

## **Development of Kalibataku Fraction Board Media to Improve Student Learning Results and Interest in Fraction Material**

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### **Abstract:**

Mathematics learning in basic education institutions is minimal in the use of learning media, and student's interest in mathematics is very low. The learning process using media is very influential in supporting students' interests and learning outcomes. This research aims to develop a *Kalibataku* fraction board media to increase interest and learning outcomes in mathematics learning about fractions. This research was carried out using the method of Research *and* Development (R&D) and using the ADDIE model. The research subjects involved were grade V students, totaling 7 students 2 experts, and 1 class teacher. The research instrument for collecting data uses questionnaires and tests. Data analysis uses ADDIE steps: analysis, design, development, implementation, and evaluation. The research results show that the media developed is suitable for use based on expert validation results. There is an increase in student interest and learning outcomes after using the developed *Kalibataku* fraction board media. Also received a positive response from educators who categorized the media as suitable for application in learning.

**Keywords:** *Interest to Learn, Learning Outcomes, Mathematics Media.*

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## Introduction

Mathematics is a learning that is found in all levels of education and has an important role in the world of education (Mukrimatin, 2018). Mathematics is also a science that contains various formulas, symbols, and numbers that can be useful in everyday life (Widyasusanti dkk., 2022). According to R. Soedjadi, mathematics is a branch of various sciences that includes knowledge of numbers, logical reasoning, quantitative facts, logical structures, and exact sciences with strict rules (Wandini, 2019). Based on the opinion above, it can be concluded that mathematics is an exact science of measurement with proof based on formulas, numbers, and certain numbers.

Mathematics learning in elementary schools contains various subject matter, one of which is about fractions. Learning fractions can be said to be numbers consisting of two separate whole numbers and there is a numerator and a denominator (M Rusli, 2020). Fractional numbers usually describe parts of a whole or parts of a set whose numbers are separated by straight lines, such as  $\frac{1}{2}$  and so on (Lisnani, 2019). Fraction learning basically has a concept that is a mutually continuous unit (Sugriani, 2019). Understanding the concept of fractions can be linked to the number line, to make it easier for students to understand (Suwanto, 2018). Apart from that, students' understanding can be easily received if they use the right methods and media according to the material (Zakiyah, Handayani, and Sofyan 2019; Rahmawati & Sholeh, 2021). The application of a problem-based learning model can also improve mathematical problem solving abilities compared to conventional methods (Saputra 2022).

The learning of fractional number operations in grade V elementary schools contains material regarding ordinary fractional number operations and decimal fractional number operations (Purnomo dkk., 2018b). Based on the results of the researcher's observations through interviews with one of the grade V homeroom teachers at the State Elementary School of Tempilang 13, the mathematics learning process was carried out using conventional methods, namely lectures and questions and answers. This is certainly a problem for students who consider mathematics learning to be boring and even causes students' interest and learning outcomes to decrease. In fact, the use of media in learning fractions can increase student interest and learning outcomes, as in Syawaluddin's research which developed fraction block media which had a great influence on students' interest in learning (Syawaluddin, 2019). Then in Taufikurrahman's research, the use of learning media with the developed fraction board can increase understanding of concepts regarding fraction material (Taufikurrahman & Nurhaswinda, 2021). Using appropriate media in learning can increase students' understanding of the material and can lead to improved interest and learning outcomes (Nurrita, 2018). Based on field observations, learning fractions that are difficult for students to work on are addition and subtraction fractions, this is because students do not understand the Least Common Multiple (LCM) and multiplication.

In grade V mathematics learning, students are provided with student worksheet books (LKS) and there are also other mathematics books that can be accessed in the library which are useful as learning supports as well as learning resources for students. It turns out that books alone are not enough to support students' understanding in the learning process, other learning resources are needed to help students' understanding process, one of which is the use of learning media. The presence of media in learning, apart from making it easier to convey material, also has practical value, such as overcoming limited experience, uniformity of student observations, instilling concrete concepts, stimulating curiosity, and increasing motivation and interest (Netriwati & Lena, 2017)

Learning mathematics using learning media that is appropriate to the material to be taught can increase students' interest and learning outcomes (Supriyono, 2018). Learning that can bring students into concrete situations when studying can increase students' enthusiasm for learning and can even have a good impact on learning outcomes (Nuraini, 2019). The learning process using innovative media can improve the quality of the learning process, the quality of learning includes planning structures, delivery of interesting material, and a pleasant class atmosphere (Nurdyansyah, 2019).

