

Developing the fraction triangle card as an instructional media for supporting 5th grade in learning multiplication of fractions

Ummu Kaltsum Fathonah*, Linda Astriani

Elementary School Teacher Education, Universitas Muhammadiyah Jakarta

Corresponding author: lindaastriani@umj.ac.id

Submitted/Received 11 July 2023; First Revised 20 July 2023; Accepted 2 August 2023

First Available Online 1 December 2023; Publication Date 1 December 2023

Abstract

This development research is motivated by the unavailability of mathematics learning media that support the learning process, especially on fraction multiplication material. The purpose of this development research is to determine the validity and practicality of Fraction Triangle Card learning media. For this reason, research was conducted using the Research and Development (R&D) method using the Analysis, Design, Development, Implementation, Evaluation (ADDIE) development model to test the validity and practicality of the Fraction Triangle Card learning media. This development research was conducted at SDN Cilandak Barat 04 Pagi in the academic year 2023/2024 odd semester. For the validation test, this learning media was conducted by three experts, namely language experts, media experts, and material experts while to test practicality it was carried out in stages, namely teacher practical trials, small group trials, and large group trials. The results showed that the Fraction Triangle Card learning media was very valid based on the results of the calculation of linguists with a percentage assessment of 84%, media experts with a percentage assessment of 90%, and material experts with a percentage of 88%. The results of the teacher's practicality trial obtained a percentage assessment of 93.3%, the results of the small group trial obtained a percentage assessment of 98.61%, and the results of the large group trial obtained a percentage assessment of 94.4%. Based on the results of the study, the Fraction Triangle Card learning media is very valid and practical to be used by fifth grade elementary school students.

Keywords: learning media, fraction triangle card, development research, ADDIE.

INTRODUCTION

Learning media is very important to help students in acquiring new concepts, skills and competencies (Arifin, 2018). Learning media is everything that can be used to convey messages or information in the teaching and learning process so that it can increase students' attention and interest in learning (Arsyad, 2013) Along with the times, learning media in each subject is always developing, one of which is mathematics.

Mathematics is a form of problem solving where through the process of teaching and learning mathematics, students can develop their ability to overcome various complex mathematical problems in depth. (Haryani 2020) Mathematics needs to be understood and mastered by all levels of society, especially elementary school to college students (Kusumawardani, Wardono, Kartono (2018).

Mathematics is often considered a complicated and less fun subject, one example

is for students (Kustantina, Nuryadi, & Marhaeni, 2021), this causes mathematics to be an elusive thing for them to achieve learning goals more efficiently and allow students to understand the material quickly, a teacher not only needs to have expertise in delivery and learning materials, but also need to be proficient in utilizing and managing learning aids (Amir, 2016). With good mastery of the material and effective use of learning media, the learning process will become more significant (Izzudin, Masugino, & Suharmanto, 2013).

In the context of learning, learning media acts as a tool that connects the source of the message with the recipient of the message to stimulate students' thinking, emotions, attention, and motivation so that they become motivated and actively involved in the learning process. (Hamid et al., 2020; Purwati, 2022).

The quality of learning media has an important impact on the implementation of

the educational process, so it is important to choose and use learning media carefully. This will ensure that the use of learning media becomes effective and does not produce unwanted results (Arsyad, 2013). However, in fact, at SDN Cilandak Barat 04 Pagi, the use of learning media is still minimal when learning takes place, especially in mathematics subjects. Teachers also tend to adopt monotonous teaching methods, namely through lectures without variation using other methods. As a result, students feel bored and lose interest in participating in mathematics learning (Khasanah & Rigianti, 2023). The fraction multiplication operation is one of the subjects of material in grade V elementary school. Multiplication is the repeated addition of the same number in each term, if a and b are numbers, then $a \times b = b + b + b$ or ab is a repeated addition that has a term and each term is b . (Haryono, et al 2014: 4) A fraction is a quotient or representation of part of a number. (Novak & Renzo, 2013:3). Fractions are one of the important materials that must be mastered by students, this is because fractional material is related to other materials such as decimals, comparisons and scales and measurements.

