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DEVELOPMENT OF FRACTIONAL DOMINO CARD MEDIA IN MATHEMATICS LEARNING AT ISLAMIC ELEMENTARY SCHOOL

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Abstract

This study aims to develop appropriate media by measuring the validity of fractional domino media on fractional material. The type of research used in this research is research and development using the model proposed by Borg and Gall with ten stages, but due to the limited research time imposed by the school, the researchers only carried out eight stages (problems and potential, data collection, product design, expert validation, design revision, product trial, product revision, and trial use). This media focuses on fractional material presented in the form of illustrated images of fractional numbers. This media is made to foster interest in and improve student learning outcomes in mathematics. The data Subjects of this study were 28 students of class III MI Nyatnyono 02, and this sampling technique used a purposive sampling technique. The secondary data in this study were in the form of books, journal references, and the relevance of previous research studies, while the primary data were in the form of interviews, media validation, and student test results. The instruments used were material and media expert validation sheets, as well as tests given to students. The results of the study were (1) the average score of student learning outcomes using fractional domino cards with a percentage of 93%, (2) the average score of material expert validation with a percentage of 94% which is in the very feasible category (3) the average score of expert validation media with a percentage of 94%. The conclusion of the research is that the development of Fractional Domino Card media can be declared "very feasible" to be used in learning the concept of fractions in elementary schools.

Keywords Carsd Fractions Domino, Instructional Media, Math Learning, MI Nyatnyono

INTRODUCTION

Education is a necessity of life. Even though this level of understanding looks forced, if you follow the flow and path of human life, it cannot be denied that education has followed a long journey from beginning to end. Education is an essential human need and a true protector. This indicates that education and humans will always be side by side (Miftah, 2013).

According to the Government Regulation of the Republic of Indonesia Number 57 of 2021 concerning National Education Standards, the existence of education holds a very important position for humans because it is one of the capitals of technological progress and development in its time (Nurul, 2022). According to the government, education is a deliberate and structured effort to create a learning environment and teaching and learning process so that students actively increase their capacity for religious, spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, goose and country (Zainuddin, 2021).

From the role of education, it can be concluded that education aims to increase the potential of each individual. This may have to be done for a superior change to a skilled and innovative person. Education is very important because it allows humans to develop their abilities, attitudes, and behaviors, as well as their knowledge and skills. Education is an element that cannot be separated from human beings. Starting from the womb to growing up and then old, humans experience an educational process (Angrayni, 2019).

Permendiknas Number 22 of 2006 describes the foundation of the implementation of learning in Indonesia. That one of the main points of learning fractions in elementary schools is understanding the idea of numbers and applying them in solving problems well (Amalia & Unaenah, 2018). By learning to teach good mathematics, students will have a good grasp of the perception of mathematics and the ability to actually deal with problems. The use of cutting-edge technology in the classroom will benefit from this capability (Syafira, 2022). The most crucial activity in the educational process in schools is learning. Thus learning can be said to be successful in achieving educational goals depending on how the learning process runs effectively (Purwanti, 2015).

Using visual aids or other learning media is one way to achieve more effective mathematics learning. Students will be able to solve problems effectively and understand mathematical concepts if they study mathematics well (Joseph, 2017). There are several things that teachers can do an important role so that learning is more effective, varied, and fun so as to improve optimal learning

outcomes. So that students do not experience difficulties in learning material delivered by teachers, especially in mathematics lessons in elementary schools (Hamidah, Nur; Ain, 2022). The media used in learning mathematics can be through teaching and learning media which helps add to the experience that is utilized by educators (Samura, 2015).

The fact that mathematics has an abstract object of study is one of its characteristics. This theoretical nature becomes one of the problems for students, where students face difficulties in understanding mathematical concepts (Gazali, 2016). Mathematics material given to elementary school students requires choices and changes. The school curriculum includes mathematics that has been selected, simplified, and adapted to the development of students' thinking (Setiawan et al., 2020).In the process of interaction between educators and students, the media is often positioned as a channel of communication. In this case, the media has an important role in determining the success of the information transfer process between two people who are communicating using certain media (Coal, 2020).

As educators, of course, we expect students to have no difficulty concentrating on the math material delivered by the teacher during the learning process. However, there are still many students who experience learning difficulties. Student learning outcomes and achievements, which are usually in the form of grades, can be used to see their level of mastery of the material. It is often found that some students often get low scores when they have to master mathematics (Basuki, 2015). This mastery of mathematics can be caused by the inability of students to respond to teacher instructions due to their lack of interest or attraction during the learning process (Hamidah, Nur; Ain, 2022).