The media developed by researchers is fractional board media which has never been developed by other research in terms of shape, size, and functional components contained in the media. The media that will be developed contains four materials on fraction operations, namely addition, subtraction, multiplication, and division. Researchers' interest in developing media is supported by several relevant studies, such as the development of a rainbow board teaching aid for fraction counting operations which is innovative and has been proven to improve student learning outcomes (Rahayu, 2018). Then the development of fractional material circuit board media for grade V was also able to improve student learning outcomes (Indri Emilia, 2022). Apart from that, efforts are made to improve skills in calculating fractions using media *Puzzle* effectively used in learning, because it meets predetermined success indicators and achieves satisfactory completion (Nisem, 2018).

Based on the background and review of relevant research, researchers are interested in developing a fraction board media. The board media developed in other research is of course different in form and component function from the media that will be developed by researchers. The media was developed through a series of quite long processes and stages in this research to create a learning media that is useful for improving students' learning outcomes and interest, especially regarding fraction material. Researchers will develop the *Kali-Bagi-Tambah-Kurang* or *KALIBATAKU* (Multiply, Divide, Add, and Subtract) fraction board media which aims to improve students' learning outcomes and interest in grade V elementary school, of course with procedures and stages chosen by the researcher.

**Research Method**

This research is development research or what is usually called R&D (*Research and Development*). This R&D research aims to develop and produce a particular product (Sugiyono, 2012). To develop *Kalibataku* board media, researchers used the ADDIE model (*Analysis, Design, Development, Implementation, and Evaluations*). The ADDIE development model uses a product approach with interactive and systematic steps (Hamzah, 2019). The subjects in this research were grade V students at the State Elementary School of Tempilang 13, totaling 7 students, 2 experts, and 1 educator. Data collection techniques in this research used interviews, tests, and questionnaires. Data analysis uses quantitative and qualitative analysis, with questionnaire data collection using a *Likert* scale with an assessment weight of 1-5. The questionnaire is used to validate media for validators consisting of media experts and material experts with the following assessment aspect specifications.

**Table 1. Product Assessment Criteria**

Media	Material
1. Media display size	1. Compatibility with KD (Basic Competencies)
2. Component attractiveness	2. Indicator suitability
3. Suitable color combination	3. Material suitability
4. Compatibility of components with materials	4. Ease of understanding

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5. Component layout consistency	5. Coherence of media components with material
6. The shape, size, and proportions of media objects are clear	6. Time efficiency
7. Media equipment	7. Ease of use
8. Media practicality	8. Effectiveness in learning

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Apart from media validation, questionnaires are also used to measure interest before and after using the media that has been developed. Tests will be given to students to see whether there is an increase in learning outcomes before and after using the media. Analysis of trial data on student responses to interests and learning outcomes that have been obtained will be tested using SPSS (*Statistical Package Social Sciences*) version 25 by conducting a *paired sample t-test*.

## Results and Discussion

The development of the *Kalibataku* fraction board media went through several development procedures that had been determined by researchers, resulting in learning media that had been tested for validity and could be used in research. The following is the procedure for developing the *Kalibataku* fraction board learning media.

### 1. Analysis Stage (*Analysis*)

#### a) Curriculum Analysis

Curriculum analysis is the initial stage in determining the education system contained in an educational institution. The education system at the State Elementary School of Tempilang 13 is the 2013 Curriculum. In this curriculum analysis stage, researchers analyzed the Core Competencies (KI) and Basic Competencies (KD) contained in mathematics subjects, especially for grade V.

