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Development of Learning Domino Card Learning Media to Improve Social Science Learning Outcomes

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Abstract: Based on the results of the pre-research, problems were found in the form of the lack of use of learning media and the development of learning resources only through student books and teacher books at SDN Mangkang Wetan 03 Semarang City so that it affects the low learning outcomes of students. This study aims to develop, test the feasibility and effectiveness of the learning media Domino Learning Card. This study uses research and development (R&D) research that refers to the Borg and Gall model. The population in this study amounted to 27 students with 6 small-scale test subjects and 21 large-scale subjects in grade IV students of SDN Mangkang Wetan 03 Semarang City. The data collection techniques used are tests (pretest-posttest) and non-tests in the form of observations, interviews, document studies and questionnaires. The results of validation by media experts and material experts show that the Domino Card Learning media meets the criteria very feasible. Based on the results of the prestest and posttest , it is known that the Domino Learning Card media is effective in improving student learning outcomes, shown by the N-Gain test result of 0.7037 which is in the high and effective category. From these results, it can be concluded that the learning media Domino Card Learning is very feasible and effective to improve student learning outcomes in learning science and plant body parts material in grade IV SDN Mangkang Wetan 03 Semarang City.

Keywords: Domino card learning; IPAS; Learning outcomes

Introduction

Education is the main step in educating the nation's life as a right that must be obtained. In addition, education is one of the most important factors for humans in achieving their goals and goals. Through education can produce qualified individuals and improve the quality of life (Lestari & Sunarso, 2024). Educational goals in each country must be clear and directed to the learning process (Mahya & Setiawan, 2024). Efforts to realize clear and directed education in accordance with, then Indonesian education requires educational standards that are created in the form of an educational curriculum. The curriculum is a set of plans and arrangements related to learning objectives, materials, and resources, as well as methods that are used as a guide in the implementation of learning activities so as to achieve educational goals.

Along with the times, Syahrir et al. (2024) the curriculum in Indonesia has developed and updated according to today's needs. The Indonesian government creates a curriculum that meets the needs dynamically and pays attention to the results of the evaluation of the needs of the previous curriculum as an implementation of the update. In 2022, the Ministry of Education and Culture, Research and Technology ratified the Independent Curriculum as a national curriculum that becomes the standard of Indonesian education. The independent curriculum was inaugurated through the Decree of the Minister of Education and Culture of Research and Technology Number 56/M/2022 on the implementation of the curriculum in the context of learning recovery,

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especially the Implementation of the Independent Curriculum which was implemented in the 2022/2023 school year.

The implementation of the independent curriculum focuses on optimizing students in understanding the content of the material, strengthening character and developing *soft skills* through learning concepts that vary according to the conditions and peculiarities of the existing potential. According to Daga (2021) deep Nursafitri et al. (2024) basically, the purpose of the independent curriculum is to provide flexibility in exploring knowledge, attitudes, confidence and skills to adapt to the surrounding environment with fun learning according to needs. In addition, the goal of the independent curriculum is to provide freedom and flexibility in learning, students focus on projects to provide opportunities to realize direct learning experiences through interaction (Alhayat et al., 2024). Learning provides flexibility in exploring knowledge by applying the use of innovative learning media. Learning media is a tool or intermediary used to help provide information about matters related to knowledge in the learning process. Learning media has a variety according to the expected context such as audio, visual and audio-visual as well as concrete media, with which every educator needs to learn how to choose and determine the right learning media according to the goals, context and characteristics to be achieved.

Another opinion says that learning media refers to any form of tool or means that functions as an intermediary between the conveyor of information (teachers) and the recipient of information (students). Learning media has an important role in motivating and encouraging students to be actively and thoroughly involved in a logical and meaningful learning process. The use of learning media by teachers can help develop cognitive, psychomotor and affective abilities for students (Enawaty et al., 2025). According to Susanti et al. (2022) Learning media is able to increase student knowledge so as to create high learning motivation, positive interaction and allow students to learn according to the abilities of each individual. The Independent Curriculum focuses on essential content that causes several elements to undergo changes at the elementary school level, such as in science subjects combined with social studies into social studies (Natural and Social Sciences) subjects.