In line with research conducted by Pitadjeng (2015) domino games with numbers can be a useful tool to improve the numeracy skills of students from grade one to six in elementary school. In line with Pitadjeng's research, Trimurtini, Astuti, & Nugraheni (2019) in their research utilizes domino games as a tool to improve the ability of grade V students of SD Negeri Tambakaji 04 in fraction multiplication operations. The findings of this study indicate that the application of domino card games in the lesson of fractional multiplication operations is effective and can be recommended. Based on these descriptions, researchers are interested in conducting a study entitled "Developing the Fraction Triangle Card as an Instructional Media for Supporting Fifth Graders in Learning Multiplication of Fractions".

RESEARCH METHODS

The method used is research and development or Research and Development, which is a research method used to produce certain products, and test the effectiveness of these products (Sugiyono 2015: 407). The development model used in this *Fraction Triangle Card* media is ADDIE (Hermita, DKK, 2021). The use of the ADDIE research model was chosen because it can be used to produce a variety of learning products, including media, models, learning strategies, and learning materials. Winarni (2018). The ADDIE development model goes through 5 stages of the development process, namely *Analysis, Design, Development, Implementation, and Evaluation* (Cahyadi, 2019).

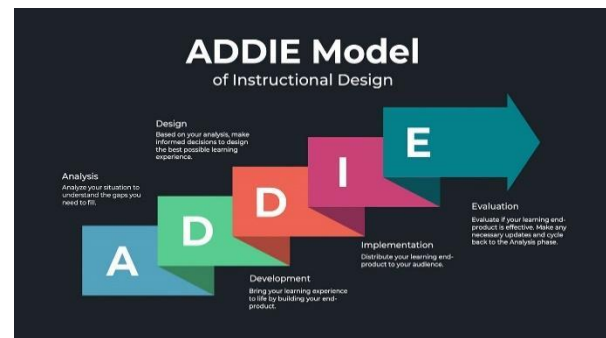


Figure 1
ADDIE development pipeline

The analysis phase is the initial step in product development that aims to identify and observe needs in the field. (Astriani & Akmalia, 2022:34). At the analysis stage, there is also curriculum analysis and student character analysis. The design stage is the stage of designing *Fraction Triangle Card* learning media that can be depicted in the form of sketches. Furthermore, the development stage at this stage aims to carry out the process of making *Fraction Triangle Card* learning media.

In the next stage, namely the implementation of learning media products that have been developed and validated, trials will be carried out. After carrying out the implementation stage, in the last stage researchers evaluate learning media products in order to perfect the learning media that

have been developed racing on the results of suggestions from expert validation

The Fraction Triangle Card *learning media* is validated by 3 experts, namely; linguists, media experts, and material experts who have educational backgrounds in accordance with their fields (Schönbrodt, DKK, 2021). Product validation tests are carried out to determine the validity of the product. After validating, the next stage of product trials was carried out on the *Fraction Triangle Card learning media*, the trials carried out were; practicality trial with one of the teachers, small group trial with 6 students, and large group trial with 24 students. Practicality tests are carried out to determine the practicality of the product.

This study conducted an experiment to assess whether this product meets quality standards, by measuring the validity and ease of use of the *Fraction Triangle Card media*. Data analysis was carried out using Likert scale questionnaires and Guttman scale. Analysis of the data obtained from the questionnaire will produce qualitative and quantitative data.

RESULTS AND DISCUSSION

Analysis

Needs Analysis

In this stage, observations were made during mathematics learning in grade V SDN Cilandak Barat 04 Pagi. The results of the analysis of problems that arise in the process of learning mathematics in the classroom show that teachers still use conventional methods, such as lectures, which causes a lack of student motivation in learning mathematics. In addition, there is also no use of learning media that supports mathematics learning, especially in fraction multiplication material.

Curriculum Analysis

In the second analysis step, namely curriculum analysis, it was found that SDN Cilandak Barat 04 Pagi adopted the 2013 curriculum. In this development research, researchers chose mathematics subjects with a focus on fraction multiplication material for grade V elementary school students.

Student Character Analysis

Class V students at SDN Cilandak Barat 04 Pagi have characteristics where many of them have understood the concept of fraction multiplication, but still have not mastered multiplication by rote. During the classroom teaching process, teachers have not used special learning media, especially in teaching this material, which results in a lack of student interest. As a result, students are less motivated to learn mathematics because of their lack of interest in learning.

