

Development and Utilization of Domino Card Media in Thematic Learning of Mathematics for Elementary School Students

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Abstract:

Learning media can facilitate students' and educators' teaching and learning processes by increasing students' learning motivation. Learning media attract students' attention and act as a conduit for messages between educators and students. They make the material easier to understand and prevent boredom. This study aims to 1) Produce Domino Card learning media for Mathematics for class II at Madrasah As-Syafi'iyah Kencong Jember, 2) Determine the feasibility of the Domino Card learning media, and 3) Assess the effectiveness of the Domino Card learning media. The study used the Research and Development (R&D) method and the ADDIE model, which involved ten students from class II at Leces Islamic Elementary School. The final product, Modified Domino Card media, was validated by media, material, and learning experts, resulting in a validity score of 93%, categorizing it as very valid. The N-Gain Score calculation showed an average learning outcome increase of 83%, indicating the media's effectiveness. Thus, domino card learning media is valid and effective in improving the thematic learning of mathematics content in class II of Madrasah As-Syafi'iyah Kencong Jember. Innovative learning media such as Domino Cards can increase student motivation and engagement in the learning process, thus helping students better understand the material more interestingly and interactively.

Keywords: ADDIE Model; Media Math; Domino Card; Thematic Learning

DOI: [10.18952/aladzkapgmi.v14i2.13951](https://doi.org/10.18952/aladzkapgmi.v14i2.13951)

Received: 2024-09-12; **Revised:** 2024-09-29; **Accepted:** 2024-10-19; **Published:** 2024-10-24

How to cite :

Asiya, S., Umam, K., Suhardi, A., & Arpilleda, A. J. (2024). Development and Utilization of Domino Card Media in Thematic Learning of Mathematics for Elementary School Students. *Al-Adzka: Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah*, 14(2). 176-188



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Introduction

Learning media is essential to learning because it can help teachers deliver learning materials more effectively. Learning media influences both students' and educators' teaching and learning processes significantly, as it can enhance students' learning motivation ([Chusna et al., 2024](#); [Kobandaha et al., 2022](#)). Learning by using learning media is more interesting for students because this media functions as a means of conveying messages between educators and students. Learning media makes the subject matter more accessible for students to understand, so they feel energized while learning ([Lestari & Prayogo, 2024](#); [Prasetya & Putra, 2023](#); [Sholeh et al., 2021](#)). Indeed, the strategic implementation of learning media is vital for cultivating an active and effective learning atmosphere.

Among various innovative learning media, domino card media is a versatile tool for enriching students' comprehension of mathematical concepts. Each set of domino cards consists of 28 unique cards, with two segments on each card displaying round numbers ranging from 1 to 6. The game, played by matching adjacent card sides, culminates when players can no longer connect ([Cinta, 2024](#)). Integrating domino cards into math instruction elevates the learning experience and facilitates a deeper understanding of complex materials ([Rahman & Amalia, 2019](#)).

As a learning medium, dominoes are essential in improving brain performance through critical thinking and focus. Using dominoes provides cognitive learning and motivates students to play an active role in teaching and learning activities ([Fatikh & Kuswanti, 2021](#)). By playing dominoes, learners are required to focus and concentrate, which in turn can improve their brain performance. Ginnis identified some essential characteristics of dominoes as a learning medium ([Surya, 2023](#)). First, dominoes are ideal for delivering subject matter. Secondly, they can be used to identify learners' prior knowledge, allowing teachers to understand the extent of students' understanding of the material that has been taught. Third, using dominoes encourages active involvement from all learners, making them more engaged in learning. Fourth, dominoes can help learners increase their confidence ([Habsah & Habiby, 2024](#)). Through the dominoes game, teachers can assess the extent to which learners understand the material learned while learners become more confident and courageous in participating in learning. Thus, dominoes not only serve as a tool in delivering the material but also as a means to increase students' engagement, confidence and understanding of the lesson ([Farikhatuzzaeniti & Purwanti, 2023](#)).