Natural and Social Science Learning (IPAS) in elementary schools is essentially a science that studies the behavior and interaction of living things and inanimate objects in the universe with their environment. Based on opinion Anggita et al. (2023) IPAS is an integrated study that leads students to develop critical and rational thinking skills according to needs and experiences in daily life including interaction with the environment, living objects and inanimate objects. From these opinions, it can be concluded that the subject of IPAS is a science that helps and studies the interaction of fellow humans and the social interaction of other living beings that can help the ability to reason critically, independently and rationally according to the circumstances of human life and their environment, be it inanimate or living objects. In science science learning, teachers need the right learning media to support the teaching and learning process and make it easier for students to understand and explore the learning material. Therefore, teachers should strive to create a creative, innovative, effective, and fun science and technology learning process, so that the learning objectives and student learning outcomes meet the predetermined achievement criteria.

Based on the results of observations at SD Negeri Mangkang Wetan 03 Semarang City, it can be analyzed that the lack of availability of learning media and the development of learning resources are only through student books and teacher books. The media used by teachers is such as video performances, using illustrations in the surrounding environment. According to the results of the interview, the availability of learning media has not been maximized and is still limited, at certain times teachers use illustrations in real life or the use of LCD to display videos or images. The lack of media and learning resources results in the learning process becoming less innovative and creative, learning focuses on teachers who apply lecture methods and students tend to get bored in understanding the material. Monotonous delivery and the absence of updates in the delivery of material that contains many concepts that are difficult to understand cause students to feel bored in learning (Wang, 2024).

Based on the data obtained by the researchers, that there are still many students who get scores below the KKTP standards, this is evidenced in the learning of the scope of material I Plants of Life on Earth obtained an average of 49.30 and as many as 20 out of 26 students have not completed the KKTP implemented. In the scope of material II Substance Forms and Their Changes, the average score was 53.38 from 26 students. In the scope of material III Styles around Us, the average daily test result of students was 55.76. The use of learning media affects student learning outcomes, especially in science and science learning. This requires a variety of learning media that can attract attention, fun and facilitate students in learning. The selection of media used should be interactive, because the teaching-learning process always involves interaction between

students and teachers (Qosyim & Priyonggo, 2018). One of the learning media that can attract students' attention is to use game learning media that directly involve students in their use. The application of the game method in learning media has a significant influence in increasing student activity and facilitating a more comprehensive understanding of concepts regarding learning materials. This is due to the fact that the game learning media encourages students to actively participate in learning activities (Wardoyo et al., 2021).

The learning media developed in this study is a learning domino card-based learning media. Learning domino card media is a form of learning media that is designed like domino cards in general, but modified by being given questions on the bottom side and the top side there are answers related to the material to be presented (Nirwana et al., 2024). Dominoes in learning are generally played in groups with a total of 28 cards that have 2 segments (Istyasiwi et al., 2021). The domino cards are designed in an interesting way possible with the appearance of images related to the subject matter being taught. The Domino Learning Card game can be played in groups to determine the answer quickly and precisely. The development of domino-based learning media, supported by the results of previous studies conducted by Nirwana et al. (2024). This opinion is in line with research conducted by Anabella et al. (2024), the results of the study revealed that the use of domino cards in grade IV learning provided an increase in student learning outcomes with individual student completeness reaching 7 out of 8 students and classically student completeness reaching 87.5%.

Generally, students like learning activities that apply learning methods through games. Learning while playing provides a more enjoyable learning atmosphere so that it is one of the solutions to increase students' interest in learning (Aldalur & Perez, 2023; Haleem et al., 2022). The application of domino cards with a game system has advantages in increasing students' enthusiasm for learning compared to monotonous learning media. Therefore, the learning materials delivered can be well understood by students (Darling-Hammond et al., 2020). This condition has the potential to increase students' interest and active involvement in the learning process, so that the results obtained from learning activities can meet the maximum level of completeness for all students in the class. According to Solehah et al. (2024) the Learning Domino Card media has several advantages compared to other media, namely being able to stimulate students to be more active in learning and interacting with students, implemented in games, so as to create a fun, not boring, easy and practical atmosphere, requiring students to think, remember, and predict in determining answers, as well as creating a direct learning experience.