Design



Figure 2

Fraction Triangle Guide Book

At this stage is the stage of designing learning media products to be developed, namely *Fraction Triangle Cards* on fraction multiplication material. At the design stage of the *Fraction Triangle Card media*, researchers made a Fraction Triangle Card design, user manual, and card box.

Fraction Triangle Card

The *Fraction Triangle Card* is designed as a triangle with a side length of 12 cm that allows for interconnected arrangement. The card is made from 310 gr quality Art Cartoon paper and coated with a glossy plastic coating to ensure durability and prevent damage. *Fraction Triangle Card creation* is designed using the Canva Pro graphics application

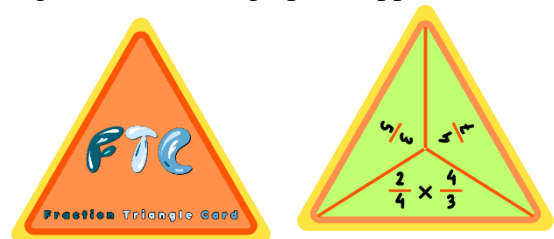


Figure 3

Fraction Triangle Card Design

In picture 3 above, the front of the card displays the *Fraction Triangle Card* logo

using *midnight green*, *picton blue*, and *columbia blue*. Each set of *Fraction Triangle Cards* consists of 21 cards, and on the back of them is a collection of fraction multiplication questions and answers.

Fraction Triangle Card Usage Manual

Guide to use *the Fraction Triangle Card* in the form of a pocket book that can be folded, with a size of about 10 cm x 14.5 cm. This guidebook is made of *art paper* which has the basic colors yellow, red, and orange. The purpose of making this guidebook is to provide guidance that makes it easier for students to understand how to use *the Fraction Triangle Card*.



Figure 4

Fraction Triangle Card Usage Manual

In figure 4 above, the product name and logo, the name of the researcher, and the image of *the Fraction Triangle Card* are displayed on the front page of the *Fraction Triangle Card* user manual. The product is briefly described on the first page, and instructions for use of the Fractional Triangle Card are provided on the next two pages.

Fraction Triangle Card Box

The *Fraction Triangle Card* box has a size of 15 cm x 3 cm and each side is in the shape of an equilateral triangle (Kerins, DKK, 2018). The *Fraction Triangle Card* box is made of *art paper* weighing 260 grams. The color scheme of the card box is consistent with the front of the card, with the main colors being orange, red, and yellow (Pickover, 2003). The *Fraction Triangle Card* logo and product name are displayed on the front of the card box.

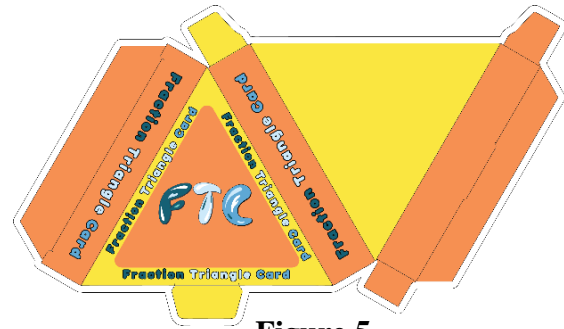


Figure 5

Card Box

Development

Media Creation

Here are the steps in developing *Fraction Triangle Card* media products:

Card Creation

Using the Canva Pro app, first design the card manually, focusing on the front and then the back of the card to create a *Fraction Triangle Card*. Then questions and answers about the content of the fraction multiplication after the design is complete, then place it on the back side of the card that has been created.

Researchers used 310 gr *Art Cartoon glossy laminated* paper to print the Fractional Triangle Card after completing the entire design. Next, the cards are cut to enhance the shape and make it more aesthetically pleasing.

Creation of Usage Manual

The first step in creating a guidebook for using the *Fraction Triangle Card* is to design a guidebook using the Canva Pro application and utilizing the elements available in the application.