Being an educator, of course, must always be updated with the method or atmosphere during the learning process, which is carried out in accordance with the conditions, because basically, the learning process is always changing and developing. As a result, educators must be able to equip students with active, innovative, and creative learning (Purwanti et al., 2022). With the ultimate goal of conveying creative learning material and students feeling they don't experience understanding problems with feelings of pleasure, teachers can utilize learning media in accordance with the material and learning targets as a learning methodology (Chotib, 2018).

One of the learning media that can benefit from students' concern for science is by utilizing game media. The role of the media in the teaching and learning process is to involve students more actively in learning activities (Spiritual, 2019). Good use of media will facilitate the achievement of

learning objectives and motivate students to study hard so they can get the most out of their education. In addition, learning collaboration in class is still relatively low; students, in general, will be detached and less interested (Rozie, 2018). As can be seen from the description above, the selection, creation, and use of learning media are very important, and a teacher must really be able to choose and use learning media appropriately. One type of learning media is fractional domino cards which are easy to modify, can present questions and answers, and are easy for students to use. In this domino card, students are expected to arrange cards according to the questions and answers on each card (Muthoharoh & Cholifah, 2020).

Based on interviews with third-grade homeroom teachers conducted at MI Nyatnyono 02 Semarang Regency, Mrs. Ana Yuliati and Mrs. Rizatul said that teaching educators were still monotonous in teaching fractional material in class due to the lack of students deepening the material, and most of the students thought that mathematics is a difficult subject to master. Most students also do not like math lessons, so learning outcomes are not optimal even though the teacher has tried to improve student learning outcomes, especially in learning mathematics, by means of evaluation tests after each lesson is finished.

Educators here have not used media that can support learning, especially in fractional material. In addition, students also feel bored with the state of the monotonous teaching and learning process centered on the teacher. Students tend to play less active roles, so that there is no support for students who are passionate about learning mathematics.

While the existing facilities in schools, such as infrastructure, are sufficient, teachers here have not used media that can help the learning process so that it attracts students' attention, especially making media in learning mathematics, such as fractional domino cards. Because learning is currently carried out face-to-face, this domino fraction learning media is feasible to use, and students can access it easily.

In addition, this research is strengthened by the results of research in the Indonesian Educational Scientific Journal, which was researched by Rosary with the title "Development of Math Card Game Media (Uno Mathematics) in Mathematics Learning on the Main Material of Integer Operations" in which it explains that its development is developed to meet the validity aspect (Validity), practicality and effectiveness. Thus the math card game media developed in this study is a good game media. The research method used is the same, using the Research and Development (R & D) method, the data collection techniques are slightly different, namely validation sheets,

learning achievement test sheets, and interviews, which make the same, namely the subjects used, namely mathematics (Srintin, 2019).

The results of the thesis research that has been carried out by Anis Agung Nurkholisa, entitled "Development of Picture Word Cards Based on Snakes and Ladders Games in Class III Arabic Learning Content at SDT Cahaya Ummat Semarang Regency." The research method used is the same, namely by using the Research and Development (R&D) method. The difference lies in the material, and here the researcher takes math material, while Anis Agung uses deep Arabic material in his research (Nurkholisa, 2021).

The results of research conducted by Auliya Adawiyah entitled "Development of Domino Card Media in Mathematics Learning Multiplication Operations for Elementary School Students" in his research said that learning by using domino cards can help students master the material and assist in remembering the material studied with domino card media. This is evident from the results of the practicality of the media from the assessment of student responses obtaining a score with the "very practical" criterion. The difference lies in the development model, and here the researcher uses the Borg and Gall development model, while Adawiyah uses the ADDIE model (Adawiyah & Kowiyah, 2021).

Research using domino card media was also carried out by Yuli and Iwan Ruswandi with the title "Modification Of Domino Card Game As An Alternative To The Introduction Of Letters For Early Childhood" The research results showed that domino card media has good aspects for alternative letter recognition media in the child. The difference lies in the domino cards developed by Yuli and Iwan Ruswandi, which are intended for children to recognize letters, while in this study, the development of domino card media is intended for elementary school students to recognize fractions (Eneng Yuli, 2019).

