it is easily visible to students, so that they immediately know the theme of the material when opening the media. The title is presented with a clear font and a sizable size.

3. Fraction Introduction

This section presents an initial explanation of the concept of fractions. The material is delivered in a simple and communicative manner so that it is easy for elementary school students to understand. The purpose of this section is to provide a basic understanding before students get into the fraction visualization stage using the cake model. Explanations can be accompanied by illustrations or examples of real situations in daily life.

4. Breakdown in traditional 3D cake modeling

It is the core of this learning medium. In the middle of the page, three main shapes are displayed, namely a rectangle, a hexagon, and a circle, which represent a 3D model of a traditional Bugis cake. Each of these cake shapes is then divided into parts that show fractions, such as 1/2, 1/3, 1/4, and so on. The purpose of this section is to visualize the concept of fractions in concrete terms using cultural objects that students are familiar with.

5. Fractional results

On the side or bottom of the cake model, the results of each cake shape that have been cut into fractional parts are displayed. Students can see the fractional results of each shape directly, thus strengthening their understanding of the value and shape of the fraction. For example, a circular cake divided into four parts will show a 1/4 fraction, and so on.

6. Catalog of Introduction to Traditional Cakes of the Bugis Tribe

At the bottom of the page there is a catalog column that contains additional information about various types of traditional cakes from the Bugis tribe used in this media, such as barongko, cucur, or lapis. This catalog not only introduces the types of cakes, but also explains the origins, shapes, and cultural meanings of the cakes.

7. Researcher Biodata

In the lower right corner, there is a small box containing a brief bio of a researcher or media developer. This information includes name, institution, and educational background. The existence of this biodata is useful to provide appreciation and identity to media developers.

c. Development

1. Media Creation

The process of making Fractional Board learning media is a crucial stage in development, where the initial design contained in the storyboard begins to be realized into concrete media. This media was developed with an ethnomathematical approach, which is to connect the concept of fractions in mathematics with local cultural values, especially through the representation of traditional cakes of the Bugis people. Before the assembly process was carried out, the researcher prepared a number of tools and materials needed, such as cork board or foam board as the base material, cutters, glue guns, colored markers, and acrylic paint for coloring media elements. The choice of cork as the main material is based on its lightweight, malleable, and safe to use by students, especially in learning activities that involve direct interaction with the media.

The first step in creating media is to arrange a basic board with a size of about 50 x 70 cm, so that it is large enough for all students to see when used classically. All components on the board are arranged according to the storyboard design that has been made beforehand. At the top of the board are placed the title and introduction of the material, followed by three types of traditional Bugis cakes that represent different geometric shapes, namely a rectangle (Katirisala Cake), a hexagon (Sikaporo Cake), and a circle (Cucuru' Bayao Cake). Each cake is cut into several pieces according to the concept of the fraction to be conveyed. For example, Katirisala Cake is cut into two and four pieces to indicate 1/2 and 1/4 fractions, while Sikaporo Cake is divided into six equal parts, and Cucuru' Bayao Cake is used to explain the division in a circle such as 1/3 and 1/4.

All pieces of cake are given bright and attractive colors such as yellow, orange, and brown to be easily recognizable and arouse students' interest. In each piece, a label in the form of a fractional value (such as 1/2 or 2/6) is added to make it easier for students to associate visual shapes with their mathematical concepts. In addition to the cake pieces, this media is also equipped with a mini catalog that explains the cultural background of each type of cake. It aims to instill local cultural values while enriching the learning context. At the bottom of the board is also included a brief bio of the media developer and instructions for use that can be read by teachers or students when they want to use the media.

After all the elements are arranged, a final checking process is carried out to ensure that the media is ready to be used. Inspections include the strength of the connection between components, the clarity of the fraction label, and the ease of removing and reassembling the cake pieces. With this structured process, the Fraction Board media is not only a visual aid, but also an interactive medium that is fun, culturally relevant, and effective in helping students understand the concept of fractions in a more real way.

