DEVELOPMENT OF DOMINO CARD MEDIA IN SCIENCE LEARNING IN GRADE VI ELEMENTARY SCHOOL

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Abstract

This research is based on gathering information in the field that educators in learning have not presented many game activities. This study aims to produce domino card media in science learning in class VI SD with a valid, practical, and potential effect. This type of research is development research using the Borg & Gall model including 8 stages of research and information gathering, planning, initial product development, preliminary trials, revision of preliminary trial results, limited trials, extensive trials, final product revisions. This research was conducted in class VI of SD Negeri 235 Palembang. The results showed that the domino card media was in the "very valid" category, namely 86.6% of the average results of the validators. The practicality tested on a limited basis is categorized as "very practical" which is 98%. The potential effect obtained from the distribution of student learning outcomes tests in the trial is broadly categorized as "very potential effect" which is 90.6%. Based on the results obtained, the domino card media is very feasible and can provide variations in presenting game activities, especially in learning science about the solar system.

Keywords: game; dominoes; science learning

Abstrak

Dalam mewujudkan kegiatan pembelajaran yang menyenangkan. Guna menfasilitasi peserta didik pada kegiatan pembelajaran lebih antusias dan berkesan dengan bermain namun belum sering dihadirkan. Penelitian ini bertujuan untuk menghasilkan media kartu domino pada pembelajaran IPA dikelas VI sekolah dasar dengan yang valid, praktis, dan efek potensial. Jenis penelitian adalah penelitian pengembangan menggunakan model Borg & Gall dari 10 langkah hanya 8 tahap yaitu: 1) penelitian dan pengumpulan informasi, 2) perencanaan, 3) pengembangan produk awal, 4) uji coba pendahuluan, 5) revisi hasil uji coba pendahuluan, 6) uji coba secara terbatas, 7) uji coba secara luas, 8) revisi produk final. Penelitian ini dilaksanakan di kelas VI Sekolah Dasar Negeri 235 Palembang dengan hasil penelitian menunjukkan media kartu dalam kategori "sangat valid" yaitu 86,6% dari hasil rata-rata para validator. Kepraktisan yang diuji coba dengan delapan peserta didik dengan nilai 95%. dan tanggapan pendidik dengan nilai 98% dalam kategori "sangat praktis". Efek potensial yang didapat dari penyebaran tes hasil belajar peserta didik pada uji coba di kelas VI A dikategorikan "sangat efek potensial" yaitu 90,6% . Berdasarkan hasil yang diperoleh media kartu domino sangat layak dan dapat memberikan variasi dalam menghadirkan kegiatan permainan khususnya pada pembelajaran IPA materi tata surya.

Kata Kunci: permainan; domino; pembelajaran IPA

Introduction

The learning process is expected to develop all the potential of students. Sanjaya (2016) says that students' potential can only develop if they are free from fear and stress so that the goals to be achieved in learning can be achieved. The results of observations and interviews in the field in class VI, showed that 56.25% (18 out of 32 students) were not very active in the process of learning activities, especially in learning natural sciences. They often used the lecture

method without props or media learning. Several things cause students not to be very active, for example, fear of expressing opinions or answers. Even though there are some students, who can, sometimes they are not confident and hesitant to express it. According to Vazirabad (2013), students and educators believe that doubt is a natural and common thing that shows someone is thinking. In line with that, Herawati (2018) said that one of the factors that encourage learning is freedom from fear. Educators have overcome the problem of teaching aids and media. For example, in the energy change material, electric circuit props from batteries are used and use pictures and videos according to the material being taught. Students in this class also really believe that students really like games, especially learning that is packaged in competition, but educators have not presented many game activities. This is evidenced when the group learning activities, students are more enthusiastic and active in solving an existing challenge. As stated by Trinova (2012) that learning at a child's age is more effectively done by playing, and Dewi (2021) states that one way to make learning fun is to package learning in the concept of play.