The front cover of the guidebook will display the product name and *Fraction Triangle Card* logo, followed by the researcher's identity and product image. The first page of the guidebook will contain a brief summary of the *Fraction Triangle Card*, while the second and third pages will explain how to use the card. After the design

is complete, the user manual will be printed using art paper with a size of 10 x 14.5 cm.

Card Box Creation

To create a card box, the first step is to design a card box with the help of graphics software like Adobe Illustrator. In this process, an equilateral triangular mesh with a size of 15 x 3 cm will be created. After the triangular design is complete and looks neat, the second step is to print these triangular webs using *art cartoon* paper weighing 260 grams. After printing, the next step is to cut the triangular webs using scissors. Next, the last stage is to arrange the pieces of the cut nets and combine them using double tape to form an equilateral triangle-shaped card box.

Expert Validation

After going through the *development* stage, the next learning media product is tested for validation by linguists, material experts, and media experts which can be seen in table 1 below:

Table 1

Expert Validation Results

Validators	Aspects	Percentage (%)	Validity level
Linguists	Grammar and Readability	84%	Highly Valid
Media Expert	The structure and elements of teaching materials, Depth of material	90%	Highly Valid
Material Expert	Graphical Display and Layout	88%	Highly Valid

In table 1 above, you can see the assessment results from expert validation, the description is as follows:

1. Linguist validation obtained an 84% assessment percentage with valid categories.
2. Material expert validation obtained an assessment percentage of 88% with the category very valid.
3. Media expert validation obtained a 90% assessment percentage with a very valid category.

Experts also provide criticism and suggestions to improve the quality of *Fraction Triangle Card learning media products*, namely:

1. Linguists' advice is to justify some words that are not right and replaced with more appropriate words.
2. Media experts' advice is to add a guide on how to use the *Fraction Triangle Card learning media product*.

Implementation

At the implementation stage, practicality trials were carried out by teachers and students to get an assessment of the practicality of the *Fraction Triangle Card learning media*. The teacher practicality test was conducted by one of the teachers in the class, a large group trial involving 24 students and a small group trial involving 6 students. The following are the percentage results obtained from filling out teacher and student questionnaires:

Table 2

Teacher Practicality Data

Assessment Categories	Percentage	Level of practicality
1. User-friendliness	93,3%	Very Practical
2. Highlights		

Table 2 above Based on the results of practicality tests by teachers, *Fraction Triangle Card learning media* is suitable for use in learning activities, with an assessment percentage of 93.3%.

Table 3
Small Group Trial Data

Assessment Categories	Percent age	Level of practicality
1. User-friendliness	98,6%	Very Practical
2. Highlights		

Based on table 3 above, 6 grade V students from SDN Cilandak Barat 04 Pagi completed a small group experiment, and the results of the practicality questionnaire showed an assessment percentage of 98.6%.

Table 4
Large Group Trial Data

Assessment Categories	Percent age	Level of practicality
1. User-friendliness	94,4%	Very Practical
2. Highlights		

Based on table 4 above, 24 grade V students from SDN Cilandak Barat 04 Pagi completed a large group experiment, and the results of the practicality questionnaire showed an assessment percentage of 94.4%.

Evaluation

The media development process has been carried out, starting with the problem identification and analysis stage, product design development, product validation, and product trials. After obtaining the results of responses from students, then enter the evaluation stage. This stage follows improvement suggestions and comments from expert validators. The evaluation is carried out from the results of validator suggestions and comments. Final evaluation of the developed learning media product to pay attention to detail, and add the necessary supporting components according to the advice of expert validators.

CONCLUSION

The *Fraction Triangle Card* is the final result of this study. A card game with an equilateral triangle shape as a learning

medium. *Fraction Triangle Card learning media* was developed with the R&D method which through the stages of the ADDIE development model (*Analysis, Design, Development, Implementation, Evaluation*) obtained very valid and practical results. The product goes through a process of validity testing by experts and practicality tests by teachers and students.

The suggestions that the researchers conveyed based on the results of the study include further development of the *Fraction Triangle Card learning media*, especially in other fractional materials such as addition, subtraction, mixed fractions, or other mathematical materials outside fractions. In addition, it is also recommended to integrate *Fraction Triangle Card learning media* into the mathematics learning process, especially in fraction multiplication material, in order to increase student interest and motivation in learning mathematics. *Fraction Triangle Card* can also be used as a reference in the development of other learning media that aims to captivate students' learning interest.