In this study, the rules for playing dominoes remain the same as usual, but there are differences in their use as learning media. In the dominoes used in this study, besides having a front side with circles, there is also a backside that contains questions to be answered by students. After students successfully connect the dominoes according to the circles, they will get a question from the back side of the dominoes. Thus, learners are not only required to concentrate and focus when connecting cards but also must be able to answer questions carefully and correctly ([Adawiyah & Kowiyah, 2021b](#)). In previous research, dominoes were modified with questions and answers on the right and left sides and only had one front side ([Insani et al., 2023](#)).

The impact of dominoes in thematic learning contexts is notable, as they have proven effective in capturing students' interest across various subjects. According to [Arifin et al., \(2021\)](#) and [Ajizah et al., \(2023\)](#), dominoes facilitate memorizing fundamental operations such as addition, subtraction, multiplication, and division while introducing geometric concepts. Their adaptability means they can be tailored

to fit numerous curricular needs, making them invaluable in thematic learning, where variety is crucial to maintaining student engagement (Sumarni et al., 2022). It is particularly relevant in mathematics, a subject often perceived as daunting, leading to student disengagement (Sidarta & Yunianta, 2019). By leveraging learning media like domino cards, educators can transform math from a feared subject into an enjoyable experience that enhances comprehension and motivates learners.

Learning media can greatly facilitate students' and educators' teaching and learning processes by increasing students' learning motivation (Chin & Fu, 2021). Engaging learning media can attract the attention of students better than traditional methods. It is because learning media serves to convey messages between educators and students (Inayah & Zubaidah, 2020). However, researchers' data in the field showed that teachers' use of learning media still needed improvement. Learning media has yet to be optimally developed for various materials, so students tend to get bored during learning.

At Madrasah As-Syafi'iyah Kencong Jember, students dislike math because it is difficult. Madrasah As-Syafi'iyah Kencong Jember is a private Islamic-based school located in Leces sub-district. Although this school has implemented learning media several times, the implementation still needs to be improved. This lack of maximization in the use of learning media is one of the factors causing students' learning outcomes to be below average. Although learning media has been applied several times at Madrasah As-Syafi'iyah, its application still needs to be improved. Grade II students tend to be passive and bored because the learning media is limited to additional material. Therefore, it is necessary to develop more interactive and exciting learning media, such as domino cards, that not only focus on one topic but can cover various mathematical concepts.

Thematic learning is a learning approach that integrates various subjects into one particular theme so that the materials studied are interrelated (Arifin et al., 2021; Susdamayanti, 2022). For example, in the Environment theme, math materials can be integrated by calculating the pond's garden area or water volume. Another example is when students learn about spatial shapes in math, such as cubes and blocks, they can also learn these concepts in the context of the "Rumahku" theme. Students can be asked to calculate the house's area and volume of rooms. In this way, learning becomes more contextual and meaningful and helps students understand the application of math in everyday life (Azizan, 2019). This material integration enhances students' critical and creative thinking skills and strengthens their problem-solving abilities. The next step is to develop the domino card learning media. This development needs to be done with different and more exciting variations to help students deepen the subject matter and become more active in learning. Thus, it is expected that the value obtained by students will be maximized compared to before. Learning media development is creating better media products in learning to provide a more effective stimulus to students (Cahyo & Ardhana, 2024).

There have been many research results that discuss domino cards only at the stage of analysis, design, and learning development (Adawiyah & Kowiyah, 2021a, 2021), implementation in mathematics learning (Ajizah et al., 2023; Chabalala & Naidoo, 2021). Meanwhile, what was done by Azahra & Dewi, 2022) only measured the impact of using domino cards. Meanwhile (Anggraini et al., 2020) introduced domino cards of Indonesian endemic animals. At the same time, the author explains in a complex way the development of domino cards in thematic mathematics learning from analysis, design, development, implementation and evaluation of their use. The author also varies the use of domino cards by adding questions from various mathematics topics or other subjects, and students will get new challenges that can

increase their activeness and motivation to learn. In addition, various creative approaches to using dominoes, such as integrating basic mathematics concepts with fun games, can make students more enthusiastic about learning.

