

## Innovative Domino Card Learning Media for Teaching Number Place Value in Elementary Education

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**Abstract:** The aims of this study is to determine the feasibility and response to the domino card learning media developed number place value material. This research method uses the R&D development method with the ADDIE model consisting of five stages, namely analysis, design, development, implementation, and evaluate. The research instrument applied media expert and material expert validation sheets and feasibility response questionnaire sheets to 1 educator and 30 third grade elementary school students. The data analysis technique used a likert scales' questionnaire. The results of media expert validation received a score of 74% before being revised categorized as feasible and a score of 94% after being revised categorized as very feasible. The results of material expert validation with a score of 93% are categorized as very feasible. After being tested, the response of students obtained a score of 93% which was categorized as very feasible and the response of educators received a score of 92% which was categorized as very feasible. Assessment of learning media made with the categories obtained is very feasible and good. The results obtained show that this learning media is very feasible and good for use on the material of the place value of numbers in learning mathematics.

**Keywords:** domino card; learning media development; number place value

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## Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process for students to actively develop religious mental strength, self-control, personality, intelligence, noble personality and possible skills needed for themselves and society (Rahman et al., 2022; Jackson, 2019). Education plays a very important role in the teaching and learning process, ensuring that students become educated children. Education itself is a means to help humans to be able to live in everyday life in society. The learning process is the interaction between educators as well as students, students and their environment in achieving teaching goals. With learning activities, educators also convey various information for students through creating a varied learning environment, so the learning process is optimized (Khairini & Yogica, 2021; Blecker & Boakes, 2010).

Mathematics for elementary school students is useful for developing systematic, critical thinking and increasing creativity. Educators are required to effectively identify, develop, and implement effective teaching strategies, so that learning media with interest is needed to keep the attention of students during math lessons so that it remains fun, not boring, and not scary. Learners have difficulty in understanding the place value of numbers which includes counting and determining numbers according to their value (tens, units, hundreds, and thousands) due to a lack of understanding of the value of numbers or numbers in relation to position or place.

But in reality, a lot of pupils struggle to grasp the idea of number place value, namely knowing where the numbers are in a number. This is due to the lack of variety of learning media with learning activities that are less interesting and less interactive, monotonous, students tend to get bored and find it difficult to understand the discussion. Then, the lack of involvement of educators results in inhibiting the involvement of students in learning activities. This has implications for students who are less focused on the lesson and joke with each other until they are sleepy because educators do not use learning media. The purpose of learning media is to

facilitate communication between educators and learners to achieve educational goals that have been made. Learning media has been believed to encourage students to think critically, emotionally, attentively, as well as enthusiastically in learning. Using creative learning tools such as domino cards can make learners more interested in what they are learning. learners will more easily understand abstract ideas, especially those related to mathematics, because this media makes learning more interesting and fun (Amelia et al., 2024).

Math learning media on the discussion of number place value was also developed by applying interactive media with the help of domino cards. Domino cards have an interesting visual appearance and are also utilized which is useful for making learning more fun and meaningful. Through the use of domino cards, students not only learn visually but can also play while learning, so that learning becomes more interesting and interactive. According to Winkel in 1996, learning media is impersonal equipment (not human) by applying or providing it from educators to teach as well as learn in order to achieve learning goals, learning media also plays a role in the teaching process (Susilana & Riyana, 2009). Any media that can channel messages (learning materials) through means that can interest learners and motivate them to do learning activities to achieve learning objectives is considered learning media. Any forms of media that teach something be it the internet, books, movies, TV, etc. serve as tools to help achieve learning objectives (Lubis et al., 2023). An integral part of the educational and pedagogical process is the use of learning media. Educators often rely on learning media in order to convey information through means that learners can understand. Incorporating learning media into the classroom has the potential to spark curiosity, inspire action, and even influence learners' mental processes in ways that benefit their education (Wulandari et al., 2023).

