Development of Kobela Media in Class IV Elementary School Fraction Material

Fitria Wulandari[1*], Arissona Dia Indah Sari[2], Nanang Khoirul Umam[3]

[1,2,3.]*Universitas Muhammadiyah Gresik*

*Corresponding Author. E-mail: fitriawulandariii77@gmail.com

Article Info	ABSTRACT
Keywords: Learning media, Kobela, Fractions, Elementary school	This study aims to develop learning media for learning boxes (Kobela) to improve understanding of fraction material with denominator eight for fourth grade students at UPT SDN 98 Gresik. The background of this study is the lack of learning media that supports the delivery of fraction material, so that learning relies more on reading books. This study uses a research and development method with the ADDIE approach which includes five stages: analysis, design, development, implementation, and evaluation. Data collection techniques include questionnaires, ability tests, media and material validation, and interviews. The results of the study showed that the Kobela media has a very high level of validity with an average validation value of 97% from media experts and material experts. In addition, the results of the student ability test showed an N-gain value of 1.6, which is included in the high category. Based on these results, the Kobela media was declared very feasible and effective in improving students' understanding of fraction material.

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INTRODUCTION

Understanding mathematical concepts, as developed through the principles and standards of NCTM, includes the following aspects: (1) explaining concepts orally and in writing, (2) providing examples and non-examples, (3) using various symbols to represent a concept, (4) transforming representations into various forms, (5) identifying characteristics of a concept, (6) comparing various concepts, and (7) analyzing concepts (Haji, 2019). Students who understand mathematical concepts can apply them in problem-solving, both within mathematics and in real-world contexts (Haji, 2019).

Efforts to provide learning experiences are carried out by educators to achieve specific educational goals. Mathematics is one subject that aims to achieve these goals. Mathematical understanding includes the ability to absorb material, recall mathematical concepts, and apply them to simple problems. Learning mathematics is not merely about memorization; students are expected to grasp concepts deeply (Kartika et al., 2020).

Students' ability to understand specific material is significantly influenced by the material previously taught (Yuliana et al., 2020). By comprehending concepts, students can apply

mathematical ideas they master to various situations (Mulyono, 2018). In mathematics learning, meaningful knowledge and conceptual understanding are essential foundations for solving problems in life (Muhandaz et al., 2018).

Mathematical understanding is one of the assessment criteria used by TIMSS (Trends in International Mathematics and Science Study) to measure students' achievements in mathematics and science. Therefore, education is very important for one generation to the next (Akrim, 2020; Hidayat, 2024; Simbolon, 2024; Sri 2024). In mathematics, TIMSS assessments focus on curriculum topics such as numbers, measurement, algebra, geometry, and data (Riswandi, 2023; Rusminati & Tur, 2018). Data indicates that Indonesia's education performance remains below average, with students' conceptual understanding categorized as low (Amirahlilis, 2023; Hadi, 2019; Nursahada & Munandar, 2022).

Based on interviews conducted by the researchers, the problem in the fourth-grade class is the lack of learning media to support teaching materials. The teaching methods used, primarily lectures, make students feel bored. Students struggle to understand fraction material, especially fractions with a denominator of 8. This low conceptual understanding is attributed to factors such as the lack of learning media. Kobela media in fraction learning can enhance students' conceptual understanding. Learning media serve as an intermediary between educators and students, encompassing all senses (sight, hearing, touch, smell, and taste) during the teaching-learning process. This helps students understand the material delivered, fostering effective interaction between educators and students.

In reality, many researchers have developed educational games in mathematics learning that facilitate mathematical performance and enjoyment of learning (Yeh et al., 2019). Game-based learning theories are rooted in Piaget's constructivism, which asserts that knowledge is effectively acquired through direct experiences (Rossano et al., 2020). One alternative to enhance conceptual understanding is through the use of Kobela media (Kotak Belajar Ajaib or Magic Learning Box).

The use of Kobela media in learning is recommended because it is engaging, practical, and easy for students to understand (Lestari & Utami, 2022; Wahid & Inayati, 2021). Kobela media is also portable due to its practical design and can be used for an extended period. Research by Ariyani & Harsiwi (2023) on the validity, effectiveness, and attractiveness of Kobela media for science learning demonstrated that the media is highly valid, effective, and appealing.

RESEARCH METHOD

This research employs a research and development (R&D) approach to produce learning products while simultaneously testing the feasibility of the developed product. The product developed in this study is the "Kobela" (Magic Learning Box), aimed at facilitating students' understanding of the material being taught. This study falls under the category of educational research, focusing on the development and testing of learning media to provide positive contributions to the school environment (Maydiantoro, 2021; Rayanto & Sugianti, 2020).