Based on the background described above, the researcher developed a learning media based on the game system, namely using the Learning Domino Card. The use of Domino Card Learning media aims to instill the concept of understanding the material in the science and science subject of the scope of material I, namely Plants Source of Life on Earth which is interesting to students and improve student learning outcomes. The purpose of this research and development is to develop a design, test the feasibility and effectiveness of the developed domino card media. Thus, the researcher provided a solution to develop a learning media product entitled "Development of Learning Domino Card learning media to improve science learning outcomes for grade IV elementary school students".

Method

The type of research used is Research & Development (R&D). Type of research Research and Development is a research method that aims to create and produce a specific product, and test the effectiveness of a particular product (Snyder, 2019). In line with that, Borg and Gall argues that (Lee et al., 2017), This type of research and development or R&D is the stage applied to develop and validate educational products. In this study, a development model adapted from the Borg and Gall development model consists of 10 stages, namely Potential and problems; Data collection; Initial design of the product; Design validation; Design revision; Product trials; Revision of trial results; Usage trials; Product revision; Mass production. However, in this study, the researcher applied 8 out of 10 stages.

Figure 1. 8 Stages of assessment procedure according to Borg and Gall

The research was conducted at SDN Mangkang Wetan 03 Semarang City with the research subject being grade IV students of SDN Mangkang Wetan 03 Semarang City and the object of the research was the development of learning media, namely the Learning

Domino Card. The research techniques carried out are by test and non-test. The tests carried out are in the form of pretest and posttest through the work of 25 multiple-choice questions. Non-test techniques through observation, interviews, document studies and questionnaires. The assessment of the feasibility of the Learning Domino Card media was obtained from the results of the product feasibility analysis by expert validators on the Learning Domino Card media by making a feasibility instrument. To conduct a feasibility test of the Domino Card Learning media, the researcher used a percentage formula as follows:

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

Information:
P = Percentage value
F = Score obtained
N = Maximum score

The results of the percentage of eligibility data are then transformed with the criteria that have been prepared. The results of the eligibility data are determined on the expert assessment criteria as follows:

Table 1. Eligibility Criteria

Percentage (%)	Criterion
76- 100	Very worthy
51- 75	Proper
26 - 50	Quite decent
0- 26	Less feasible

The next stage after going through expert validators is a small-scale test. The small-scale test was carried out by 6 fourth grade students of SDN Mangkang Wetan 03 Semarang City. The test was carried out to get student and teacher responses to the use of Domino Card Learning media. A large-scale trial was conducted to determine the effectiveness of the Learning Domino Card media. The subjects from a large scale are the fourth grade students of SDN Mangkang Wetan 03 Semarang City totaling 21 students. In this trial, the concept of pre-experiment designs is used with a one grub pre-test – post-test design model, where pre-test is carried out before treatment and post-tets after treatment. This trial was conducted to compare conditions before and after treatment. The following is the design of one grub pre-test – post-test.

Table 2. Research Design

Prestets	Treatment	Posttest
O1	R	O2

Information:
O1 = *Prestest value*
O2 = Posttest value
R = application of Domino Card Learning media

The results of the pretest and posttest of small-scale and large-scale tests will be tested for normalization. The next stage is to determine whether there is a significant difference between the two interconnected samples and a paired t-test will be carried out. In addition, data processing will be carried out to measure the effectiveness of the media through the N-Gain test. The calculation uses the following formula.

$$Normal\ gain = \frac{skor\ posttest - skor\ pretest}{skor\ maks - pretest} \quad (2)$$

The N-Gain value is used to determine the category of percentage increase in learning effectiveness applied using the Learning Domino Card learning media.