Thus, the development of domino card-based learning media in number place value material is expected to help support students' interest in learning as well as facilitate their understanding of the concept of number place value. This media is expected to be able to support the learning process with fun as well as activate the involvement of students more optimally. According to Ramlah (2022) in domino card media, learners can enjoy fun and interesting learning tools in the form of rectangles. The right side of the card contains statements and answers, while the left side contains concept cards that learners must match with the right card.

This is reinforced by Salehha et al. (2021) asserting that using dominoes as a teaching medium has the potential to interest learners and encourage learners to take an active role in their education, rather than reducing boring exercises. Using media such as dominoes can help learners remember more information, improve their performance in class, and make them think critically and actively about what they are learning. Learners can benefit from learning exercises that use the modified dominoes media. learners may be more engaged and enthusiastic about learning when they use these learning materials to learn in the context of a game (Sabella et al., 2022). In addition, the domino game allows students to practice critical and logical thinking when connecting the place value of the numbers on the cards. This activity involves students' ability to identify, classify, and organize numbers according to their place value (units, tens, hundreds, and thousands). Thus, this media not only functions as a learning tool, but also as a means to train thinking skills and develop a deeper understanding of mathematical discussions or materials.

Based on previous research, namely research Adawiyah & Kowiyah (2021) with the title domino card media development for learning math multiplication operations. Furthermore, research by Sabella & Ramadhani (2022) dominoes of building space material. Furthermore, research by Istyasiwi et al., (2021) developed digital domino card media in learning science discussion of the food chain. Furthermore, research by Setiawan et al., (2023) with the title development of fraction dominoes. Meanwhile, research by Yustisia et al., (2022) with the title of developing domino cards as a medium for learning water cycle science.

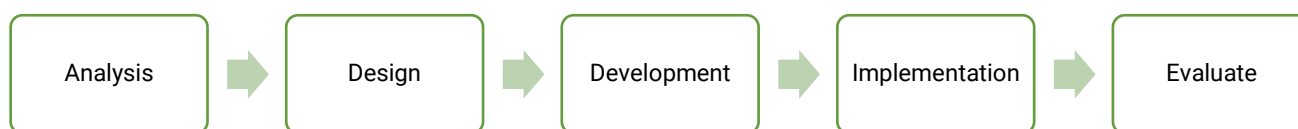
Based on observations that researchers have made in 2025 in elementary schools in the DKI Jakarta area, what educators use when teaching Mathematics content that discusses the place value of numbers is limited to the use of educator books, student books, practice problems on the blackboard and not using learning media. The use of learning media used by educators is considered again, considering the existence of learning media learning while playing in order to support students' critical. Strengthening elementary school students' critical and strategic thinking skills through domino card games. The novelty of this research is the development of special domino cards for teaching place value in elementary schools, not only as a game but also as a visual medium for learning. The significance of this research is to improve elementary school students' understanding of place value concepts through concrete and visual media so that learning is easier to understand and increases student motivation, involvement, and enthusiasm because the media is designed based on games, not just conventional lectures or exercises.

## Methods

In the research discussed, researchers used a type of development research. Referring to Creswell & Creswell (2017) the Research and Development (R&D) research method is a research method applied to

produce certain products and also test the effectiveness of these products (Okpatrioka, 2023). Research and development is known as a method or series of steps to develop new products or improve existing research (Waruwu, 2024). Researchers use the R&D research method with the ADDIE development model, namely analysis (analisis), design (desain), development (pengembangan), implementation (implementasi), dan evaluate (evaluasi). Data collection techniques used questionnaires, interviews and tests. The subjects in the research discussed were elementary schools in DKI Jakarta in grade III students with a total of 30 students.

