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DEVELOPMENT OF PAPER-CRAFT VISUAL MEDIA ON GRADE IV FRACTION MATERIAL IN ELEMENTARY SCHOOL

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ABSTRACT

The lack of utilization of learning media makes it difficult for students to learn the concept of fractions, including students having difficulty understanding the teacher's explanation and difficulty performing calculations. Creating beautiful papercraft media to teach math is the driving force behind this research. The purpose of this research is to develop visual papercraft media and to find out whether visual papercraft media is feasible to be used as learning media in the Mathematics content in the classroom. This research uses the Research and Development (R&D) method using the 4-D model which goes through four stages, namely: 1. Define, 2. Design, 3. Development (Development), 4. Dissemination (Disseminate). Descriptive questionnaires were used for data collection. Students of SDN Cilincing 03 Pagi who are in grade IV participated as research subjects. This research was conducted by forming large groups and small groups. There were a total of 27 students from class IV B, with 10 students from class IV A forming the small group. The validation results from media experts and material experts showed that papercraft media is very suitable for teaching fractions. Media expert validation results reached 90% with a very feasible category, material expert results reached 91% with a very feasible category, and responses from 10 students in this study reached 94.9% with a very feasible category. In addition, responses from 27 students were at 94% with a very feasible category. It is concluded that papercraft media is a learning media that is very suitable for teaching fraction material in Mathematics subjects to grade IV elementary school students.

Keywords: Learning Media, Papercraft, Elementary School, Developer

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PRELIMINARY

In terms of Indonesia's national growth, education ranks among the most important factors. Whether we are still in the womb or not, education is an essential part of human existence (Susila, 2020). Education in schools is carried out through the learning process in the classroom, which is guided by teachers who have an important role as a storehouse of knowledge and as a means for students to act as a person seeking knowledge (Fauziah & Ninawati, 2023). Many parts of education are interdependent on each other. Learning objectives, courses, media, techniques, approaches, methods, subjects, environments, and students are components that are closely interrelated (Humaira & Ninawati, 2023).

According to (Wulandari et al., 2023), the learning process is an activity that involves educators and students who aim to achieve a learning goal. According to (Fadillah & Ninawati, 2020), individuals experience changes in attitudes and behavior as a result of learning, an internal process that occurs during interaction with their environment. Listening, reading, speaking, and writing are four skills that students must strive to master (Indriani et al., 2019). Each of these four abilities contributes to student growth in their own unique way. The use of learning media at the teaching stage is very helpful in the effectiveness of the learning process, as well as increasing the understanding of students to receive messages and lesson content at that time (Wulandari et al., 2023). It is hoped that the effective use of media can help in the process of students' thinking growth.

Teachers and facilitators have the responsibility to guide students in the right direction by providing interesting and informative lessons. Successful learning and learning processes include more than just memorizing scientific facts. The process also involves ideas that help understand more complex concepts (Khasanudin et al., 2020). Educators can use this in various ways to impart knowledge to their students. Using learning media is one of them. (Gayatri et al, 2022), states that learning media can be used to make learning more efficient and effective, which in turn can help students achieve learning objectives and perform better in school. Thus, learning media allows teachers more freedom to deliver material in a way that suits their needs.

One of the many forms of educational media is papercraft media. Papercraft is one type of three-dimensional media, and media manipulation is an important part of using this media (Margiati, 2018). According to (Mariyana et al., 2022a), one form of artistic production that starts from paper and can be transformed into three dimensions as imagined is papercraft media. This papercraft media was chosen to be developed by researchers because, among other things, it has the ability to attract students' interest, so that students have a stronger desire to learn mathematics.

Learners can apply what they learn in math class to real-world problems (Putu et al., 2021). According to (Mayasari et al., 2024), mathematics has an important role in every aspect of human life. According to Boon & Van Baalen; Tuhuteru et al., cited in (Sitopu, 2024), in the foundational stage of primary education, learners develop a foundation of intellectual development and relevant understanding. This paradigm shift recognizes the need to move beyond traditional methods, emphasizing a deeper understanding and practical application of mathematical knowledge.

To develop other abilities in mathematics, such as communication, problem solving, making connections, critical thinking, and so on, it is necessary to first master the ability to understand mathematical concepts (Indriani et al., 2019). Students will find motivation to learn mathematics through the existence of mathematical procedures (Mayasari et al., 2024). In addition, engineering and math both include basic calculations.