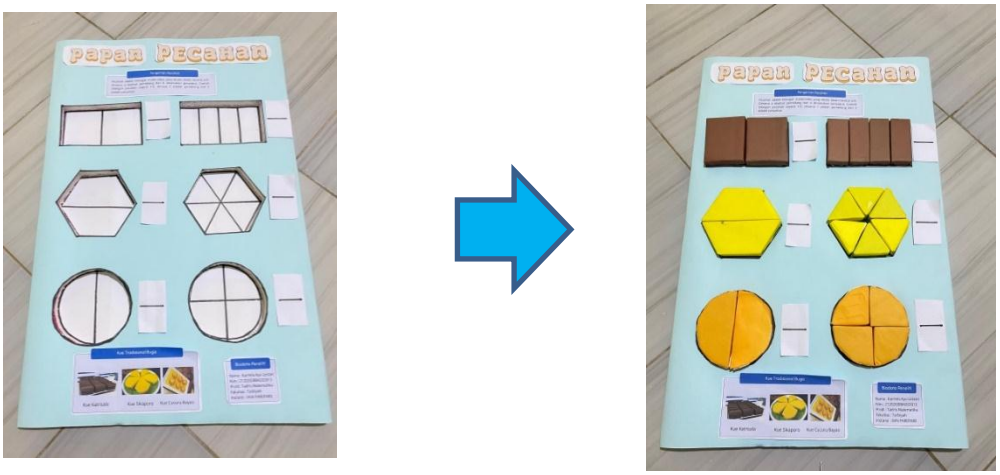

Figure 1. Fractional Board Display
Source: Researcher Development Results

2. Validation By Experts

After the Fractional Board media is completed, the next stage is the validation process by experts. This validation is an important step in ensuring that the designed media meets the feasibility standards both in terms of material content and visual appearance and functionality as a learning aid. In this process, researchers involve two types of experts, namely material experts and media experts, who each provide assessments based on their competencies and areas of expertise. Validation by material experts was carried out by Mrs. Wahida and Mr. Buhaerah, who have a background in mathematics education and a deep understanding of the curriculum and learning outcomes. Meanwhile, the media validation was carried out by Mr. Herlan Sanjaya, S.T., M.Kom., who has expertise in the field of visual and interactive learning media development.

Material experts evaluate the suitability of media content with elementary learning indicators, especially fractional concepts. They assessed the clarity of the material, the accuracy of fractional symbols, and the visual relationship of traditional cakes to mathematical concepts. As a result, the media is considered appropriate and contextual, but it is recommended that the term fraction of value be explained more concretely and that each piece of cake be labeled as a consistent fraction.

Meanwhile, media experts assess the visual, layout, and clarity aspects of the instructions. Media design is considered attractive and appropriate for elementary students, but it is recommended that the

instructions for use be made simpler and equipped with visual icons. The size of the board is also recommended to be adjusted so that it is practical to use in the classroom.

Based on all the validation results, the researcher made several revisions according to the input of experts. The revisions include the addition of a "How to Use" section at the top of the board with step-by-step instructions with images, improved fraction labels on each piece of cake, and color adjustments to make it more contrasting and less confusing. With this validation process, the resulting media is not only feasible to use, but also effective in conveying material and visually appealing. This validation provides assurance that the Fractional Board media has gone through a comprehensive due diligence process before being used in a learning trial.

d. Implementation

At this stage, the step that needs to be taken is to implement learning media in the form of fractional boards that have gone through a development and validation process. The implementation was carried out with a series of trials, starting from one to one trials to understand individual needs, then continued with small group trials that aimed to observe interactions in a more social context. In addition, field evaluations were also carried out to get a more comprehensive picture of the learning media. This entire series of trials aims to assess the level of practicality and effectiveness of learning media, so as to ensure that the tools used really support the teaching and learning process optimally.

1. One-to-one trial

At this stage, the one-to-one trial was carried out involving two students from grade IV. After the trial was completed, the two students were asked to provide their responses and opinions regarding the level of practicality of learning media in the form of fraction boards related to ethnomathematics. For this reason, they filled out the response questionnaire that had been provided. This questionnaire is designed with the aim of identifying and minimizing weaknesses or shortcomings that may exist in the fractional board learning media that has been developed. If there are still deficiencies found in the fraction board, revisions will be made for improvement. This step is very important so that the learning media is ready before proceeding to the small group trial stage, which will be the first step before it is implemented in the actual classroom or evaluated in the field.