Learning Natural Sciences (IPA) in elementary schools is a subject that emphasizes effective direction. It requires the application of learning models that involve students to be active in the learning process (Walid, 2017). According to Wedyawati and Lisa (2019), the appropriate science learning model for elementary school-age children is a learning model that adapts student learning situations to real-life situations in society. This is why it is necessary to use science learning media to foster interest and motivation in learning. This is reinforced by Awang (2015) that the causes of students having difficulty learning science are aspects of interest, motivation, self-confidence, study habits, and aspirations. The results of the 2018 PISA survey have proven that Indonesia is in 74th place, aka sixth from the bottom. Especially in science ability, with a score of 396, is in position 71. According to the Organization for Economic Co-operation and Development in Wuryanto and Abduh (2022), in the field of science, it explains that 35% of Indonesian students are still in the competency level 1a group and 17% in the lower.

In Game World, Yulita (2017) categorizes games into traditional and modern. Tim (2017) stated that traditional games are relatively simple but provide extraordinary benefits, and games are full of challenges that require creativity, foresight, and dexterity to win. It differs from modern games, which nowadays do not involve many physicalities when playing Kovačević & Opić (2013). Functional Magnetic Resonance Imaging Study (IMRI) study of rest and grey volume shows that playing online games causes changes in brain areas responsible for impulses, motor function, regulation of emotional control, and sensory-motor coordination Weinstein, Livny, & Weizman (2017). So that traditional games still need to be developed in this increasingly advanced era because they can be an alternative to introducing cultural diversity that exists in Indonesia and can instil values and morals as the basis that forms a noble child's personality Sangaji (2018). Furthermore, Khasanah, Prasetyo, and Rakhmawati (2011) say that traditional games are very suitable to be applied in learning strategies because they can help children develop physically and mentally, socially and emotionally, do not give up easily, explore, experiment, and foster a spirit of leadership, as well as traditional games. Which can stimulate the brain and use strategies to win, for example, chess, koa, dominoes.

Of the various existing problems, researchers want to contribute to increasing understanding, which starts with the development of learning media. As stated by Trismayanti (2019), increasing students' learning interest is creating a class environment free of threats, changing the learning atmosphere, offering various learning models and methods, creating positive competition, offering prizes, providing opportunities for students to study in groups, make class fun. In choosing games in science learning, it must be concrete. Nurhamidin (2018)

Popular media in-game media uses card-based materials. Of the various card games that are well known, Dominio is due to the traditional games in its environment. In addition, it is felt that domino card games can be used as learning media with modifications according to the material being taught. In line with that, Junia and Rachmadyanti (2018) argued that domino card games could make it easier for students to remember and understand the learning material delivered by educators so that learning in class is more meaningful.

Domino cards are felt to be in accordance with the psychological development of elementary school children who are in the concrete operational development phase, where they have started to think rationally and in an organized manner such as solving concrete problems in the form of real activities. According to Yuli and Ruswandy (2019) domino cards are a medium that can provide direct experience to children, where children can be directly involved in learning activities. Agree with Piaget in Ardini and Anik (2018) argues that children's development at the age of 8-11 years (social play games with rules stage) social development is getting better and children are starting to enjoy playing with peers and at this age children really like to obey previously made rules. Agree with that, according to Ibdal in Wiratni, Ardana, & Mardana (2021) theoretically elementary school-age children are in the concrete operational stage which when learning requires concrete objects. They will find it difficult without the help of objects that are able to represent the thing in question.

It is starting from this problem. So it is necessary to innovate learning media to overcome this. One of the uses of learning media is in accordance with its objectives. Accordingly, Mulyati (2019) suggests that ideal learning should be based on children's interest tendencies so that the learning process can run effectively. And in line with Setyawan et al. (2020) that the learning carried out must be effective and fun so that students are comfortable and not bored with monotonous lessons. Researchers raise the desire to develop learning media that are close to the student's own environment, namely traditional games.