This research applies the R&D model, this method is used to research, design, and produce new products. This research applies the ADDIE model with five stages (**Figure 1**), which are as follows: a) Analysis Stage, in the first stage of this analysis, researchers conducted a needs analysis by collecting data using observation techniques and also interviews with grade 3 elementary school teachers in DKI Jakarta; b) Design Stage, in this second stage of designing the game adapted to the material as well as the characteristics of the students, the researcher determines the theme of the domino card design of place value material and the title of the domino card (Creativity in Learning Number Place Value). Researchers design domino card designs using the Canva.com application for the desired concept and card model in number place value material; c) Development Stage, in the third stage the researcher designs the domino card learning media design, from the results of product development it continues through design validation with material experts as well as media experts, then if there are deficiencies the researcher revises the domino card design again; d) Implementation Stage, in this fourth stage the updated product is implemented or tested on students and educators directly in the classroom; e) Evaluation Stage, at this final stage the product that has been tested by researchers is analyzed for product revisions based on the results obtained to become the final product.



**Figure 1.** Stages of the ADDIE Development Model

During the research, researchers tested the instruments with media and material expert validation, learner and educator questionnaires including the measurement scale of the research variables. Then, the R&D method applies quantitative as well as qualitative analysis. Data collection techniques through observation and questionnaires. Observations were made to find out the problems experienced by educators and students during the learning process. The use of research questionnaires consists of media validation questionnaires, material validation, student responses and educator responses. Validation and response from the scoring results in the form of numbers in the questionnaire will be converted into descriptive analysis and used as material to assess the feasibility and quality of domino card modifications. Then there is a percentage formula to calculate the results of the feasibility test through the formulation and the eligibility category refers to the criteria as follows in **Table 1**.

$$\text{Feasibility Test Results} = \frac{\text{total score obtained}}{\text{maximum score}} \times 100\%$$

**Table 1.** Percentage and Criteria for Media Feasibility

No	Score in percent (%)	Feasibility Category
1.	< 21%	Very Unfit
2.	21 – 40%	Not Feasible
3.	41 – 60%	Feasible Enough
4.	61 – 80%	Worthy
5.	81 – 100%	Very Feasible

Source: (Ernawati, 2017)

In accordance with the research criteria, if the number place value learning media is >61%, then the development product is categorized as feasible as well if the media has a percentage criterion of >61% in all aspects, so that domino card media can be applied to students. This shows that the assessment given by students and educators has an important role in determining the quality of the developed learning media. Determining the level of success is also obtained by developing learning media referring to the response of students and educators as well as the percentage of media in the **Table 2**, namely:

**Table 2.** Learner and Educator Response Rating Scale

No	Score	Description
1.	1	Stongly Disagree
2.	2	Disagree
3.	3	Neutral
4.	4	Agree
5.	5	Strongly Agree

Source: (Gea et al., 2023)

## Result and Discussion

The results obtained in the research and development (R&D) of domino card based learning media development of number place value material in mathematics learning are in line with the ADDIE model. (R&D) is a method for creating new products by discovering and developing products or updating a previous product with the suitability of innovation, improvement and processes that can provide many benefits.