2. Small group trials

The small group trial conducted at this stage is the second step taken after revising the shortcomings found from the results of the trial one by one (one to one). In this trial, three students from grade IV were involved to provide input. After the trial was completed, the three students were asked to provide their responses and opinions regarding the level of practicality of learning media in the form of fraction boards related to ethnomathematics through the questionnaire that had been provided. This questionnaire aims to identify whether there are still weaknesses or shortcomings in the fractional board learning media that has been developed, before the media is implemented in the actual classroom or evaluated in the field.

3. Field Evaluation

Products that have gone through individual trials (one to one) and trials in small groups are now entering the field evaluation phase, which is carried out in real classes. The learning media tested was a fraction board related to ethnomathematics, and this trial was carried out in grade IV of SD Muhammadiyah 2 Parepare involving 14 students. The purpose of this field evaluation is to assess the level of practicality of the learning media provided for students and teachers who teach.

e. Evaluation

This study uses two types of evaluation, namely formative evaluation and summative evaluation, each of which is adjusted to the purpose of media research and development activities. The main objective of this evaluation is to assess the extent to which the designed learning media meets the aspects of feasibility, practicality, and effectiveness. Formative evaluation is applied during the media development process, including the stages of analysis, design, creation, and implementation. Each of these stages is thoroughly evaluated to ensure that the media produced is truly relevant to the learning needs. In its implementation, formative evaluation also involves input and recommendations from experts or validators, which is used as a basis for perfecting and revising the media so that the final results are more optimal and of higher quality.

Meanwhile, summative evaluation was carried out through learning testing with pretest and posttest methods given before and after the use of fractional board media on a large trial scale. This evaluation aims to assess the impact of media on improving students' understanding of fractional concepts. Through the comparison of the results of the initial test and the final test, the researcher can

measure the level of effectiveness of the media in supporting the student learning process. The results of this summative evaluation provide a concrete picture of the contribution of media to the achievement of learning outcomes, as well as a basis for consideration in the improvement and development of similar learning media in the future

2. Level of Validity, Practicality, and Effectiveness of Learning Media in ethnomathematics-based fractional materials

a. Validity or Eligibility Level

1) Results of Validation by Media Experts

Validator	Aspek	Jumlah Skor	Skor Maks	Presentase	Kreteria
I	tampilan (desain)	26	28	93%	Sangat Valid
	penyajian materi	32	32	100%	Sangat Valid
Jumlah		**58**	**60**	**97%**	**Sangat Valid**

Table 4. Results of Media Validation Data Analysis
Source : Research Data

$$\text{Rata-rata} = \frac{53}{4\times15\times1} \times 100\% = 96,66$$

Based on the results of the analysis of media validation data in table 4, it can be seen that the score for each aspect of the assessment is in the very valid criterion and the overall average score of 96.66% is obtained with **very valid criteria**.

$$\frac{\sum Skor\ keseluruhan\ aspek}{Skor\ Tertinggi \times \sum butir \times \sum responden} \times 100\%$$

2) Material Expert Validation Results

Validator	Aspek	Jumlah Skor	Skor Maks	Presentase	Kreteria
I	kelayakan isi materi	38	40	95%	Sangat Valid
	penilaian kontekstual	17	20	85%	Sangat Valid
Jumlah		**55**	**60**	**92%**	**Sangat Valid**
II	kelayakan isi materi	30	40	75%	Valid
	penilaian kontekstual	15	20	75%	Valid
Jumlah		**45**	**60**	**75%**	**Valid**

Table 5. Results of material validation data analysis
Source : Research Data

$$\bar{x} = \frac{\sum Skor\ keseluruhan\ aspek}{Skor\ Tertinggi \times \sum butir \times \sum responden} \times 100\%$$

$$\text{Rata-rata} = \frac{100}{4\times15\times2} \times 100\% = 83,33\%$$

Based on the results of the analysis of media validation data in table 5, it can be seen that the score for each aspect of the assessment is in the Valid criterion and the overall average score of 83.33% is obtained with the **Very Valid criterion**.