Table 3. N-Gain Index Perception

Interval Gain	Criterion
g ≥ 0.7	Tall
0.3 ≤ g < 0.7	Keep
g ≥ 0.3	Low

Results and Discussion

This research aims to develop products as learning media to improve student learning outcomes by knowing the feasibility and effectiveness of media. The product developed is the Domino Learning Card with plant parts and their functions. In the initial stage, the researcher identified the problem through observation of the learning process in the classroom. The observation results showed that the lack of use of learning media by teachers, the learning process was classified as passive for students and monotonous by teachers. This happens because teachers use the lecture method in learning. In addition, learning resources only use teacher books and the application of media is carried out on certain materials. This condition affects student learning outcomes in several subjects, especially in learning science and sciences material on Plants Source of Life on Earth. Learning media plays a role as a tool for teachers in delivering material. The use of media can overcome student boredom that may arise if learning is only in the form of lectures, so that students can more easily understand the material presented (Rahmawati et al., 2023; Khobir et al., 2022; Widodo et al., 2025). This can trigger the spirit of

learning, creativity, critical thinking skills, motivation, and improve student learning outcomes.

Therefore, learning needs to be packaged with fun learning. Fun learning is in line with the application of Domino Card Learning media which provides learning context by playing games (Lisnani & Irzawati, 2019). Domino card games are carried out in a fun learning atmosphere that can make it easier for students to understand the material. The domino card game helps students to solve existing problems, namely in the domino card questions Study. Therefore, the use of Domino Card Learning learning media in learning on a content that includes many facts and concepts is very appropriate. The next stage is media design. The media design stage is the design stage *Draft* Initial Learning Tools to be Used in Learning (Kao et al., 2023). Researchers developed Domino Cards Learning on plant body parts. The Learning Domino Card media is shaped like a domino card in general with a size that is adjusted to the needs of elementary school students, namely 7 x 4 cm.

Figure 2. Card games

Figure 3. Help cards

Figure 4. Learning resource cards

The design of the Learning Domino Card is carried out by making *prototype* Using the App *Canva*. The Learning Domino Card consists of 31 cards which are divided into several components, namely game cards with a total of 28 cards, 2 help cards and 1 learning resource card. The game card consists of the front part i.e. *Cover* And the back part consists of two segments, namely the upper segment containing the answer and the lower segment containing the question for the next card (Dwivedi et al., 2022; De Villiers et al., 2020). Help cards can be used when students face difficulties in answering questions on challenge cards in the game (Widalaksita et al., 2024; Mavroudi et al., 2022). The learning resource card contains materials and teaching materials about plant body parts and their functions. The selection of colors and images on each component of the Learning Domino Card adjusts the characteristics of elementary school students, namely clear, attractive, and bright.

In addition to designing the domino card component, there are other components to support the use of the Learning Domino Card, namely the guidebook.

Figure 5. Guidebook

Learning dominoes can be used for competitions in learning that include other study groups. The way to play dominoes is that students who get a card with "Star" written on it place the card on the game board or table. The rule on the use of domino card media is that students form groups of 5-6 people to work together in arranging cards so that they find the answer to every question on the subordinate segment and end up on the card with the word "finish" on the game card. The time of the domino card game is 10-15 minutes. There are two criteria for winners in the domino card learning media learning competition, namely groups that can complete the preparation within 10-15 minutes, the arrangement of the game cards according to the existing answers. The design is then evaluated by material experts and media experts. In the development of the Domino Card Learning media, the assessment criteria used by material experts and media experts adjust to the characteristics of the media (Isnaeni & Prasetyaningtyas, 2024). The assessment criteria and evaluation results are presented in Table 4 and Table 5.

Table 4. Material Expert Validation Results

It	Aspects	Percentage (%)	category
1	Material feasibility	90	Very worthy

Table 5. Results of Validation of Media Experts

It	Aspects	Percentage (%)	category
1	Media eligibility	95	Very worthy

Based on the assessment conducted by validators of media experts and material experts, it is known that the assessment of the feasibility of the material on the Domino Card learning material for plant body parts obtained a score of 72 out of 80 scores with a percentage of 90% included in the very feasible criteria. The assessment of the feasibility of the Domino Card media Learning plant material obtained a score of 57 out of 60 scores with a percentage of 95% included in the very feasible criteria.