Research Method

This research uses the Research and Development (RnD) method to produce specific products, such as developing domino games. Developing this learning media refers to the ADDIE learning media design model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation ([Mumpuni & Supriyanto, 2020](#)). However, in this research, the ADDIE model only reaches the Implementation (Development) stage, where validators conduct a feasibility test to assess the results of this learning media development. Students became the main subjects of this study. Students in class II of SD Islam Leces amounted to 10 people, consisting of five boys and five girls.

Analysis is a crucial step in the learning media development process, which aims to identify needs and problems and analyze the tasks to be completed. This process includes several important aspects, such as competency analysis, learner characteristics, and teaching material. Data for this analysis can be obtained through observations and interviews with classroom teachers. In analyzing learner characteristics, researchers will directly discuss their abilities and cognitive development with the teacher. In the design stage, researchers formulate learning objectives and strategies that will be used for media implementation, as well as develop a learning media design, which in this case is Domino Cards. The development process includes several stages, where researchers must choose suitable materials, such as durable and easy-to-find materials, and prepare the tools and materials needed. In addition, researchers also made a validation questionnaire to be assessed by a team of validators consisting of lecturers and class teachers. This validation aims to get feedback so that the learning media is by the objectives set. After getting feedback from the validators, researchers revised the product to improve it before proceeding to the implementation stage.

At the implementation stage, learning media that is declared feasible will be tested in the field. The aim is to ensure that Domino Card media can be used effectively in learning. Furthermore, the evaluation stage is carried out to assess the entire learning program. This evaluation measures the competence of students' skills, knowledge and attitudes and provides an overview of their responses to learning activities. The results of this evaluation are essential to determine whether there is an increase in learner competence and benefits for the school institution. If there are deficiencies or weaknesses in using Domino Card media during the implementation, researchers need to make improvements to make the product more effective. In addition, material analysis is also a significant focus, where researchers identify the concepts that will be used, in this case, related to distance units such as meters and centimetres. This material is often challenging for students, especially in unit conversion, so developing this learning media aims to deepen their understanding. Thus, the whole process, from analysis to evaluation, aims to create effective learning media and ensure learners can understand and apply the material well.

In collecting data, this study used observation techniques to directly observe the use of thematic learning media with mathematics content. In addition, a learning media validation questionnaire was also used, filled in by media experts and material experts through a Likert scale questionnaire ([Istyasiwi et al., 2021](#)). The collected

data were then analyzed using qualitative and quantitative analysis ([Mansur et al., 2022](#)). Qualitative analysis describes the results of observations and suggestions from validators. In contrast, quantitative analysis assesses the product's success based on the validator's assessment. After obtaining feasibility from the validator, the researcher implements the media and provides questionnaires and pretest and posttest questions to students to determine the practicality and effectiveness of the data.

Results and Discussion

Analysis of Domino Card

The first stage of this research was analysis, which was conducted through interviews and observations at the research location. The interview with the principal aims to get an overview of various activities in the school, including the implementation of learning and learning media that have been applied. This analysis included competency analysis, learner characteristics, and subject matter. Interviews and observations were conducted to obtain information that would be used in this study.

Competency analysis and learner characteristics were obtained through interviews with the grade II teacher. The purpose is to understand the competencies that learners must achieve and to recognize the characteristics of learners so that the learning media developed can suit their needs. This analysis is critical because understanding the competencies and characteristics of learners allows researchers to design more effective and exciting learning media. For example, knowing that learners have a short attention span can encourage the development of more interactive and exciting media.

Meanwhile, material analysis aims to understand material concepts that learners consider difficult. This information is used to develop learning media that can help deepen learners' knowledge. This research focuses on thematic learning of mathematics content so that the learning media developed - domino cards - can help students understand complex mathematical concepts.

The interview results showed that the domino card media was previously only used for additional material. Students feel bored and struggle with math problems because the learning process relies solely on the worksheet book and the blackboard. The classroom atmosphere could be more conducive, and the boredom in students shows the need for variations in learning methods.