BIBLIOGRAPHY

- Amir, A. (2016). Penggunaan media gambar dalam pembelajaran matematika. *Jurnal eksakta*, 2(1), 34-40.
- Arsyad, (2013). *Media Pembelajaran*. Jakarta: PT Raja Grafindo.
- Arifin, Z. (2018). Pengembangan Media Pembelajaran Audio Visual Adobe Flash Berbasis Android Pada Kompetensi Dasar Konsep Pemasaran Online di Kelas X Pemasaran SMK Negeri 1 Surabaya. *Jurnal Pendidikan Tata Niaga (JPTN)*, 6(2).
- Astriani, L., & Akmalia, S. (2022). Pengembangan Modul Bangun Ruang

- dan Statistika Berbasis Project Based Learning. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 6(3), 3431–3442.
- Cahyadi, R. A. H. (2019). Pengembangan bahan ajar berbasis ADDIE model. *Halaqa: Islamic Education Journal*, 3(1), 35-42.
- Hamid, M.A., Ramadhani. R., Juliana. M., Safitri. M., Jamaludin. M.M., & Simarmata. J. (2020). *Media Pembelajaran*. Yayasan Kita Menulis.
- Hermita, N., Alim, J. A., Putra, Z. H., Gusti, P. M., Wijaya, T. T., & Pereira, J. (2021). Designing interactive games for improving elementary school students' number sense. *Al-Jabar: Jurnal Pendidikan Matematika*, 12(2), 413-426.
- Izzudin, A. M., Masugino, M., & Suharmanto, A. (2013). Efektivitas penggunaan media pembelajaran video interaktif untuk meningkatkan hasil belajar praktik service engine dan komponen-komponennya. *Automotive Science and Education Journal*, 2(2).
- Kerins, B., Yong, D., Cuoco, A., Stevens, G., & Pilgrim, M. (2018). *Fractions, Tilings, and Geometry* (Vol. 7). American Mathematical Soc..
- Khasanah, F., & Rigianti, H. A. (2023). Teachers'efforts In Dealing With Students Who Experience Boredom During Learning In Elementary School. *Renjana Pendidikan Dasar*, 3(4), 266-277.
- Kusumawardani, D. R., Wardono, & Kartono. (2018). Pentingnya Penalaran Matematika dalam Meningkatkan Kemampuan Literasi Matematika. *PRISMA, Prosiding Seminar Nasional Matematika*, 1(1), 588–595.
- Kustantina, V. A., Nuryadi, N., & Marhaeni, N. H. (2021). Analisis Kebutuhan Komik Matematika untuk Meningkatkan Kemampuan Literasi Numerasi dan Motivasi Belajar Siswa. *KoPeN: Konferensi Pendidikan Nasional*, 3(2), 201-205.
- Nugraha, A. G., & Rafidiyah, D. (2019). *Training of using domino card game to teach fraction for mathematics teachers at Junior High Schools in Banjar Regency. Comment: An International Journal of Community Development*, 1(3), 67–70.
- Pitadjeng. 2015. *Pembelajaran Matematika yang Menyenangkan*. Yogyakarta : Graha Ilmu.
- Pickover, C. A. (2003). *Wonders of numbers: adventures in mathematics, mind, and meaning*. Oxford University Press.
- Purwanti, E. (2022). *Pembelajaran Kontekstual Media Objek Langsung dalam Menulis Puisi*. Penerbit P4I.
- Schönbrodt, F. D., Hagemeyer, B., Brandstätter, V., Czikmantori, T., Gröpel, P., Hennecke, M., ... & Schultheiss, O. C. (2021). Measuring implicit motives with the Picture Story Exercise (PSE): Databases of expert-coded German stories, pictures, and updated picture norms. *Journal of personality assessment*, 103(3), 392-405.

Sugiyono, (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.

Trimurtini, T., Astuti, F. D., & Nugraheni, N. (2019). *Fraction Triangle Cards (FTC) game as learning media for multiplying fractions in fifth-grade elementary school. Unnes Journal of Mathematics Education*, 8(3), 152-156.