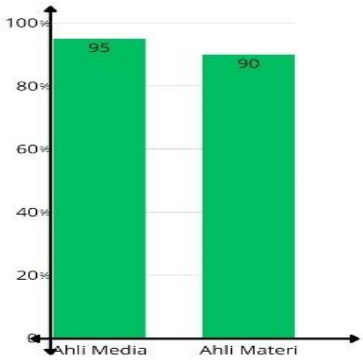


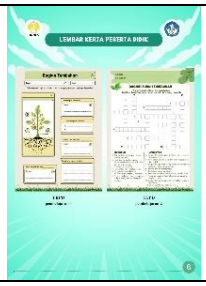
Figure 6. Percentage of validation results of media and material experts

Table 6. Help Card Cover

Before revision	After the revision	Information
		Media experts give suggestions to add the selection of A or B cards, making it easier for students to choose the help cards to use

From the results of the assessment of the feasibility of the material and the feasibility of the media by experts, there are several suggestions and inputs for the improvement of the learning domino card madia. The design revision stage was carried out in accordance with the directions of the media expert validators, starting from the help card cover, product manual, and the addition of cards for learning resources.

Table 7. Guidebook

Before revision	After the revision	Information
There is no page of the student's worksheet in the guidebook		Media experts provide input on the preparation of components so that student worksheets are added to the guidebook

Revision of the guidebook on the domino card component page and addition of student worksheet pages.

Table 8. Learning Resource Cards

Before revision	After the revision	Information
		Media experts provide input on the learning resource card so that it has its own card and is easily accessible

Based on the assessment and revision of the feasibility of the material and the feasibility of the media on the Domino Card Learning material on plant body parts by experts, experts stated that the product can be tested at the next stage. Through the use of

Learning Domino Cards, students are stimulated to answer questions contained in the media, so students are used to solving problems in a fun way, namely through games in accordance with the procedure for using Learning Domino Cards. This is supported by the results of the research Satriawan et al. (2020) stated that the learning domino card media developed met the feasibility component by obtaining an average score of 4 in the very valid category and in line with the development carried out by Chang et al. (2024) that the domino card media has met the eligibility criteria of media experts by 89% and 82% of material experts so that it is included in the good and suitable criteria for use. Based on the results of the research conducted and supported by the results of previous research, it can be concluded that the learning domino card media is feasible to be tested at the product trial stage in learning.

The next stage is product trials with this implementation carried out with small and large-scale trials. The small-scale trial included 6 fourth-grade students with the ability level of 2 high-achieving students, 2 medium-achieving students, and 2 low-achieving students. This data was obtained from student learning outcomes on the plant material and teacher assessment. After being involved in the learning process, namely by pretest before learning, learning process, and posttest after learning, the results of improving learning outcomes carried out by 6 students and having a good impact on increasing student knowledge. Based on this, it can be continued to carry out large-scale trials. A large-scale trial was carried out at SDN Mangkang Wetan 03 Semarang City with 21 students. Similar to small-scale trials, large-scale trials are enforced with pretest, learning and posttest processes, showing a significant increase in learning outcomes for students. The following are the results of normality tests in small-scale and large-scale trials.

Table 9. Small-Scale and Large-Scale Pretest and Posttest Normality Tests

		Test of Normality					
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Large To Small Group	Statistic	df	Sig.	Statistic	df	Sig.
Learning outcomes	Small group pretest	.289	6	.129	.759	6	.025
	Small group posttest	.216	6	.200	.884	6	.290
	Large class pretest	.182	21	.69	.919	21	.085
	Large class posttest	.120	21	200	.951	21	.349

*This is a lower bound of the true significance
a. Lilliefors Significance Correction

Based on the results of the SPSS output above, the results of the pretest and postest normality test with the Shapiro Wilk formula assisted by SPSS version 25 were obtained. The normality test criteria are said to be normal if the significance value (sig) > 0.05 so that the data is distributed normally. Based on the data obtained, the Sig value > 0.25 for the small-scale pretest and the score for the large-scale posttest > 0.290. Then for the Large-Scale pretest sig > 0.290 and the Large-Scale postest sig > 0.349. The data is said to be normally distributed or accept H0 if the sig value > 0.05, and not normally distributed if the sig value < 0.05. The Pretest and Postest values have a normal distribution so that they are continued to the paired t-test (t-test) through parametric statistics.