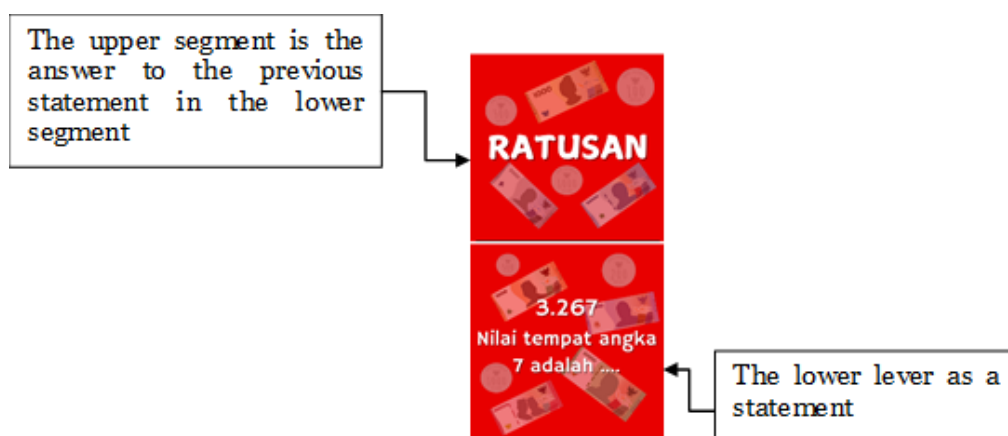
### Analysis stage

Analysis is the initial stage in the ADDIE development approach for the research discussed. The researchers in the analysis stage collected data from interviews and observational studies with educators and learners of grade III elementary schools in Jakarta. In order to gather information for their research, the researchers interviewed grade III educators at the school especially those involved in the use of learning media, to identify common problems and facts. According to the interview results, educators only focus on the lecture and blackboard approach, which makes learners bored and have difficulty in learning math, especially with the material of number place value. Learning media is needed according to learners' needs, but the media used is less varied and less learner-centered. Panjaitan & Dasari (2024) claims that the use of game media in the classroom helps learners' enthusiasm and enthusiasm for learning. Researchers see these factors as an experiment to produce learning media products with domino card modifications.

### Design stage

In the second stage, researchers collected data from the results of the needs analysis interview that had been obtained through one of the third grade elementary school educators. The game design is aligned with the discussion and characteristics of students, researchers determine the theme of domino card design place value material and the title of domino cards (Creativity Learning Numbers Place Value). Researchers design domino card designs using the Canva.com application according to the desired concept and card model on the number place value material. Research in this field produces domino cards as a means to teach students about the place value of numbers. The cards have attractive colored images and the appropriate size to be played by students, so that it can be an optimal learning tool.

Domino cards (**Figure 2**) are a game that uses blocks on one side of which there is a sign that states the value of 1-6 (Priyatna & Dwi, 2023). Domino card media is domino cards not only function as a game tool, but also as an effective learning media in education, especially in mathematics learning that can be used to attract students' interest by involving them in group discussions, thus creating active interaction and contribution between students by making students more active, enthusiastic, and involved in the learning process so that it not only improves material understanding, but also learning outcomes.

**Figure 2.** Domino Card Modification Picture of Number Place Value Material

### Development stage

The third step of development, researchers see and analyze basic competencies, create indicators, and learning objectives. Researchers design domino card media by downloading the Canva.com application which can be accessed on the Google page. Then after the application is downloaded on a laptop or computer, the researcher installs the Canva application to work on the domino card modification design. The use of domino card content contains grade III mathematics learning material for the Merdeka Curriculum based on one Learning Outcome, namely: Learners can read, write, determine place value, compare, sort, use place value, perform composition and decomposition of these numbers. This is included in the content aspect, to adjust the conditions of students and the content of the material that will later be presented on the domino card learning media. In the display aspect, researchers determine the size of the card with a length of 10 cm, width of 5 cm, typeface Hammersmith One, font size 14-20 pt. there are 28 cards made with 4 different colors with a combination of matching card base colors, namely 7 red cards, 7 green cards, 7 blue cards and 7 purple cards (**Figure 3**). Next is the aspect of use, the researcher makes instructions for using domino card learning media for the place value of numbers by also being used by students during the learning process.

With the benefits of this learning media, the lesson information that will be conveyed to students will be easier to understand (Priyatna & Dwi, 2023). The purpose of learning media that can assist teachers in the process of delivering subject matter to students, the process is carried out so that all subject matter delivered can be easily understood by students, and make learning interesting and exciting. The purpose of the media in the teaching process is to make the teaching and learning process more interesting for students. Making the subject matter clearer in meaning so that it can be better understood. Teaching methods will be more varied and interesting. Students will do more learning activities (Daniyati et al., 2023).