Design of Domino Card

The second stage in this research is the design stage, which aims to formulate and design domino card learning media products. At this stage, the Core Competencies (KI) and Basic Competencies (KD) used are KI 3 and KI 4, as well as KD 3.6 and KD 4.6, which are by the thematic material of Theme 5 "My Experience" Subtheme 2 "My Experience at the Playground" Learning 3. In this design stage, various essential documents such as syllabus, Annual Program (Prota), Semester Program (Promes), and Learning Implementation Plan (RPP) are also prepared.

The learning media design process involves making domino card media. Making domino cards uses materials that are easy to find around us. The primary material used is thick cardboard paper as the innermost layer, which is then coated with ivory paper, which functions as question paper. The outermost layer uses thick mica to protect the dominoes from damage, especially if exposed to water. This design

not only considers the ease of manufacture and availability of materials but also the durability and comfort of use by learners. With careful design and carefully selected materials, Domino learning media are expected to be used effectively in teaching and learning, helping students be more active and motivated. The following is the design of the domino card media that the researcher wants to develop:

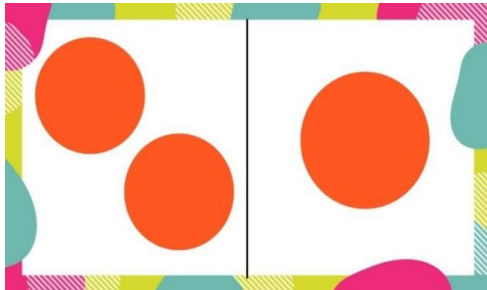


Figure 1. Domino Card Design



Figure 2. Product Packaging Sticker Design



Figure 3. The Domino Card

Development of Domino Card

The third stage in this research is the development stage, where the learning media that has been designed is realized physically. The modified domino card media is produced as a two-dimensional visual learning media at this stage. This media is designed to help learners deepen the material in an interactive and fun way. These domino cards are then validated by a team of media validators, material validators, and learning expert validators. Validation is essential in developing learning media to ensure that the resulting media meets the quality and relevance standards needed in the teaching and learning process.

Table 1. The Validation Result

No	Validator	Percentage	Criteria
1	Validator 1	90%	Excellent
2	Validator 2	94%	Excellent
3	Validator 3	95%	Excellent
Average percentage score		93%	Excellent

The validation results from the validator team showed that the domino card media obtained an average percentage of 93%, which is included in the very valid and feasible category. The domino card media developed has high quality and is suitable for learning. However, the validators suggested some minor revisions to improve the media further.

Implementation of Domino Card

The next stage is the implementation stage. At this stage, the validated product will be implemented in subjects in the field. The valid product will then be tested in learning conducted in class II Madrasah As-Syafi'iyah Kencong Jember Probolinggo on Theme 5, "My Experience" Subtheme 2 " My Experience in the Playground" Learning three mathematics content on the material of distance units (meters and centimetres). The implementation was carried out with face-to-face learning two times. The initial meeting was used to do pretest questions and explain the material. In contrast, the second meeting was carried out with implementation and posttest questions followed by filling out a student response questionnaire.

Based on the implementation results, the effectiveness of the domino card learning media can be obtained based on the student's response questionnaire and the results of students' learning improvement through the pretest and posttest questions given. Testing development products in improving learning outcomes using the One Group Pretest-Posttest N-gain Score design normality test. The following picture is during the application of domino cards in the classroom;