The characteristics of the 2013 curriculum itself are identical to learning which requires students to be active in their learning, but in reality, it is educators who are more active in explaining than students. This is due to a lack of socialization regarding the 2013 curriculum and unsupportive school facilities (Abdurrahman, 2020). The current curriculum is an improvement on the previous curriculum, where the curriculum must be implemented in a planned and sustainable manner (Fernandes, 2019).

The curriculum used at the State Elementary School of Tempilang 13 is indeed the 2013 curriculum with complete reports and data every month. However, in its implementation, the curriculum used is still not appropriate when the learning process takes place. The use of an appropriate curriculum and support from the school is essential for the progress of the school education system, of course, it will have an excellent impact on the students' learning process. Not only that but teacher competencies and skills must also be enriched (Mu'arif dkk., 2021).

#### b) Learning Analysis

Analysis of mathematics learning, especially for grade V, there are three learning topics in the odd semester, including operations to calculate fractions, speed and discharge, and scale. Of the three learning topics, each topic takes approximately one month to study. However, on the topic of material regarding fractions, the learning process takes a relatively long time, namely approximately three months.

In learning fraction material there are two Basic Competencies (KD), namely, 3.1 Explaining and adding and subtracting two fractions with different denominators, and 3.2 Explaining and doing multiplication and division of fractions and decimals (Purnomo dkk., 2018a). After analysis, there

are two Basic Competencies whose indicators must be developed. The researcher chose to develop learning media that develops indicators regarding ordinary fractions which includes material on addition fractions, subtraction fractions, multiplication fractions, and division fractions in grade V mathematics.

c) Needs Analysis

Based on the results of observations made by researchers, it is very rare to use media in mathematics learning. Even though students really want to learn using teaching aids or media as learning resources. Most students are less enthusiastic about learning mathematics, because the material presented is still abstract in terms of examples, causing students' low interest in learning.

In the learning process, it is highly recommended to use any concrete media in learning, this can increase students' enthusiasm (Arsyad, 2017). The use of media can clarify teaching material so that learning objectives are achieved (Netriwati & Lena, 2017). Therefore, media is needed to attract students' interest in learning. Using appropriate media in the learning process can improve the quality of learning and the results to be achieved (Nurdyansyah, 2019). With the *Kalibataku* fraction board media, grade V ordinary fraction material is expected to increase student's interest and learning outcomes.

2. Planning Stage (*Design*)

This planning stage can be carried out after passing the analysis stage. In this planning stage, several activities are carried out, such as creating a sustainable design or concept using fractional material for grade V elementary school. The concept for the *Kalibataku* fraction board media was initially created using initial draft illustrations created using the Canva application before creating a real product. After having an initial illustration of making media, take measurements for the media so that it can be seen by grade V students. In the process of making the learning media that will be developed, you need to pay attention to the size of the media that will be made. The media to be developed must be able to be seen clearly by students at a distance of approximately one meter according to class size conditions (Maimunah, 2016).

The size of the learning media that has been determined is 60 cm x 60 cm and then measured again for each component contained in the *Kalibataku* fraction board media. Media measuring 60 cm x 60 cm has four component parts measuring 30 cm x 30 cm for each fraction material, namely addition fractions, subtraction fractions, multiplication fractions, and division fractions. The media is made from white melamine plywood with dimensions of 60 cm x 60 cm which is then assembled in stages with the help of a carpenter.

The *Kalibataku* fraction board media measuring 30 cm x 30 cm is made smaller than the previous size which can be used by students during the process of learning fraction material. This media also has the same four components as before, only the size is relatively smaller than before. The main ingredients for small media are made from thick cardboard, cardboard, and thin double side whiteboard which is formed in such a way that the main media is sized. The following is the *Kalibataku* fraction board media design.