This research focuses on developing domino card media in science learning on solar system material. In this material, visualization is needed to attract students' attention in remembering understanding which they may quickly forget if it is not memorable.

Research Methods

This research is a Research and Development (R&D) development research. This research is directed at solving variable problems (conditions, methods, and learning outcomes) in learning in academic units. This study uses the Borg and Gall model in Hamzah (2019), which consists of 10 stages, but this study only includes eight stages because the R&D steps can be simplified and adapted to the needs of researchers. After all, research using R&D with more than two schools requires the cost is not small, and the time is quite long without compromising the value of research and development in testing the validity, practicality, and potential effects on the product being developed. This is based on the Borg and Gall model in Emzir (2015), which suggests that in thesis, thesis and dissertation research, research is limited to a small scale, including the possibility of limiting the research steps. The research phase will be carried out as follows, 1) Research and information, 2) Planning, 3) Develop Preliminary Form of Product, 4) Freelance Field Testing, 5) Main Product Revision, 6) Main Field Testing, 7) Operational Field Test. 8) Final Product Revision.

Stage 1) Research and information are to analyze the needs and availability of resources, time availability and problems that occur in learning activities so that the product to be developed can be determined. Stage 2) Planning is determining the goals to be achieved from

both basic competencies and competency achievement indicators. 3) Develop Preliminary Form of Product determines the product design developed to be validated by material experts, linguists and media experts. 4) Freelimanary Field Testing in this trial to determine the validity of the product by validating it by experts so that the product deserves to be tested. 5) Main Product Revision, After the previous trials, the researcher made improvements to the product according to the comments and suggestions of the validators 6) Main Field Testing, this trial was carried out to find practicality. In this case, it was tested on students using Stratified Random Sampling with as many as eight people. 7) Operational Field Test is carried out for potential effects before and after teaching and learning activities, which gives 15 questions tested to 32 students in class VI A, and questionnaires are distributed to educators and Class VI students for product evaluation. 8) Final Product Revision is the improvement of the final product from input from educators and students so that the product resulting from the developer is more accurate according to the desired specifications.

The purpose of this study was to develop and find out the validity, practicality, and potential effects of domino card media on science learning in the solar system. This research was conducted at SD Negeri 235 Palembang in class VI of elementary school. According to Sugiyono (2019), a research instrument is a method used to measure a variable. The data obtained in this study were data from the media development process through a questionnaire which contained several questions from the validation data from the validator, student response questionnaires and educators and questions. As for the results of the questionnaire from the validator, scoring was carried out according to the criteria for validity, practicality, and potential effect. In this case, what was measured was the results of the responses of experts, educators, and students using the Likert scale (Hamzah, 2019). From the results of the questionnaire analyzed, the following formula is used to determine the validity and practicality of the product as follows:

$$\text{Validity/Practical Value} = \frac{\text{Score obtained}}{\text{Maximum score}} \text{ x } 100\%$$

After the results of the percentage of validity and practicality values that have been developed have good validity and practice if the minimum criteria achieved is> 76%. Judging from the validity and practicality criteria according to Sidarta and Yumianta (2019), it can be seen in Table 1 below:

Table 1. Criteria for validity and practicality

Validation Value (%)	Criteria
86-100	Very good
76-85	Good
60-75	Pretty good
55-59	Less good
<54	Not good

To determine the potential effect level of the product that has been developed, test questions are distributed, which are given a score on the answers in each item, then calculated and categorize the scores according to the KKM (> 75) obtained by each student. Then the number of students who have achieved complete learning outcomes is calculated using the following percentage formula:

$$P = \frac{Pa}{Pb} \; x \; 100\%$$

Information :

P = Percentage of Learning Completeness of Learners

Pa = Number of Completed Students

Pb = Number of All Students

After calculating the percentage of students' learning completeness, it is adjusted to the potential effect value criteria. The product is developed if the potential effect product in learning is at least $60 < P \geq 80$. Following are the criteria for potential effect values according to Sugiyono (2019), which are in Table 2 below:

Table 2. Potential Effect Value Criteria

Level of Completion (%)	Criterion
$P > 80$	Very Potential Effects
$60 < P \geq 80$	Potential Effects
$40 < P \geq 60$	Enough Potential Effects
$20 < P > 40$	Less Potential Effects
$P \geq 20$	No Potential Effects

Results and Discussion

This research was conducted to develop and validate domino card media in science learning about the solar system in grade VI elementary school, as well as being tested in the process of learning activities. This stage refers to the steps that have been arranged in the research method. The research results include 8 stages, namely: 1) Research and information, 2) Planning, 3) Develop Preliminary Form of Product, 4) Freelimanary Field Testing, 5) Main Product Revision, 6) Main Field Testing, 7) Operational Field Test . 8) Final Product Revision. These eight stages are described as follows:

First, Research and information. Researchers explore the problems that occur in science learning related to the use of learning media. From the results, it was found that students needed learning with games to facilitate the learning process in order to grow their interest in learning, especially learning science. Based on the observations of researchers in the field, students are enthusiastic if their learning is involved during the learning process. For example, learning is done practically, and learning is done by playing. According to Davis (2022) that the game has become a culture of educators as a way of conveying knowledge because it greatly enhances the experience and emotional learning of students.

Second, Planning, at this stage, analyzing the syllabus and planning what material will be taught to students. The choice of solar system material is because students have difficulty remembering the names and shapes of planets and other celestial bodies, so they need to be visualized. Furthermore, an Outline of Media Content (GBIM) and Material Details (JM) are made before creating the product to be developed.

a. Content of Media and Material (GBIM)

In the development of dominoes was, chosen the theme 9, Exploring Outer Space with Basic Competence 3.7, which explains the solar system and the characteristics of the members of the solar system. The contents of the media consist of a box, a card containing images of the solar system as well as instructions for the use of the media.

b. Material details (JM)

Matter focuses on the solar system outside of space. Such as celestial bodies in the form of the sun, planets, stars, meteors, comets, asteroids, and satellites.

Third, Develop a Preliminary Form of the Product. At this stage determines, the product design that is developed according to the material and basic competencies as well as competency achievement indicators that have been taken. At this stage, a domino card media design has been determined, and the card size is 12 x 7.5 cm. Domino cards are made in 24 cards, and then the cards are given the desired colour. After that, the researchers included an image that corresponds to the solar system material to serve as the background. After that, make a boundary in the middle and on the top side of the question, and the bottom part will be filled with answers related to the material of the solar system. How to play it is by pairing cards according to their partners, starting from the opening card that has the first question. Then look for the answer and then pair it until the last card is paired according to the previous card question, and the game is over. Here is the initial product design as follows:

Figure 1. Domino Opening and Front View

Figure 2. Last Domino card and Front View

Figure 3. Domino Card Back View

Fourth, Freelimanary Field Testing, at this stage, validators carry out product validation covering media, material, and language. This test aims to determine whether the developed product is valid for use or not for use in field trials. Here the validator also provides comments and suggestions to improve domino cards to be better and can be tested. Some of the suggestions and ratings are given from the following Table 3 and 4 validators:

Table 3. Validator Comments and Suggestions

Validator	Comments and Suggestions
Validator I	Fixing the background on domino cards with bright color and not one colour, and fixing the wrong questions when writing spelling.
Validator II	Fixing the background on domino cards with bright colours and not one colour, and fixing the wrong questions when writing spelling.
Validator III	Consider several questions that have the same answers so that in the game, you are not mistaken in matching them, consider the size of the paper so that it is adapted to small children's hands.

Table 4. Validator Value Data

Validator Name	Total Assessment Score (Max 100)	Validation Result (%)
Validator I	62	62%
Validator II	58	58%
Validator III	67	67%
Combined validation results		62,3%

Based on the results of the validator's assessment that the domino media about the solar system is related to validity, it shows a result of 62.3%, which can be said to be quite valid but does not meet the validity requirements (Value of Validity> 76%). According to Prabali and Sukmana (2021), the learning process can run smoothly and optimally if supported by effective and efficient language in the learning media used. So the researchers received input, comments and suggestions from the validators to make this domino card media even better.