Table 10. Paired T Test

		Paired samples Test							
		Paired Differences							
				95 % Confidence Interval of the Differences					
		Mean	Std. Deviation	Std. Error mean	Lower	Upper	t	df	Sig.(2-tailed)
Pair 1	Learning Outcomes_Large_group Small_group	63. 92	21.61	2.941	68.027	69.82	21.73	63	.000

Based on the calculation above, it can be seen that the average difference from the pretest and posttest using SPSS version 25 with a value of sig.(2-tailed) 0.000. In the Paired Samples T-Test, there is a criterion that there is a significant difference in values between the pretest and posttest data if the value of sig.(2-tailed) < 0.05. Meanwhile, if the value of sig. (2-tailed) > 0.05, there was no significant difference in learning outcomes between pretest and posttest data. From the results of the t-test above, it shows the value of sig. (2-tailed) 0.000 < 0.05, so it can be concluded that the results of the difference between the pretest and posttest scores show significant differences, so that the Domino Card media for learning plant material is

effective to be applied to learning science science and plant material. Furthermore, the average score increase (N-Gain) test by comparing the increase in prestest and posttest scores calculated using gain index analysis. In the calculation of the average increase in N-Gain, there are score division criteria according to Damayanti et al. (2022) and Nisa et al. (2018) namely the N-Gain value of $g > 0.7$ is in the high category, the N-Gain value is $0.3 \leq g \leq 0.7$ is in the medium category and $g < 0.3$ is in the low category. The results of the calculation of the average gain are as follows.

Table 11. N-Gain Average Increase Test

	Descriptive Statistics				Std. Deviation
	N	Minimum	Maximum	Mean	.23136
Ngain_Score	27	-09	1.00	.7037	23.13553
Ngain_Persen	27	-8.70	100.00	70.3742	
Valid N (listwise)	27				

Based on the results of the N-Gain test analysis, the average value of N-Gain was 0.7037 which was included in the high category. This shows that the use of Domino Card media to learn plant body parts material in the fourth grade science subject for students of SDN Mangkang Wetan 03 Semarang City has succeeded in improving student learning outcomes. This is supported by the results of research conducted by Gitamayu et al. (2021) stated that the domino card learning media obtained a score with a percentage of 94.3% entering the very good category and plus the teacher's response to the media entered the very good category with a percentage of 100%. In addition, it is strengthened by the results of the research (Sari & Aminatun, 2024). In the development of domino card media on plant structure and function materials with an average assessment of 89%, it is in the category of very feasible and very practical to use in learning.

Based on the results of the above calculations on the feasibility test, normality test, t-test and N-Gain test, the Domino Card for Learning plant body parts in the fourth grade science subject can be said to have feasibility and effectiveness in the learning process to improve student learning outcomes. From the results of the trial, there are advantages in the media, namely making students more active in learning compared to media in the form of monotonous images, providing learning enthusiasm to students with the application of learning while playing and making it easier for teachers to explain learning materials to students so as to provide maximum improvement in learning outcomes. The learning domino cards that are developed have similarities to dominoes in general (Farikhatuzzaeniti & Purwanti, 2023; Rahman & Amalia, 2019), but modified in which there are question and answer segments and have help cards, on the learning domino cards have an interesting background and in accordance with the material studied.

Conclusion

The results of the study have shown success in the development of learning media for Domino Cards learning plant material for grade IV at SDN Mangkang Wetan 03 Semarang City, in addition to that based on the results of the feasibility test by media experts and the media materials of the Domino Card Learning are very feasible to be used with a material feasibility of 90% and media of 95%. Furthermore, the media effectiveness test showed that the use of Domino Learning Cards could improve students' understanding and learning outcomes of the material taught. The results of data analysis showed a significant improvement in student learning outcomes, with an average N-Gain score of 0.7037, which is included in the high category.

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Author's Contribution

Conceptualization,; methodology,; validation,; formal analysis, R. A. E.; investigation,; resources,.; data curation, R. N.: writing—original draft preparation,; writing—review and editing,.: visualization, S. S. A. All authors have read and agreed to the published version of the manuscript.

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Conflict of Interest

The author states that there is no conflict of interest.

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