Figure 1. Media size 60 x 60 cm

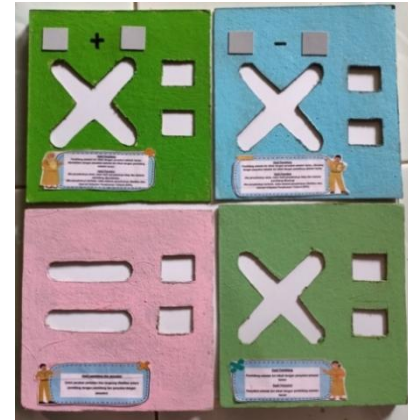


Figure 2. Media size 30 x 30 cm

### 3. Development Stage (*Development*)

In the development stage, product validation activities were carried out by media experts and material experts. The results of validation and testing from these experts are in the form of input, suggestions, and constructive comments in improving the media as well as references in making improvements to the media to be developed. The material validator for the development and research of the *Kalibataku* fraction board media was carried out by a Mathematics lecturer at UIN Sunan Kalijaga. The material assessment aspect includes the suitability of the material content on the *Kalibataku* fraction board media. The following are the validation results of the media material developed.

**Table 2. Material Validation**

No.	Rated Aspect	Score
1	Media suitability with KD (Basic Competencies)	5
2	Suitability of media to learning outcomes	4
3	Suitability of the media to the material to be studied	5
4	Addition, subtraction, multiplication, and division fraction material is easy to understand using the developed media	4
5	Collapse of components in the media regarding fractional material	5
6	The developed board media saves time in explaining the material	4
7	Suitability of delivery of fractional material	4
8	Student learning is more educational using the media developed	3
9	The media developed can control student progress	2
10	The material and practice questions are easy for students to understand using the media developed	4
<b>Total</b>		<b>40</b>
<b>Percentage Value</b>		<b>80%</b>

The results of the material expert assessment obtained a percentage value of 80% with valid category interpretation criteria. There is advice from material experts that the media developed is good for students in completing practice fraction questions, but they are less able to understand the concept of fraction operations. Writing or instructions can be made more attractive, for example with colorful letters or typical children's decorations, and need to be made waterproof.

The use of attractive colors can actually attract students' attention in the learning process (Khusniyah & Wana, 2020). The media validator in this research and development was carried out by lecturer and Head Professor of IAIN Syaikh Abdurrahman Siddik Bangka Belitung. The following are the results of media validation.

**Table 3. Media Validation**

No.	Rated Aspect	Score
1	Accurate media display size	5
2	The attractiveness of media components	4
3	Suitable color combination	4
4	Compatibility of media components	5
5	Consistency of layout of media component parts	4
6	The component layout is simple and continuous	4
7	The shape, size, and proportions of the media are clear and legible	4
8	The use of media cues is easy to understand	5
9	The practicality of the media when used	5
10	Ease of media operation	4
<b>Total</b>		<b>44</b>
<b>Percentage Value</b>		<b>88%</b>

The calculation results of the percentage value are 88% in the very valid category. From the development of this media, there are suggestions from media experts that the size and shape of the media need to be adjusted to real class conditions, and the use of narrative words and sentences in media instructions needs to be paid attention to so that students can easily understand them. Then, when making media, you should also pay attention to the elements of simplicity, integration, emphasis, balance, shape, and color. The choice of media developed should pay attention to student characteristics and student involvement in the learning process (Mahnun, 2017). The following is a recapitulation of the results of teacher responses to the *Kalibataku* fraction board media that has been developed as in the table below.

**Table 4. Teacher Response**

No.	Rated Aspect	Score
1	Conformity with KI (Core Competencies)	4
2	Compatibility with KD (Basic Competencies)	5
3	Suitability of media to learning material	5
4	Make it easier for students to work on questions	5
5	Easy to use by students	4
6	Learning is more effective and time efficient	4
7	Learning is in accordance with objectives and indicators	5
8	Can increase interest and learning outcomes	4
9	The media developed helps in the learning process	5
10	Suitability of media to students' developmental stages	5
<b>Total</b>		<b>46</b>
<b>Percentage Value</b>		<b>92%</b>

The teacher's response to the media developed received a percentage score of 92% which was categorized as very valid. This is because the media developed is very helpful in the learning process, especially fraction material. Media that is developed in accordance with the objectives and indicators is able to improve the quality of the learning process and speed up the duration of learning time. Based

on the data from the table above, it can be seen that the *Kalibataku* fraction board media developed is in the valid and very valid categories. The results of media validation from expert judgment contain constructive suggestions and comments in the media creation process. It can be concluded that the media developed is suitable for implementation with students.