The development process in this study adheres to the R&D stages, which include designing, validating, and testing the effectiveness of the learning product. Data collection techniques involve questionnaires and tests. The questionnaires include validation surveys aimed at obtaining validity scores from media and material experts to ensure the developed learning media is suitable for school use. Meanwhile, tests are conducted twice—before and after using the learning media—to measure students' knowledge levels and evaluate the effectiveness of the developed media. This approach is designed to ensure that the resulting product is not only technically viable but also effective in enhancing students' understanding.

RESULTS AND DISCUSSION

Analisis (Analysis)

At the analysis stage, researchers conducted a series of activities to identify students' difficulties in learning mathematics, particularly fractions. The initial step involved administering a pretest to identify students' challenges in understanding fractions. Additionally, interviews with class teachers were conducted to gather in-depth information about students' learning processes in mathematics. The analysis revealed that students require learning media that can help them grasp fraction material more easily.

To address this issue, the researchers developed the Kobela learning media. This media was specifically designed to enhance students' understanding of fraction concepts. Kobela uses replicas of watermelons as visual aids to concretely explain different fraction forms. This approach aims to facilitate students in comprehending the material and help educators deliver fraction concepts more effectively and engagingly.

The need analysis for students involved testing their knowledge of fractions. Based on the analysis, it was concluded that there is a need for learning media to assist students in understanding mathematics, particularly fractions. The Kobela media was chosen to make fraction learning easier, as it contains watermelon replicas that visually demonstrate fraction forms, making it easier for educators to teach the topic.

Desain (Design)

After completing the analysis, the next stage was the design phase. In this phase, several essential steps were undertaken to develop the Kobela (Magic Learning Box) media.

The first step involved designing the initial product using the Tinkercad application. This application was used to create a 3D model of the Kobela media. The box was designed to measure 20 cm, comprising two combined boxes to create an interior space. Once the two boxes were combined, the top of the box was perforated for interactive purposes. Circular shapes were also added to facilitate the placement of the watermelon replicas. These replicas, used as visual aids, were divided into eight equal parts, each forming a 45° angle. The box's lid was designed to be

removable, aligning with the watermelon segments. A small hole was made on the lid's edge to accommodate a handle that would assist educators in direct teaching.

Next, materials were chosen. Kobela media was created using PLA+ (polylactic acid plus), a type of plastic characterized by its smooth surface, durability, and water resistance. This makes it suitable for long-lasting and safe learning media. Additionally, the Kobela media name was designed as a sticker to make it visually appealing. The name design process utilized Canva, enabling creative designs tailored to the needs.
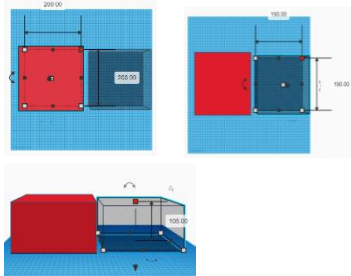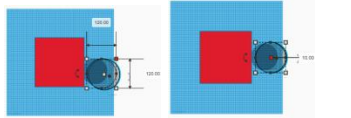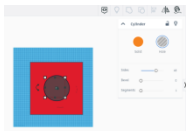
The fraction material was selected based on issues observed in the classroom, focusing on fractions with a denominator of eight. This material aimed to help students concretely understand fractions through interactive and engaging media. With its design and material, Kobela is expected to optimize the learning process
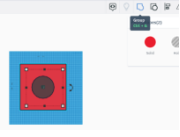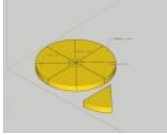
Development

1. Create Media

The media development phase involves transforming the design into a physical product as planned. The media was produced using a 3D printing machine via an online application. During this phase, the researchers sought validation from academic supervisors to ensure the media was appropriate. Below is an overview of the Kobela media development (Details about the design, production process, and diagrams were provided in the original text, demonstrating the creation process step by step.)

Tabel 1. Kobela Media Design Plan

Picture	**Explanation**
	Creates two boxes with different questions. A red box for the outside and a transparent box for the inside. The size of the red box is 20 cm and the transparent box is 19 cm with a height of 10.5 cm. In the picture the measurements are 200, 190 and 105 in millimeter measurements.
	Make a circle and place it on the top of the box. The built-in circle is intended to make a hole with a 12 cm diameter with a height of 1 cm.
	The hole that forms a circle is smoothed so that it does not become jagged and forms a perfect circle.

	Select the red box, transparent box and circle by ctrl+a then click on the "group" option which is available at the top right. Combining everything to make the printing process easier.
	Creating names on media uses design with the help of the Canva application. The design of the teìrseìbuìt is printed on stickers.
	Building a door for the top of the box. The building tube can be divided into 8 parts so that it can be separated and combined. At the end of each part there is a small hole which will be filled with a tube with the same material as a tube. The existing tutorial is used to embed media which is divided into 8 parts.
	Design of watermelon splitting media which is divided into 8 parts. Each fragment is filled with bits like the seeds in a watermelon.
	Media with final results.