There is material that discusses fractions in Mathematics. Evidence from SDN Cilincing 03 Pagi shows that this procedure is not actively used in learning or educational activities. This is due to teachers who either do not use learning media at all or have not found a way to make the most of it when introducing new lessons. As a result, students often struggle to pay attention in class and understand the concepts being taught. In addition, teachers rely solely on textbooks and the storytelling method of teaching, whereas students would benefit greatly from the use of tangible learning aids in the math classroom. Students' natural interest fades. The ability to maintain curiosity is essential for success in school, especially in mathematics. Students are encouraged to actively participate in activities that encourage critical thinking. Papercraft learning media was developed to assist students in achieving the learning objectives delivered by the teacher.

The use of media in learning is very important. Activities that use interactive media can affect learning activities more efficiently and effectively (Armanto, 2024). The use of papercraft as learning media can help students to focus, keep class discussions interesting, and prevent students from becoming bored. The incorporation of three-dimensional media into learning materials will make learning materials more real. As has been done by previous researchers, papercraft has been used as a learning media to support student learning. One of the researchers who have utilized papercraft media is (Pandesty, 2019) utilizing papercraft media to increase the creativity of drawing cultural arts and crafts of students was carried out at SD Negeri 2 Sukarame Bandar Lampung. Based on the results of his research that the creativity of drawing students increases in each cycle.

Researchers are interested in conducting research on the development of new learning media in accordance with the concrete operational stage, given the facts described above, as a solution to overcome the limitations of learning media. The purpose of this research is to develop a papercraft visual media and will be tested for feasibility to determine whether the papercraft visual media is suitable for use in classroom learning or not. Papercraft is a visual media that provides contextual information about fractions. Therefore, researchers are interested in making papercraft media for learning grade IV math at SDN Cilincing 03 Pagi. Researchers and teachers can take lessons from this study and strive to be

more creative in developing and using learning media. The findings of this study can be valuable information for schools that are considering creating educational media.

METHODS

This research was conducted at SDN Cilincing 03 Pagi, Cilincing, North Jakarta on May 7, 2024. This study used 27 fourth grade students from SDN Cilincing 03 Pagi as subjects. R&D methodology was used for the research and development process. Research and development (R&D) is a strategy to assess the efficacy of a product (Sugiyono, 2012). Okpatrioka (2023), states that R&D development research is a process or series of actions to create new products, improve existing products, and implement more innovative forms of education. In this study, the 4D model was used. According to (Riani et al., 2023), this research model was created in 1974 by Melvyn I. Semmel, Dorothy S. Semmel, and Sivasailam Thiagarajan. Several forms of learning media can be created using the 4-D development model, which is a generic learning paradigm (Arkadiantika et al., 2020). Research and development, or R&D for short, is a process whose main purpose is to find out more about what people want. The main objectives of research and development are product validation and development.

In this model, there are several stages to be carried out. The first stage is define, which is the stage of analyzing and collecting information to find out the problems that occur in the learning process. The second stage is design, at this stage will select the media to be developed for the material to be explained, the third stage is development or development is the process of making visual media *papercraft*. The last stage is dissemination, at this last stage it will be done to promote the media to students.