The results of research in educational journals conducted by Miftakhul Janah with the title "Development of Mathematical Computing Domino Cards-Quick Code" media with the results of the study stating that the development of Mathematical Computing Domino Cards-Quick Response Code (KOMIKA-QR) media was declared "feasible and practical" for use in learning the concept of fractions in elementary school. The results of the level of validity of the material by experts were 95%, the validity of the media was 96.66%, and the practicality of the user (student) response questionnaire was 87.7%. The similarity of this research with research conducted by Miftakhul Jannah is the same using the Borg and Gall development model. The difference lies in the

modification of the domino card. The KOMIKA-QR Media In its application, there is a quick response code which is a symbol as a link between the question card and the illustration video (Jannah, 2020).

Based on the relevance above, it can be concluded that the similarities are both in conducting research using domino cards in their research. The differences from the five studies described above are the place of implementation, the subjects, the research model used, and the modification of domino cards. It can be concluded from the statement above that the use of domino cards can support implementation in the learning process and can foster student enthusiasm for learning. The purpose of conducting this research is to develop learning media for fractional domino cards to make it easier for students to learn fractional assignments. This will enable students to learn while playing while making students more dynamic and enthusiastic in learning. Paper is used to make broken domino cards, and paper is a material that is easy to obtain at a low cost. In the event that instructors need to make their own designs, this aims to make it easier for them to do so. The openness of paper as an important mechanism for making lots of cards can be used as one of the considerations that games are appropriate for use as learning media.

METHOD

This research is a Research and Development study using the model proposed by Borg and Gall. Development research is a form of basic research to obtain information on user needs. While development is a strategy to produce as well as test the effectiveness of products linked to education, development research is used to develop as well as a means of validating these educational products (Sugiyono, 2018).

Borg & Gall explained that there are ten steps in R&D. This research is a way that can be used to measure the feasibility of products that are developed in a valid and practical manner (Fauziyah, 2022). The steps are simplified as follows due to the limited time available for research: 1) problem and potential, 2) data collection, 3) product design, 4) expert validation, 5) design revision, 6) product trial, 7) product revision, and 8) trial use. According to the anticipated need for research, research was terminated at step 8.

This research was conducted at MI Nyatnyono 02, Semarang Regency, on April 1 – 12, 2023. The place of implementation in this study is MI 02 Semarang Regency which is on the Road. Hasan Munadi, Sendang Rejo Nyatnyono Village, West Ungaran District, Semarang Regency,

Central Java Province. Field trial subjects in this development research were class III students at MI Nyatnyono 02, totaling 28 students. The sampling technique used by researchers at this stage is a purposive sampling technique, namely a sample collection technique with certain considerations (Sugiyono, 2018).

Data sources obtained through this research are divided into two types of data, namely primary data and secondary data. Primary data or evidence are facts that have been collected and obtained directly from the source that owns the data (Nurdin & Hartati, 2019). The method that the author can use to gather primary evidence is in the form of interviews, validation carried out by two experts, namely media experts and material experts who are lecturers of media experts and material experts, and tests given by students to find out student learning outcomes after using fractional domino cards. Secondary data is data taken from other sources by researchers (Balak, 2022). Secondary detain this study in the form of books, journal references, and the relevance of previous research studies.

The technique in this development research is to use several data collection techniques. The first is an interview. In this development research, interviews were conducted before producing the media. The interviews in this study were addressed to the homeroom teacher for class III MI Nyatnyono 02. The interviews with the homeroom teacher for class III aimed to find out the problems and needs needed in learning. Then using a questionnaire, collecting data in this development research using a questionnaire. Questionnaires were given to media experts and material experts to determine the validity of the media. This study also uses data collection techniques in the form of tests. The tests in this study were in the form of pretest and posttest. The aim of the pretest was to find out students' initial knowledge and learning outcomes on fractional material before being treated using fractional domino card learning media. At the same time, the purpose of the posttest is to find out students' knowledge and learning outcomes on fractional material after being given using fractional domino card learning media (Stratton, 2019). The results of the pretest will be compared with the results of the posttest, so that it will be known the effectiveness of using fractional domino card learning media in learning mathematics for class III students at MI Nyatnyono 02 Semarang Regency.

The usefulness is obtained from the questionnaire, which is then analyzed by the researcher so that the researcher can conclude that the developed media has benefits for students in learning.