b. Level of Practicality

1) Students' Response to the Level of Media Practicality

No	Aspek	Jumlah Skor	Skor Maks	Presentase	Kreteria
1	Minat Peserta didik	17	24	70,8%	Praktis
2	Materi	39	64	60,9%	Kurang Praktis
3	Kejelasan Huruf	5	8	62,5%	Kurang Praktis
4	Tampilan Media	15	24	62,5%	Kurang Praktis

Table 6. Results of Data Analysis of Students' Responses to the Practicality of Learning Media in a *One-to-One Trial*

Source : Research Data
Sumber : Data Penelitian

$$\bar{x} = \frac{\sum \textbf{Skor keseluruhan aspek}}{\textbf{Skor Tertinggi} \times \sum \textbf{butir} \times \sum \textbf{responden}} \times 100\%$$

Rata-rata = $\frac{76}{4 \times 15 \times 2} \times 100\% = 63,33\%$

Based on the results of data analysis in table 6, it was obtained that the level of practicality of using learning media in a one-to-one trial involving two students for each aspect was in the criterion **of less practical** with an overall average score of 63.33% so it was classified **as less practical** to use.

No	Aspek	Jumlah Skor	Skor Maks	Presentase	Kreteria
1	Minat Peserta didik	28	36	77,8%	Praktis
2	Materi	69	96	71,9%	Praktis
3	Kejelasan Huruf	8	12	66,7%	Praktis
4	Tampilan Media	27	36	75,0%	Praktis

Table 7. Results of Data Analysis of Students' Responses to the Practicality of Learning Media in Small Group Trials

Source : Research Data

$$\bar{x} = \frac{\sum \textbf{Skor keseluruhan aspek}}{\textbf{Skor Tertinggi} \times \sum \textbf{butir} \times \sum \textbf{responden}} \times 100\%$$

Rata-rata = $\frac{132}{4 \times 15 \times 3} \times 100\% = 73,33\%$

Based on the results of data analysis in table 7, it was obtained that the level of practicality of using learning media in a small group trial involving 6 students for each aspect was in the practical

criterion with an overall average score of 73.33% so it was considered practical to use.

Table 8. Results of Data Analysis of Students' Responses to the Practicality of Learning Media in Field Evaluation
Source : Research Data

No	Aspek	Jumlah Skor	Skor Maks	Presentase	Kreteria
1	Minat Peserta didik	134	168	79,8%	Praktis
2	Materi	360	448	80,4%	Praktis
3	Kejelasan Huruf	45	56	80,4%	Praktis
4	Tampilan Media	131	168	78,0%	Praktis

$$\bar{x} = \frac{\sum \textbf{Skor keseluruhan aspek}}{\textbf{Skor Tertinggi} \times \sum \textbf{butir} \times \sum \textbf{responden}} \times 100\%$$

Rata-rata = $\frac{670}{4 \times 15 \times 14} \times 100\% = 79,76\%$

Based on the results of data analysis in table 8, it was obtained that the level of practicality of using learning media in field evaluation involving 14 students for each aspect was in the **practical** criteria with an overall average score of 79.76% so that it was classified **as practical** to use.

2) Teachers' Responses to the Level of Media Practicality

No	Aspek	Jumlah Skor	Skor Maks	Presentase	Kreteria
1	Minat Peserta didik	12	12	100%	Sangat Praktis
2	Materi	36	36	100%	Sangat Praktis
3	Kejelasan Huruf	4	4	100%	Sangat Praktis
4	Tampilan Media	8	8	100%	Sangat Praktis
JUMLAH		**60**	**60**	**100%**	**Sangat Praktis**

Table 9. Results of Data Analysis of Subject Teachers' Responses to the Practicality of Learning Media in Field Evaluation
Source : Research Data

$$\bar{x} = \frac{\sum \textbf{Skor keseluruhan aspek}}{\textbf{Skor Tertinggi} \times \sum \textbf{butir} \times \sum \textbf{responden}} \times 100\%$$

Rata-rata = $\frac{60}{4 \times 15 \times 1} \times 100\% = 100\%$

Based on the results of the analysis in table 9, it can be seen that the level of practicality of the use of fractional board learning media by mathematics subject teachers obtained an overall aspect score of 100% with criteria that are very practical to use.