4. Implementation Stage (*Implementation*)

The implementation stage in the research and development of the *Kalibataku* fraction board media is the application of the media that has been developed which will be tested at the State Elementary School of Tempilang 13. Before carrying out the trial, the researcher first explains the aims and objectives of the media that will be used in the fraction material. Researchers gave a questionnaire and practice questions totaling 10 questions before and after media use. The following are the results of obtaining interest and outcome data before treatment and after student learning treatment.

**Table 3. Paired Sample T-test Interest in Learning**

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Interest Before Treatment - Interest After Treatment	-41.143	9.873	3.732	-50.274	-32.012	-11.025	6	.000

**Table 4. Paired Samples Test Learning Results**

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pret est - Post test	55.714	6.075	2.296	-61.333	-50.096	24.265	6	.000

Based on the table data above, shows the results of *paired samples tes* grade V students between interest and learning outcomes get a significance value of *2-tailed* equal to  $0.000 < 0.05$  So there is an average difference in the interest data and student learning outcomes in using the *Kalibataku* fraction board media in grade V. It can be concluded that there is an increase in student interest and learning outcomes after using the developed learning media.

Increasing interest in learning will certainly influence students' learning outcomes because the two are mutually sustainable and can be obtained from within (Trisnowati MS, 2017). The tendency to increase interest is due to encouragement from within which creates curiosity and trying new things which greatly influences learning outcomes (Wilda dkk., 2017). As is known, interest in learning mathematics at various



levels of education is very low (Friantini & Winata, 2019). Interesting and innovative learning by developing relevant media in the learning process will certainly play a role in improving the quality of learning, for this reason, it is highly recommended to develop media such as those developed by researchers to increase interest in learning and the results of the learning process.

#### 5. Evaluation Stage (*Evaluation*)

The evaluation stage in the research and development of *Kalibataku* fraction board media is an evaluation activity by analyzing the research data that has been obtained. Based on the results of the development stages which refer to the results of the assessments of experts who provide comments, input, and suggestions until the media development is feasible. For the *Kalibataku* fraction board media, there are several improvements before starting trials with students, the most significant of which is the color of the media and instructions for using the media.

The results of applying the *Kalibataku* fraction board media that has been developed can be seen to show how much influence the media that has been developed has on students' interests and learning outcomes. Evaluation in the development of the *Kalibataku* fraction board media on grade V fraction material was carried out by analysis based on the results of data acquisition using predetermined formulas and tests. The evaluation results will be linked between the results of media suitability carried out by the validators and the implementation of media use carried out by students in the implementation process. Based on the results of the development stages and media implementation stages, it was found that the media developed was feasible and there was an influence between interest and learning outcomes before and after using the media that had been developed.

The procedure for developing *Kalibataku* fraction board media using the ADDIE model is very efficient and uses dynamic steps. Resvani and Gusti agree that the use of the ADDIE model is very relevant when used in research because it has a very high level of flexibility and can be adjusted to suit needs (Ade Rasvani & Ayu Wulandari, 2021). The use of the ADDIE development model really helps researchers in the successful development of *Kalibataku* fraction board media products.

#### **Conclusion**

The development of the *Kalibataku* fraction board media that has been implemented shows very good results in the development process. Through the development stages with the ADDIE model, the development process can be easily carried out. The results obtained were based on media experts and material experts getting valid scores, and the teacher's response to the media being developed got a good response in the very valid category so the *Kalibataku* fraction board media was suitable to be implemented for grade V students. Apart from that, there was an increase in students' interests and learning outcomes after using the media developed. Judging from the results of paired sample tes which gets a significance value of *2-tailed* of 0.000 which is smaller than 0.05 there is a difference between students' interest and learning outcomes in using media before and after learning.

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