Furthermore, product validity and feasibility can be obtained from the questionnaire results, which are analyzed using the following formula:

$$\boldsymbol{NP = \frac{R}{SM} x\ 100\%}$$

Information:

NP = the percent value sought or expected

R = raw score obtained

BC= ideal maximum score

After calculating the percentage score of the assessment, the next step is to analyze the percentage results based on the following aspects:

Table 1. Table of Eligibility Level Criteria

No.	Percentage	Interprestation Criteria
1.	0% - 20%	Very unworthy
2.	21% - 40%	Not feasible
3.	41% - 60%	Pretty decent
4.	61% - 80%	Worthy
5.	81% - 100%	Very Worth it

Source: *(Sugiyono, 2018)*

FINDINGS AND DISCUSSION

Findings

In this study, the researcher collected information and analyzed needs in learning mathematics by conducting interviews with the homeroom teacher for class III MI Nyatnyono 02. The results of the interviews found several things, including the difficulty in learning mathematics which was often found because the object of study of mathematics was abstract and not yet the existence of teaching aids or media to support the learning process so that it is more interesting for students learning interests and students' understanding, especially in fractional material. Teaching and learning activities are still teachers cantered so that communication that occurs during the learning process is only one way.

After analyzing the potential and problems, the researcher collected data which was carried out by means of needs analysis by interviewing the homeroom teacher of grade 3 MI Nyatnyono 02. With these interviews, the researcher was able to find out the required learning media which was appropriate to address the problems in the mathematics lesson content.

The next researcher plans a product design regarding what material will be taught to students. The learning material specified in this study is fractional material. The initial product design draft and the creation of fractional domino card learning media were carried out using the Canva application. The designs made on each card are divided into two columns above and below. The top column of the card contains illustrations of fractional numbers, and the bottom column contains fractional numbers. Fractional domino cards are made with a total of 28 cards. After the domino learning media design was made, it was printed on ivory paper and cut to a size of 10 x 7 cm. After that, a validation test was carried out by media and material experts to determine whether or not the fractional domino card media was appropriate.

Figure 1. The Use of Fractional Dominoes

After designing the design, the next researcher conducted a product validity test. The validity test was carried out by two experts, namely media experts and material experts. At this validation stage, the researcher gave validation sheets and questionnaires to each expert. Experts provide feedback or suggestions aimed at improving the products being developed.

Table 2. Media Expert Validator Assessment

No.	Assessment Aspects	Score
1.	Appropriateness with the level of development of students	7
2.	Media is easy to use by students and teachers	11
3.	Visual display design	16
	Amount	34
	Percentage (NP%)	94%

From the validation results of media experts, an average percentage of 94% was obtained, so it was concluded that the fractional domino card media developed was included in the very feasible assessment criteria. The researcher validated with Dr. Hamdan Husein Batubara, M.Pd.I., who acts as a media expert validator by adding revision suggestions as follows: 1) delete sub-material writing

on the front view of the card, 2) enlarge the illustration of the fractional number, 3) remove the curved line decoration on the front view of the card because it distracts students from focusing on the illustrations of fractional numbers.

Table 3. Material Expert Validator Assessment

No.	Asessment Aspects	Score
1.	Compatibility of Material with Competence	12
2.	Suitability Material with Grade Student Thinking Levels III MI	7
3.	Compatibility of Images with Materials	15
	Amount	34
	Percentage (NP%)	94%

From the results of the material expert validation, an average percentage of 94% was obtained, so it was concluded that the fractional domino card media developed was included in the very feasible assessment criteria. The researcher validated with Muh Syauqi Malik, M.Pd., who acted as a material expert validator, by adding the following revision suggestions: 1) remove the illustrations of soybean seeds because they do not match the level of students' understanding of fractions, 2) look for fractional numbers up to how many grade III students then adjust.

Furthermore, the researchers improved the media according to input from the validator. The following is the revision of the domino card media.

Table 4. Revision of Domino Card Media Products

No.	Revision Aspect	Before	After
1.	Card Front View		
2.	Card Back View		

After revising, the researcher continued at the product trial stage, and the researcher demonstrated the use of fractional domino card media in a small-scale trial taking a sample of 6 students, including two upper-ranked students, two middle-ranked students, and two lower-ranked

students. This sampling aims to make the product trials carried out balanced and evenly distributed so that all students can use them. In this small group trial, a pre-action test (pretest) and post-action test (posttest) will be carried out. The trial technique to determine the difference between pretest and posttest was carried out using the normality test and the N-gain test. A summary list of the results of trials using domino card media on a broad scale can be seen in Table 5.