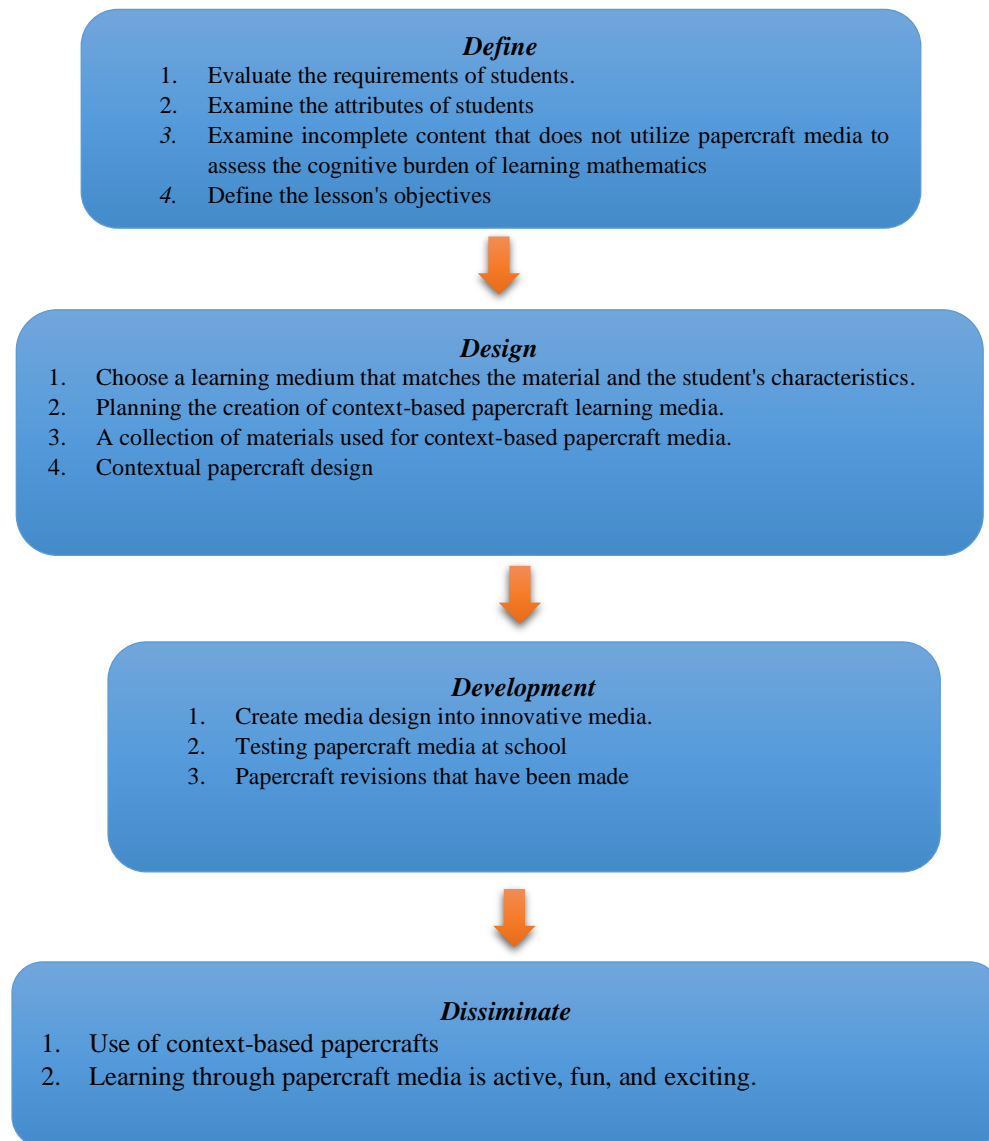


Figure 1. 4D Model Design Drawing

Product validation was conducted by media experts, subject matter experts, and the students themselves who filled out the questionnaires for this study. To conduct this validation, a specialist team consisting of material experts and media experts was formed. The fourth grade teacher at SDN Cilincing 03 Pagi was the material expert in this study. A lecturer who specializes in media was the media expert. 27 fourth grade students from SDN Cilincing 03 Pagi were the research sample. Both large and small groups were used to conduct the research. 10 students from Class IV A constituted the small group, while 27 students from Class IV B constituted the large group. These samples were collected and will be calculated to determine whether the visual *papercraft* media is feasible to use as media.

A Likert scale was used as the evaluation tool for this survey. Results from the descriptive survey were used in the data collection process. Responses, criticisms, and ideas from experts and grade IV student respondents were used to compile the descriptive data.

After the media evaluation was completed by subject matter experts, media experts, and student respondents, the descriptive percentage technique was used to measure the validation of the media, which was calculated in the following way:

$$P = \frac{f}{N} \times 100\% \quad (1)$$

Description:

f = Frequency being searched Percentage

N = Number of Cases

P = Percentage Number

The data that has been obtained from the validation results is calculated using a Likert Scale, The eligibility criteria for *papercraft* media are shown in the table below:

Table 1. Percentage Range and Media Feasibility Criteria

Percentage Range	Criteria
76% - 100 %	Very Feasible
51% - 75%	Worth
26% - 50%	Less Feasible
0% - 25%	Not Feasible

In order for the *papercraft* media to meet the feasibility criteria, the minimum feasibility level must be equal to the feasible criteria level. Obtaining a validity level below feasible needs to be revised. If the *papercraft* media has a media feasibility percentage range of 51% or higher, and 85% or higher according to the classical criteria, then the media is considered effective.

RESULT AND DISCUSSION

The purpose of this project is to advance the use of *papercraft* as a medium to teach fourth graders about fractions in Math class. By using three-dimensional shapes that closely resemble the real thing, *papercraft* media brings an event or scene to life. The use of cakes as a medium for teaching fractions that children encounter in their daily lives is expressed in this medium. The researcher took inspiration from the colorful slices of cake for this *papercraft*, which sets it apart from others. Comes with a smart board to add more media.

The *papercraft* stays true to the original by taking the shape of colorful cake slices, which gives it a more realistic look.