3. Effectiveness level

To determine the improvement of student learning outcomes after using ethnomathematics-based fraction board media, *pretest* and *posttest tests* were carried out on 14 students. *The pretest* is given before learning to find out the student's initial ability, while *the posttest* is given after the learning to measure the improvement of student understanding. Furthermore, *pretest* and *posttest scores* were analyzed using the N-Gain formula to see the effectiveness of learning.

No.	Nama Siswa	Nilai										*N-Gain*
		Pretest					*Posttest*					
		S1	S2	S3	S4	S5	S1	S2	S3	S4	S5	
1	ZAIDAN	0	2	0	0	0	2	2	2	2	0	0.75
2	FIRA	0	0	0	0	0	2	2	2	2	2	1.00
3	A.AINUN	0	0	1	0	2	2	2	2	2	2	1.00
4	AHMAD ALAM	0	0	1	1	0	0	2	1	1	2	0.50
5	FAHIRA	0	0	1	0	2	2	2	2	2	2	1.00
6	NURHALISA	0	0	1	0	2	2	2	2	2	2	1.00
7	NUR ILYA	2	2	2	2	2	2	2	2	2	2	.
8	FAHRI FAY	0	0	0	0	0	2	2	2	2	2	1.00
9	ALFIYAH	0	0	1	0	2	2	2	2	2	0	0.71
10	FARHAN	2	0	1	0	1	2	2	2	2	2	1.00
11	MUH.RAFA	2	2	2	2	2	2	2	2	2	2	.
12	MUH.FAJAR	2	2	0	0	0	0	2	2	2	2	.67
13	MUH.FURQAN	0	0	2	0	2	2	2	2	2	2	1.00
14	MUH.REZKY	0	2	0	0	0	2	2	2	2	2	1.00
JUMLAH		**50**					**130**					**0,88**
Kreteria		**Tinggi**										

Table 10. Data on pretest and posttest results of students
Source : Research Data

$$\boldsymbol{Gain\ Score = \frac{nilai\ posttest - nilai\ pretest}{nilai\ ideal - \ nilai\ pretest}}$$

$$\boldsymbol{Gain\ Score = \frac{130 - 50}{10 - 50} = \ 0,88}$$

Based on the table of 10 pretest and posttest results from the 14 students above, data was obtained that the overall average score of N-Gain was 0.88 in the **high category**.

CONCLUSION

1. The learning media development process is carried out using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model. The media developed is a fragment board that integrates elements of the local culture of the Bugis people, such as the traditional katirisala cake (rectangular in shape), sikaporo (hexagonal in shape), and cucuru' bayao (in the shape of a circle). This media is designed to support students' understanding of the concept of fractions of value in a contextual and concrete way.
2. The results of the study show that the ethnomathematics-based fraction board learning media developed has met the criteria of valid, practical, and effective. In terms of validity, the validation results showed that this media was classified as "very valid" with a validity rate of 83.33% according to material experts and 96.66% according to media experts, both of which were in the range of ≥ 82% according to the feasibility guidelines for learning media. The practicality of the media was also proven to be high based on the questionnaire of student and teacher responses, where in a limited and extensive trial, student responses showed practicality of 79.76% and

teacher responses reached 100%, so overall this media was classified as "very practical". In terms of effectiveness, this media is able to significantly improve student learning outcomes, which is shown by the average N-Gain score of 0.88 in the "High" category. Based on these three aspects, it can be concluded that ethnomathematics-based fraction board learning media is very feasible to use in learning, especially in helping students understand the concept of equal fractions.