Table 5. Results of small-scale trials

The Number of Students	Pretest Average	Posttest Average	N-Gain	Category
6	60	90	0.76	Tall

Based on the results of the small-scale pretest and post-test trials above, it can be seen that the average pretest value is 60, and the average post-test is 90, with an N-Gein result of 0.76, which is included in the high category. After that, the researcher conducted an analysis of the normality test, which can be seen in Table 6.

Table 6. Small Group Normality Test Results

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	Df	Sig.
Pretest	.202	6	.200*	.853	6	.167
Poshest	.180	6	.200*	.920	6	.505

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The results of calculations in the pretest and post-test data tables for small group trials have a significance value. 0.200 or greater than 0.05. So, it can be said that the pretest and post-test data are normal.

After conducting product trials on a small scale, of course, you will get a result and product deficiencies when implemented in small groups. The weakness lies in how to play that students do not understand. At this stage, improvements are made to the product being developed to make it more effective when used. Researchers provide additional procedures for playing in place of domino card media so that students can understand before using the media.

Figure 2. Product Revision

After making improvements or revisions to the product being developed, a trial phase will then be carried out on a larger scale. The subjects of this study were 28 class III students at MI Nyatnyono. This analysis was carried out to find out whether there was an increase in student learning outcomes in fractional material after using fractional domino cards. Test activities are carried out by carrying out pretest and posttest. A summary list of the results of trials using domino card media on a broad scale can be seen in Table 6.

Table 6. Results of Trials Using a Large Scale

The Number of Students	Pretest Average	Posttest Average	N-Gain	Category
28	69,11	93,21	0.77	Tall

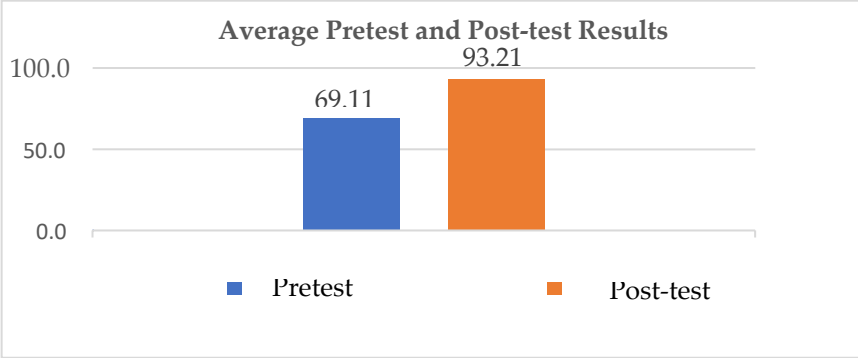
Based on the results of the pretest and post-test trials above, it can be seen that the average pretest value is 69.11, and the average post-test is 93.21, with an N-Gein result of 0.77, which is included in the high category. After that, the researcher conducted an analysis of the normality test, which can be seen in Table 7.

Table 7. Results of the Wide-Scale Normality Test

	Tests of Normality					
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pretest	.267	28	.000	.874	28	003
Poshest	.183	28	.017	.867	28	002

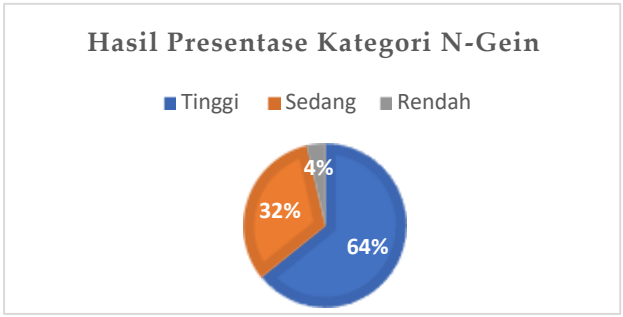
Based on the results of the normality test in Table 7, it can be seen that the sig. On the post-test of 00.0 and the value of sig. of 0.17. At sig. The pretest is not normal, while the post-test scores are greater than (>) 0.05, so it can be stated that the test scores for learning outcomes after using domino card media are normally distributed. The results of the analysis of test scores are in the following diagram:"

Figure 3. Average Pretest and Posttest Results



"Based on the results of the acquisition of these values, it was then analyzed with the Gain normality test (N-Gain) to obtain data showing the influence of the treatment of using fractional domino card media on the learning outcomes of class III MI Nyatnyono 02 students. The results of the N-gain normality test percentage in the low category obtained a percentage of 4%, the moderate category gets percentage of 42%, and the high category gets a percentage of 64%. The average result of the N-Gain test is 0.77, which is categorized in the High category. The percentage results for the N-Gein category are shown in the diagram below:"

Figure 4. The Results of the Presentation of The N-Gein Category



Discussion

The material taken for this product is "Fractions" in accordance with the Basic Competency (KD) being taught, namely KD 3.2. Compare simple fractions. In addition, this material is taken from the chapter on fractions, the sub-chapter on the meaning of fractions, and appropriate fractions from the teacher's mathematics handbook and class III student books. The researcher then begins to design the media according to the goals set at the design stage. A set of broken dominoes, a general guide, and a play guide are included in the package. In the guide, there are directions for the use of media, learning objectives, and the material being taught.