The purpose of this research is to create *papercraft* learning media that can be used in 4th grade math lessons with fraction material, and has been successful. In this study *papercraft* has been developed by (Margiati, 2018; Mariyana et al., 2022; Pandesty, 2019) showed that *papercraft* media can be an effective method for teaching fractions in mathematics. Research in this area differs from previous research in one important way, if previous research forms *papercrafts* to resemble different animals, the current research forms them into cut cakes with various colors to make them look realistic. Math lessons in fourth grade often use *papercraft* materials.

Among the many steps involved in the creation of this *papercraft* media is the validation stage which includes professional reviews and studies with large and small groups. After that, it can only be determined whether the media produced is appropriate and practical. In addition to feedback from students, the validation of this media was conducted by two experts, one from the material field and another from the media field. The 4D model for fraction material in mathematics subjects is the basis for making this *papercraft* media.

Research and development efforts in the field of *papercraft* have produced media made from real cake-shaped paper, which can captivate students. Grade IV students can get fraction material in this media. The following is a presentation of *papercraft* media.



Figure 2. Box Cake Display



Figure 3. Outside View of The Box



Figure 4. Side View



Figure 5. Papercraft Smart Board

The result of this development research is a Visual *Papercraft* learning media on fraction material class IV SDN Cilincing 03 Pagi with 4D model that has been prepared for field testing and validated by media experts and material experts.

This validation step is carried out to see whether the media developed is ready to be used as learning media. The products produced by researchers have been validated by two expert lecturers in the field of media. Based on the validation results obtained from the two media experts, it was found that the media validation level reached 90%, a value that corresponds to the very feasible category in the feasibility assessment table. The media that has been validated will then undergo a revision/improvement process in accordance with the input and corrections from the media validators on the development of *papercraft* media.

Table 2. Media Expert Validation Table

Aspects	Percentage	Category
Aspects of Physical Appearance of Media	91%	Very Feasible
Aspects of Color Usage	93%	Very Feasible
Aspects of Media Supporting Components	85%	Very Feasible

Based on table 2, there are three aspects that have been validated by media experts. One of them is the physical appearance of the media, which gets a percentage of 91%. Another aspect, the use of color, received a percentage of 93%. Finally, aspects related to the supporting components of the media, gave a percentage of 85%. With a total score of 90% and a very practical qualification, the papercraft media is clearly an excellent product for educational purposes. Consistent with previous research, this study found that learning can benefit greatly from high validation results (Mariyana et al., 2022a; Pandesty, 2019) To ensure that the media content is appropriate to the materials produced, this validation step is conducted. Experts in the relevant subject matter checked the final output.

This validation step will be carried out to ensure the suitability of the media content to the material developed. The developed product was validated by two material experts. The first step is to get permission from the material experts to act as material expert validators and provide material validation assessments in the form of questionnaires on *papercraft* media. The validator checks the material to ensure suitability with the media that has been developed.

Table 3. Material Expert Validation Table

Aspects	Percentage	Category
Suitability of media with material	92%	Very Feasible
Language and sound	90%	Very Feasible

Based on table 3, the results of the material expert validation include 2 aspects, the aspect of media suitability with the material getting a percentage of 92% and the aspect of language and sound getting a percentage of 90%. The sum of these two aspects is 91% of the whole, according to the eligibility qualification table that this is very feasible. Because of this, there is no need for revision/improvement. Based on the results of media validation, it can be concluded that the development of *Papercraft* media is said to be very feasible to use in the learning process of fraction material in learning Mathematics.

After carrying out validation of the media and the developed product is said to be suitable for testing on students, the trial will be carried out on two scales, namely a large scale in class B and a small scale in class A. The initial stage carried out during the trial is

to explain the learning media that has been validated and revised to students. After that, students will try to use the media in groups and work on the questions given. When finished, students will be asked for their availability to fill out a questionnaire on the feasibility of contextual-based *papercraft* media. Learners began to assess the questionnaire of contextual-based *papercraft* media developed.

Table 4. Small Scale Learner Response Table

Aspects	Percentage	Category
Media user aspects	93.75%	Very Feasible
Aspects of learner response	98%	Very Feasible

Table 4 is the result of a small group response with a total of 10 students with a result of 93.75% for the media user aspect, and for the student response aspect, the result is 98%.

Table 5. Large Scale Learner Response Table

Aspects	Percentage	Category
Media user aspects	95%	Very Feasible
Aspects of learner response	91%	Very Feasible

Table 5 shows the findings from a large-scale survey of 27 students; according to this survey, 95% of students were media users, and 91% of students provided feedback.