**Figure 3.** Dominoes Combined Picture

### Implementation stage

In this implementation stage, researchers conducted a trial of domino card learning media to students and educators directly in the classroom. After the domino card modification has been revised, the media product must be tested on students and educators, the product trial is carried out by the researcher himself directly. The trial was conducted in class III School in DKI Jakarta, if in the implementation of the product trial there were deficiencies or obstacles, the product was also revised. Testing trials with the application are aligned with the steps of using the media. In the first trial or limited trial, researchers also gave questionnaires to students and educators to find out the response to the domino card media that had been used. Researchers will review the effectiveness, feasibility, shortcomings and advantages of the media from the results of questionnaires given from students and educators. The results of the questionnaire obtained will be used as a reference in media improvement. The media is also able to channel messages and stimulate the feelings and desires of students so that there is an encouragement of the learning process in each student. However, the use of media is at least packaged as creatively as possible by a teacher. It aims to improve the fun teaching and learning process. One of the media that teachers can use is visual. Its function is to attract and direct students' attention to concentrate on the content of the lesson (Fadilah et al., 2023).

Furthermore, the learning media is validated by media experts and material experts who include learning media lecturers from university. Media expert validation by loading aspects of appearance and use which resulted in a percentage of 74% before being revised and a percentage of 94% after being revised by the researcher was categorized as very feasible referring to the media expert's assessment (**Table 3**).



**Table 3.** Learner and Educator Response Rating Scale

	Assessment Aspect	Gain Score	Maximum Score	Presentation	Category
Before Revision	Appearance	30	35	85%	Very Feasible
	Use	7	15	46%	Feasible Enough
	Average			74%	Worthy
After Revision	Appearance	34	35	97%	Very Feasible
	Use	13	15	86%	Very Feasible
	Average			94%	Very Feasible

The aspect of appearance assessment is adjusted to the suitability of background color, suitability of illustrations, accuracy of font size selection, accuracy of font selection, accuracy of illustration size, the attractiveness of the illustrations presented and the media raises the curiosity of students. The percentage in the display aspect was 85% before being revised with a very feasible category and the percentage amounted to 97% after being revised by the researcher with a fairly feasible category. The average percentage before being revised amounted to 74% in the feasible category.

The use aspect is adjusted to the media presenting activity instructions, clarity of instructions for use and the media is also applied for a long time. The percentage in the use aspect of 46% before being revised is categorized as quite feasible as well as the percentage totaling 86% after being revised by the researcher is categorized as very feasible. The average percentage after revision amounted to 94% which is very feasible.

Before being revised, the dominoes had a total of 20 cards with 4 card colors, namely 5 red, 5 green, 5 blue and 5 purple. The writing color is black and the background with a picture of money stands out. Media experts suggest revisions to the domino card media, as for the suggestions from the media expert validator, namely adding the number of domino cards as many as 28 cards with 4 card colors, namely 7 red colors, 7 green colors, 7 blue colors and 7 purple colors, the color of the writing is changed to white, the background is replaced more transparent.

Media expert validation by including media aspects resulted in a percentage of 94% which is categorized as very feasible. Material expert validation by including aspects of content and language that produce a percentage of 93% which is categorized as very feasible refers to the material expert's assessment. The content aspect is adjusted to the suitability of number place value material with initial competencies and core competencies, the suitability of learning material with learning outcomes (CP), the order of presentation of the material, the material presented is in accordance with the level of cognitive development of students, the discussion presented is in accordance with mathematics learning, the completeness of the material is in accordance with everyday life, the media encourages students to form their knowledge, the media raises students' interest in learning, the media makes it easier for students to evaluate and the media makes it easier for students to reflect.

The language aspect is adjusted to the accuracy of the use of language based on EYD and the use of language that is easy for students to understand. The content assessment aspect with a percentage of 88% with a very feasible category and the language aspect with a percentage of 100% which is categorized as very feasible. Material expert validation by including material aspects resulted in a percentage of 93% with a very feasible category with no revisions (**Table 4**).