Class III students of MI Nyatnyono 02 Semarang Regency are very interested in the activities carried out with this learning media, based on the learning process that has taken place using the learning media of fractional domino cards. From the results of ongoing learning activities, students also play an active role, students feel happy learning mathematics, and students feel bored when learning is reduced. Using this media, it shows a good response from students.

The use of learning media can foster students' interest in learning new things in the learning material delivered by the teacher so that it can be easily understood. Interesting learning media for students can be a stimulus for students in the learning process (Nurrita, 2018). In teaching and learning activities, the use of media images can increase student attractiveness, making it easier for students to understand abstract material (Shoffa Shoffan et al., 2021). It can be concluded that the developed media can increase students' enthusiasm for learning, help students become active, and help them practice working on a collection of abstract materials and remembering material easily.

In addition, this research is strengthened by the results of the study (Hasanah & Suyadi, 2020), which stated that the learning media of fractional domino cards could make students not get bored easily during learning, as well as teach students to be able to solve a problem by working together. (Adawiyah & Kowiyah, 2021) Her research also said learning by using domino cards can help students master the material and help in remembering the material being studied with domino card media.

The research conducted by Atikah Mumpuni and Agus Supriyanto stated that Domino card media is effective in improving the learning abilities of elementary school students (Mumpuni & Supriyanto, 2020). (Miftahuddin et al., 2020) His research said that domino cards are a learning medium that can be used to attract students' interest in learning mathematics. In addition, the research conducted by Antica and I Komang obtained the results of assessing the responses of practitioners and students to domino card media for third-grade elementary school students in fractional material, with the results of domino card responses being very good, interesting, and able to arouse students' enthusiasm in the learning process. The use of this media is also very helpful for students in accelerating students deepening of the subject matter (Antika et al., 2023).

Seen during the learning process, researchers saw that playing or demonstrating fractional domino card media brought out the best potential of students. This can be seen from the students' responses because dominoes with fractions is the first activity they try to use in their learning. Students at the elementary school level have the characteristics of being happy to play, happy to

move, happy to work in groups, and happy to feel, do, or demonstrate something directly so that the availability of fractional domino cards makes it easier for them to remember and understand the lessons they have learned (Life, 2021). This fractional domino card learning media has been developed and has been tested for its feasibility. The use of fractional domino card media has also been declared valid and feasible to be tested.

"From the research that has been done, it can be seen that domino card learning media can be used as a learning medium in elementary schools, especially in fractional material. In addition, it can be seen that during the educational experience using the media of domino fragments, students become active students, and the level of tension and tension of students decreases because learning is carried out as a game."

"After using fractional domino card learning materials, the average student learning outcome was 93.2. In tests that have been completed by students, the minimum learning outcomes are 80, and the highest is 100. These learning results indicate that using fractional domino cards can help students understand fractional material and improve their learning outcomes."

CONCLUSION

Based on the results and discussion described above, it can be concluded that fractional domino card media products can be one of the learning media solutions for improving student learning outcomes of class III MI Nyatnyono 02 on fractional material. This media can make it easier for students to learn and can increase student cooperation. This learning media also makes students not easily bored during learning and teaches students to be able to solve a problem by working together. The results of the validation calculations from media experts on fractional domino card media obtained a percentage of 94% in the "Very Eligible" category, and validation from material experts obtained a percentage of 94% in the "Very Eligible" category. So that the fractional domino card media is feasible and can be tested by making several revisions. The value of working on pretest questions obtained an average of 69.11, and posttest questions obtained an average of 93.21. Based on these data that there is an increase in student learning outcomes before using fractional domino card media and after using fractional domino card media, then the value is analyzed by the Gain Normality test (N-Gain) to obtain data showing the influence of the treatment using fractional domino card media on student learning outcomes with an average N-Gain result of 0.77 in the high category.

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