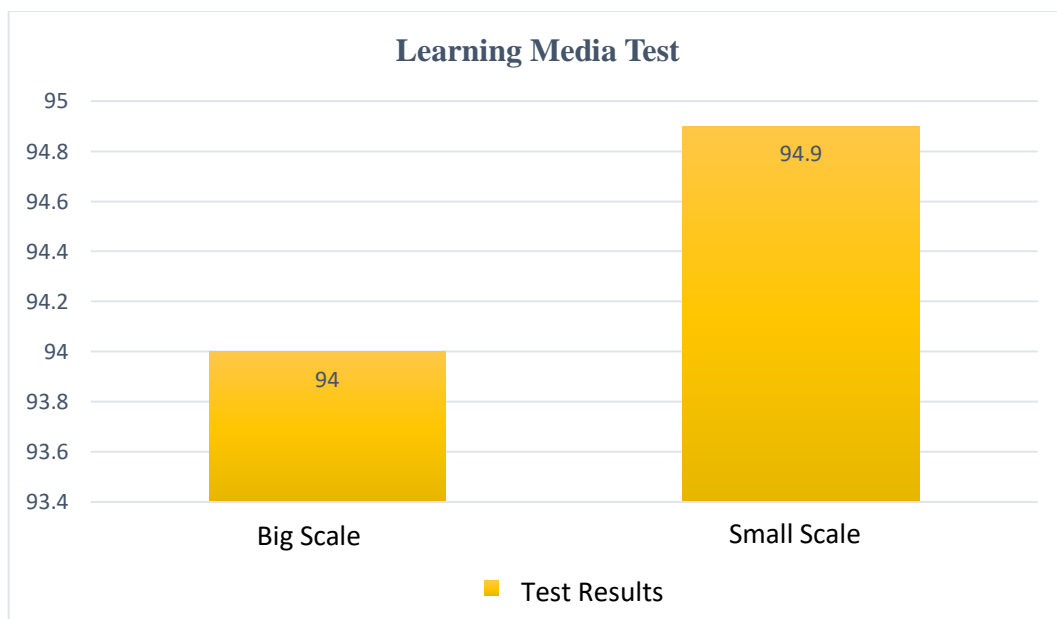


Figure 6. Bar Diagram of Learner Respondent Results

Based on the results of trials conducted by students, it can be concluded that the percentage of trial results on a large scale is 94% and on a small scale is 94.90%. This percentage value is adjusted to the criteria table which indicates that the feasibility lies in very feasible qualifications. The conclusion is that the response of students from small and large groups that *papercraft* media can be said to be very feasible to be used in the learning process of fraction material in Mathematics learning which is because this media is contextual or real, students can more easily observe how fractions are calculated using media that resemble their original form.

The use of *papercraft* media as teaching aids can attract students' attention, make the learning process easier and make students better understand the material being taught. The advantages obtained with the form of media that is very similar to the original form of *papercraft* media will encourage the imagination and creativity of students in thinking so that it makes it easier for students to understand concepts in fractions. Although it has such advantages, *papercraft* media has disadvantages, namely, the durability of *papercraft* media is considered easily damaged which can be known that *papercraft* is a media made from paper which is easily damaged when exposed to water or moisture. *Papercraft* media can be quickly torn or destroyed if treated improperly. In addition, the process of making *papercraft* media requires a lot of time, accuracy, and skills that will make *papercraft* more beautiful and more real. *Papercraft* media is recommended for educators so that when applying the material not only using the lecture method and only relying on books, but educators can utilize *papercraft* media in their learning.

CONCLUSION

The research described here validated the use of *papercraft* media based on fraction materials for math learning, piloted with 10 students in a small group and 27 students in a large group in grade four at SDN Cilincing 03 Pagi. The researchers found that *papercraft* media can be a powerful tool to improve students' understanding of math concepts.

Based on the findings of the research and development, a new product was developed. This product is in the form of visual media *papercraft* fraction material for grade IV math subjects. This product was tested at SDN Cilincing 03 Pagi using the 4-D model and obtained a feasibility validation of 91% from the material expert which shows very feasible qualifications. This includes consideration of material, language, and sound for media suitability. The media validation study with experts resulted in a 90% feasibility rating for the product, indicating that it met all the necessary criteria. Which covered various topics:

media support components, color theory, and physical appearance of the media. With highly practical requirements, the implementation in the fourth grade resulted in learning media quality results of 94.9% on a large scale and 94% on a small scale. This indicates the successful utilization of context-based visual media in papercraft.

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