Figure 4. The Implementation of Domino Card

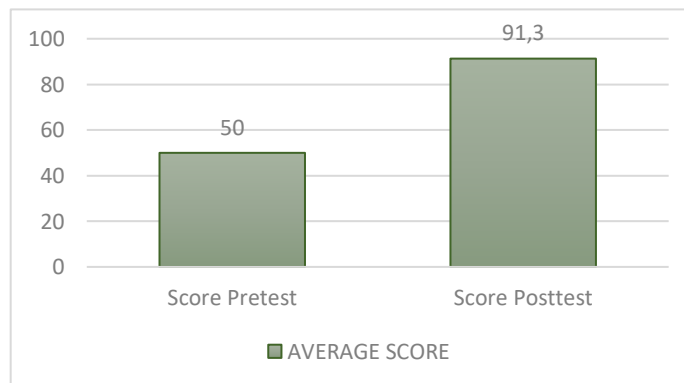


Figure 5. Learning Implementation of Dominos Card

The diagram shows that the average pretest score of learning outcomes of class II students was 50 before being given treatment using domino card learning media. After being given treatment, the average posttest score increased significantly to 91.3. This data indicates that using domino card learning media effectively enhances students' learning outcomes.

When Grade II learners at Madrasah As-Syafi'iyah Kencong Jember experienced increased learning outcomes from pretest to posttest scores, they understood the material better. They felt more confident in their ability to learn and master the material. With significant improvements in learning outcomes, domino card learning media proved to be an effective tool, especially in thematic math content

learning. Well-designed and engaging learning media can make learning more enjoyable and effective, helping learners achieve better results and better understand the material.

Tabel 2. Gain Test

No.	Name	Pre-test	Post-test	Post-Pre	Ideal Score (100)-Pre	N Gain Score	N Gain Score Persent
1.	Students 1	40	95	55.00	60.00	0,92	91,67
2.	Students 2	30	100	70.00	70.00	1,00	100,00
3.	Students 3	60	82	22.00	40.00	0,55	55,00
4.	Students 4	40	100	60.00	60.00	1,00	100,00
5.	Students 5	30	82	70.00	70.00	0,74	74,29
6.	Students 6	70	86	16.00	30.00	0,53	53,33
7.	Students 7	30	82	56.00	70.00	0,80	80,00
8.	Students 8	50	86	32.00	50.00	0,64	64,00
9.	Students 9	70	100	30.00	30.00	1,00	100,00
10.	Students 10	80	100	20.00	20.00	1,00	100,00
Mean						0,8183	81,8286

Based on the data in the table, the average N-Gain Score is 0.8183, which is included in the high category. The percentage of the N-Gain Score reached 81.82%, which is included in the effective interpretation category. From these figures, it can be concluded that the use of domino card learning media significantly improves students' learning outcomes, with an 83% increase.

Evaluation of Domino Card

At the evaluation stage in the ADDIE model development research, several supporting and inhibiting factors influence the application of Domino Card learning media. The main supporting factor is the positive response received from validators and students. The validation shows that the media developed is based on the specifications set, thus giving researchers confidence that the product is suitable for use. Based on the average results of learners' responses shown in the table, the domino card media received an excellent response with an average percentage of 95%. This figure is calculated using the percentage formula, which shows a very high level of acceptance and satisfaction from students towards this learning media, which indicates that they felt helped in the learning process by using the media.

However, although there are supporting factors, some obstacles may arise during implementation. One of the most common barriers is teachers' need to understand how to use new learning media, which can lead to difficulties in classroom implementation. In addition, time constraints in the learning process can also interfere with the optimal use of media. For example, if there is insufficient learning time, activities involving Domino Card media may not be maximized. Therefore, even though the learning media has been declared effective, challenges in the field of implementation need to be considered so that the learning objectives can be adequately achieved.

Discussion

Learning media is a means to assist the teaching and learning process so that the messages conveyed can achieve learning objectives more clearly and effectively ([Susanti et al., 2022](#); [Liana et al., 2024](#)). Modified domino card media is a learning media made from materials easily found around us. This media uses thick cardboard paper as the inner layer, while the domino card image design is printed using ivory paper measuring 10 cm x 18 cm. Each domino card consists of two segments separated by a centre line, with circles from numbers 1 to 6 on each side ([Adawiyah & Kowiyah, 2021a](#)). There are a total of 28 cards in this domino set.