2. Validation Of Media

Once the Kobela media was fully designed, the next step was validation to ensure it met the required standards. The validation process was conducted by two predetermined validators: a media expert and a subject matter expert. Evaluation instruments were prepared by the researchers to assess aspects such as design, functionality, and the media's relevance to learning objectives.

a. Media expert validation
The validation results showed that the Kobela media received an average feasibility score of 94% from both validators. This percentage indicates that the media is categorized as "highly feasible" for classroom use. With this high validation score, Kobela media can be utilized effectively in class to help students understand fractions better and more engagingly.

b. Subject matter expert validation

The results of the validation process by the subject matter experts showed a perfect score of 16 out of a maximum of 16 from both validators, resulting in a 100% validation score. This result was calculated as follows:

Validation 1 $\quad = \frac{f}{N} \; x \; 100 = \frac{16}{16} \; x \; 100 = 100\%$

Validation 2 $\quad = \frac{f}{N} \; x \; 100 = \frac{16}{16} \; x \; 100 = 100\%$

The average score was obtained by summing the validation results from all validators (both media and subject matter experts) and dividing it by the total number of validators. The media expert validation score was 94%, and the subject matter expert validation score was 100%. Based on these results, the Kobela media (Magic Learning Box) was categorized as highly valid in terms of both media and content.

Implementation

This phase involved applying the Kobela media in a learning trial conducted on January 25, 2024, with fourth-grade students at UPT SDN 98 Gresik. The researcher taught for two class periods, beginning with greetings, collective prayers, and attendance checks. The learning objectives were then explained to the students.

During the core activity, students were asked warm-up questions related to the material, followed by a structured explanation using the Kobela media. The students showed enthusiasm in answering questions and actively engaged during the lesson. The Kobela media functioned well, and the class was divided into four heterogeneous groups to complete prepared tasks collaboratively.

The session concluded with motivational words and ice-breaking activities to maintain students' excitement before ending the lesson with greetings. Analysis of student learning outcomes before and after using the Kobela media showed significant improvement. Based on the N-Gain score of 0.8, which is categorized as high, it was concluded that the Kobela media was effective in the learning process.

Evaluation

In this stage, the researcher compared the data from media validation and students' learning outcomes. The

validation results are as follows:

Tabel 2. Recapitulation of Kobela media validation results

No	Aspect	Average Percentage	Criteria
1	Media validation 1	88%	Highly Feasible
2	Media validation 2	100%	Highly Feasible
3	Subject matter validation 1	98%	Highly Feasible
4	Subject matter validation 2	100%	Highly Feasible
Average		97%	Highly Feasible

The Kobela media achieved an average validation score of 94% from media experts and 100% from subject matter experts, resulting in an overall score of 97%, categorized as highly feasible.

Student learning outcomes before and after using kobela media. The following table summarize student learning outcomes:

Tabel 3. Assess Before and After Results

No	Student name	score		N Gain
		before	after	
1	Rrq	75	100	1
2	Mhr	100	100	1
3	Sry	50	75	0.5
4	Fna	75	100	1
5	Ssk	50	75	0.5
6	Nr	75	75	1
7	Chnt	75	100	1
8	Jnt	50	75	0.5
9	Clst	75	100	1
10	Kvn	50	100	1
11	Ilys	100	100	1
12	Rsyd	75	100	1

13	Ala	75	100	1
14	Dst	50	100	1
15	Aqlh	75	100	1
16	Azk	100	100	1
17	Mhr Jngg	50	75	0.5
18	Zdn	50	100	1
TOTAL		1250	1675	16
Averages		69	93	0,8

Based on the results of previous and final recapitulation results of class IV students at UPT SDN 98 Gresik, it can be stated that the learning media is effective if the N-Gain score results are in the minimum medium category, namely $0.3 \leq g \leq 0.7$. The N-Gain score obtained from previous and previous results is 0.8 with high criteria. In this way, the commercial media used in the learning process can be declared effective.

CONCLUSION

Based on the conducted research and development, the Kobela media has been proven to be feasible and effective in learning. Developed using the ADDIE model (Analyze, Design, Develop, Implement, Evaluate), Kobela was applied in UPT SDN 98 Gresik involving 18 students as participants.

The media's feasibility was validated by experts, with scores of 94% from media experts and 100% from subject matter experts. The overall feasibility score of 97% categorizes the media as highly suitable for use as interactive learning support.

In addition to feasibility, Kobela's effectiveness was tested through an analysis of student learning outcomes before and after its implementation. A significant improvement was observed, with an N-Gain score of 0.8 categorized as high, proving the media's capability to enhance students' learning outcomes effectively.

Kobela media is not only a feasible teaching tool but also contributes positively to improving the quality of the learning process. It is hoped that this innovative media can serve as an alternative for educators to create engaging and meaningful learning experiences for students.

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