REFERENCES

Alfie Ridho, Arina Denggan Munthe, Dimas Andika Shaputra, Indah Wahyuni, Lutfhia Farhana Putri Lubis, Nursiti Maysarah, & Inom Nasution. (2023). Analisis Evaluasi Program Pendidikan Dalam Pembelajaran Di Sekolah. *Jurnal Pendidikan, Bahasa Dan Budaya*, *2*(2), 211–221. https://doi.org/10.55606/jpbb.v2i2.1516

Franciscus Xaverius Wartoyo. (2022). Measuring Merdeka Belajar Correlativity with the National Education System Act No. 20 of 2003 and Pancasila. *Widya Pranata Hukum : Jurnal Kajian Dan Penelitian Hukum*, *4*(2), 115–126. https://doi.org/10.37631/widyapranata.v4i2.682

Kurnia, F. (2023). Pemanfaatan Teknologi Informasi dan Komunikasi dalam Pembelajaran di SMA Bayt al-Hikmah Pasuruan. *Tarbawi : Jurnal Studi Pendidikan Islami*, *11*(1), 07–23. https://doi.org/10.55757/tarbawi.v11i1.312

Sibuea, H. Y. P. (2020). Education System Reform in Indonesia: Progress and Challenges. *Kajian*, *22*(2), 151–162. https://jurnal.dpr.go.id/index.php/kajian/article/view/1520/788

Sugiyono. (2024). *Metode Penelitian Kuantitatif, Kualitatif Dan R & D. (Bandung, Alfabeta, 2014)*.

Suncaka, E. (2023). Meninjau Permasalahan Rendahnya Kualitas Pendidikan Di Indonesia. *Jurnal Manajement Dan Pendidikan*, *02*(03), 36–49. https://journal.an-nur.ac.id/index.php/unisanjournal

Wahyudi, L. E., Mulyana, A., Dhiaz, A., Ghandari, D., Putra Dinata, Z., Fitoriq, M., & Hasyim, M. N. (2022). Mengukur kualitas pendidikan di Indonesia. *Ma'arif Journal of Education, Madrasah Innovation and Aswaja Studies*, *1*(1), 18–22. https://doi.org/10.69966/mjemias.v1i1.3

Alfie Ridho, Arina Denggan Munthe, Dimas Andika Shaputra, Indah Wahyuni, Lutfhia Farhana Putri Lubis, Nursiti Maysarah, & Inom Nasution. (2023). Analisis Evaluasi Program Pendidikan Dalam Pembelajaran Di Sekolah. *Jurnal Pendidikan, Bahasa Dan Budaya*, *2*(2), 211–221. https://doi.org/10.55606/jpbb.v2i2.1516

Franciscus Xaverius Wartoyo. (2022). Measuring Merdeka Belajar Correlativity with the National Education System Act No. 20 of 2003 and Pancasila. *Widya Pranata Hukum : Jurnal Kajian Dan Penelitian Hukum*, *4*(2), 115–126. https://doi.org/10.37631/widyapranata.v4i2.682

Kurnia, F. (2023). Pemanfaatan Teknologi Informasi dan Komunikasi dalam Pembelajaran di SMA Bayt al-Hikmah Pasuruan. *Tarbawi : Jurnal Studi Pendidikan Islami*, *11*(1), 07–23. https://doi.org/10.55757/tarbawi.v11i1.312

Sibuea, H. Y. P. (2020). Education System Reform in Indonesia: Progress and Challenges. *Kajian*, *22*(2), 151–162. https://jurnal.dpr.go.id/index.php/kajian/article/view/1520/788

Sugiyono. (2024). *Metode Penelitian Kuantitatif, Kualitatif Dan R & D. (Bandung, Alfabeta, 2014)*.

Suncaka, E. (2023). Meninjau Permasalahan Rendahnya Kualitas Pendidikan Di Indonesia. *Jurnal Manajement Dan Pendidikan*, *02*(03), 36–49. https://journal.an-nur.ac.id/index.php/unisanjournal

Wahyudi, L. E., Mulyana, A., Dhiaz, A., Ghandari, D., Putra Dinata, Z., Fitoriq, M., & Hasyim, M. N. (2022). Mengukur kualitas pendidikan di Indonesia. *Ma'arif Journal of Education, Madrasah Innovation and Aswaja Studies*, *1*(1), 18–22. https://doi.org/10.69966/mjemias.v1i1.3