Developed domino card learning media with a more attractive design and various play methods to attract students' interest in math in the classroom. This approach is based on the theory of constructivism, which emphasizes the importance of the active involvement of learners in the learning process ([Susdamayanti, 2022](#)). By making learning more interactive and fun, learners are expected to be more motivated and able to understand the material better. Developing learning media like this increases learners' interest and motivation to learn and helps them overcome difficulties in understanding mathematical concepts ([Handayani et al., 2021](#)).

The way to play this domino card is by connecting one side of the card with the other side until the game ends when all groups cannot place their cards ([Azahra & Dewi, 2022](#)). This media pays attention to important aspects of learning media, namely the durability, feasibility, and effectiveness in implementation. Therefore, researchers developed domino card learning media with a more attractive design and various play methods to attract students' interest in math in the classroom. This approach is based on the theory of constructivism, which emphasizes the importance of the active involvement of learners in the learning process ([Susdamayanti, 2022](#)). By making learning more interactive and fun, learners are expected to be more motivated and able to understand the material better. Developing learning media like this increases learners' interest and motivation to learn and helps them overcome difficulties in understanding mathematical concepts ([Handayani et al., 2021](#)).

Before the trial, the domino card media was first validated by a team of media, material, and learning validators. The validation results show that this domino card media is categorized as very valid. This media was also declared effective after testing and analyzing students' responses. The validation and trials ensure that this media is feasible for learning and can increase learning effectiveness. This modified domino card media is an excellent example of implementing the principles of making compelling and engaging learning media, which is by the theory of learning media development that prioritizes aspects of design, material, and active involvement of students in the learning process.

Domino card learning media in thematic learning of mathematics content is assessed for feasibility through a validation test by a team of validators. The feasibility trial was conducted before the media was used in learning. This validation process involves three validators, each tasked with validating the media, material, and learning. Based on the validation results from the three validators, an average percentage of 93% was obtained. This figure shows that domino card media is considered valid and feasible for learning.

The effectiveness of domino card learning media was also evaluated through students' learning outcomes and responses to the media. Learning outcomes were

measured using pretest and posttest tests, while students' responses were measured through questionnaires. The effectiveness analysis used the N-Gain Score calculation, which showed an average increase in learning outcomes of 83%. Domino card learning media is efficacious in improving students' learning outcomes. Learning media development theory suggests that validation and evaluation are essential to ensuring the developed media meets the quality and relevance standards needed in the learning process. According to the learning media development theory described [Anggraini et al., \(2021\)](#) and [Puspitasari et al., 2023](#), validation aims to evaluate the developed media's design, content and pedagogy aspects. Expert validation ensures that the media is visually appealing and pedagogically effective.

In addition, the theory of improved learning outcomes by Bloom (1956) in [\(Zamir & Ali, 2023\)](#) through Bloom's taxonomy model, which involves cognitive, affective, and psychomotor aspects, supports these findings. The significant increase in learning outcomes from the pretest to the posttest indicates that domino card media can facilitate learners' understanding and retention of material. According to [\(Arifin et al., \(2021\)](#) and [Nurmawati et al., \(2022\)](#) , effective media use can improve the learning process by integrating visual and verbal elements to maximize learners' understanding. Dominoes supports this theory as a two-dimensional visual learning tool by providing visual representations that help learners organize and process information better.

Conclusion

The conclusion of this study shows that the development of domino card learning media on thematic learning of mathematics content for grade II students of Madrasah As-Syafi'iyah Kencong Jember uses the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation. This development process succeeded in producing learning media that is valid and feasible to use, as evidenced by the validation test conducted by three validators. The validation results showed an average percentage of 93%, categorizing the domino card media as valid and feasible for learning. In addition to feasibility, the effectiveness of domino card learning media has also been proven to be high. Through pretest and posttest tests, as well as student response questionnaires, it was found that the use of this media was able to improve student learning outcomes significantly. The N-Gain Score calculation shows an average increase in learning outcomes of 83%, which indicates that this media is very effective in helping students understand math material better. Thus, the domino card learning media is valid and effective in enhancing the quality of thematic learning in mathematics content for Grade II at Madrasah As-Syafi'iyah Kencong, Jember.

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