**Table 4.** Material Validation Result

Assessment Aspect	Gain Score	Maximum Score	Presentation	Category
Contents	31	35	88%	Very Feasible
Language	20	20	100%	Very Feasible
Average			93%	Very Feasible

The application of learning media to third grade students of elementary schools in DKI Jakarta was carried out at the product trial stage. After the application of domino card media was carried out, the researchers then analyzed the questionnaires given to students and educators. The overall questionnaire of students gets an average result of 93% with a category very feasible to use. The educator's response questionnaire gets an average percentage of 92% which is categorized as very feasible to use (**Table 5**).

**Table 5.** Student Response Questionnaire Results

Aspect	Presentation	Category
Media	94%	Very Feasible
Learning	92%	Very Feasible
Average	93%	Very Feasible

The aspect of learner response contains two aspects, namely media and learning aspects, then the media aspect contains the suitability of domino card media design to make interested, after using domino cards makes excited in learning math, domino card design images close to everyday life, can arrange domino cards easily. The percentage of content aspects of 94% is categorized as very feasible. In the learning aspect, it adapts to being able to complete domino cards in a short time, arrange domino cards carefully, better understand the material of the place value of numbers after using domino cards and feel challenged to learn with domino cards. The percentage in the learning aspect amounted to 92%, categorized as very feasible. In this result, domino card media on number place value material is very feasible and good for use during math learning. By using domino cards without being limited to the function as a game tool but also a medium for learning while playing by being able to attract students' interest by involving them in discussions, thus creating active interactions and contributions between students that make students more active, enthusiastic and involved in the learning process, not only improving understanding of the material but also on learning outcomes. So through this it is proven that students are helped through domino card learning media.

**Table 6.** Educator Response Questionnaire Results

Aspect	Presentation	Category
Material	88%	Very Feasible
Media	96%	Very Feasible
Average	92%	Very Feasible

The educator response aspect contains two aspects, namely material and media aspects, the material aspect includes the suitability of the presentation of material including initial competencies, the suitability of the presentation of material including learning outcomes and objectives, the clarity of the material on domino cards, the use of clear language and the presentation of material to be used as a reflection (**Table 6**). The percentage of material aspects of 88% is categorized as very feasible. The media aspect includes suitability, clarity of instructions for using the card, the writing on the card is clearly legible, the appearance of the card design raises interest in learning, the card design is practical in its presentation and the card design can be used as a medium for independent learning by students. The media aspect with a percentage of 96% is categorized as very feasible. The percentage of results from the educator response questionnaire is 92% categorized as very feasible.

### Evaluation stage

In this final stage, researchers analyzed product revisions based on the results obtained from the educators' questionnaire sheets as well as students through appropriate data analysis techniques. Then from the results of the data analysis carried out there are deficiencies or weaknesses. So, product revision is carried out as a final product to improve the development of domino card modified learning media that can be applied to the learning process. According to Nasution, the following are some of the benefits obtained from the utilization of learning media as a tool in the learning process: (a) Students feel more interested in learning, so that their learning motivation increases. (b) The meaning of the teaching material becomes clearer, making it easier for students to understand it and can successfully master the learning objectives. (c) Learners do not feel bored and teachers do not feel exhausted; learning methods are not only limited to verbal communication through teacher speech. (d) Learners are more involved in learning activities because they perform tasks such as observing, working, and demonstrating, in addition to listening to teacher direction (Sari, 2024).

### Conclusion

The conclusion is that with the presence of the development of mathematics learning media on the material of the place value of numbers in grade III elementary school students, that learning by utilizing domino cards can support students to master the material and be effective in increasing students' understanding of the material of the place value of numbers. This media makes interactive learners not only learn but can while playing with dominoes. In addition, domino cards encourage active involvement of students, increase cooperation between students, and assist educators in delivering material in a contextual way. The feasibility and quality of the media get an very feasible category. From the average percentage, the domino card learning media on the material of the place value of numbers in mathematics learning for grade III Elementary School has been declared very feasible for the learning process.

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