Fifth, Main Product Revision. After the previous trials, the researchers then improved the domino card media about the solar system in accordance with the comments and suggestions of the validators. In accordance with Ucus' opinion (2015) that all stages of learning with games must be handled in practice planning and evaluation processes in detail, and the necessary steps must be taken to solve the problem. Then the game rules are changed. Players can start the game with the opening card according to the player's wishes, then pair it up until the opening card meets the last card. This change allows each player to finish with the best strategy/tactics. The following is one of the revised aspect changes from Table 5 below:

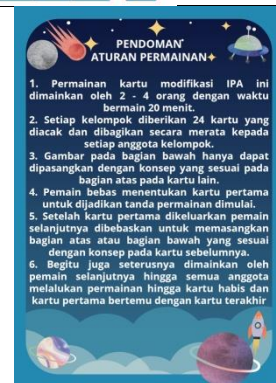**Table 5.** Domino Card Media Revision

Revision Aspect	Before	After
The "Start" card is replaced with an answer		
Change questions that have the same answer		
The "Finish" card is changed to a question		
Changes to the card back design		

Adding a box packaging design to domino cards	
Game guide design changes	

The results of the validation of the domino card media that has been repaired stated that it is suitable for use in class VI elementary school students, with an average validity value of 86.6% which is stated to be very valid (validity value> 76%). The following is an assessment of the validator in Table 6 below:

Table 6. Validator Value Data

Validator Name	Total Assessment Score (Max 100)	Validation Result (%)
Validator I	88	88%
Validator II	78	78%
Validator III	94	94%
Combined validation results		86,6%

Sixth, Main Field Testing, at this stage, the researcher began to conduct product trials, which were carried out in small groups with eight students at SD Negeri 235 Palembang. Based on the assessment of educators and students on the domino card learning media about the solar system that has been developed, obtained from educators obtained an assessment of 98% and eight samples of students (3 with high ability, 2 with medium ability, and 3 with low ability based on KKM IPA) obtained were 95% (Practical Value > 76%). So the domino card learning media on solar system material is categorized as very practical and can be used for teaching and learning activities. In line with previous research by Wiratni et al. (2021) argues that practicality is obtained from evaluating the results of the questionnaire data resulting from student responses and educator responses.

Seventh, Operational Field Test, at this stage, a trial was carried out to see the potential effect of domino cards on the solar system, which was carried out on 32 students in class VI A SDN 235 Palembang. Based on the data from the trials conducted by 32 students, the average score was 93.9, with three students who did not meet the KKM score of 75, namely one person getting a score of 60, one person getting a score of 66.7 and one people getting value of 73.3.

However, 29 other students have completed when viewed from the KKM score, with one student getting a score of 80, three students getting a score of 86.7, five students getting a score of 93.3 and twenty students getting a score of 100. the results showed that the average score of students was 93.9, and the percentage of students' learning completeness was 90.6% (P > 80). Based on the criteria for the potential effect value, it is included in the very potential effect category.

Eighth, Final Product Revision, the final product revision is the final product improvement. This domino card has been refined because it is in accordance with the opinion according to Karisma (2020) that domino games must comply with the rules of the game, for example, who is the player, how many players are there, where are they playing, and what is the result. This domino card is played by small groups consisting of 4 people per group by pairing one card and another and preparing learning media students must know the technique and how to play it first. The following Domino card products have been developed:

Figure 4. Game Rules Domestion Display

Figure 5. Final Dominoes Display

The domino card media game for learning science on solar system material has gone through stages which show this media has validity, practicality and potential effects. This shows that domino card learning media in science learning on solar system material can be used in the learning process and as an option in learning by playing, where learning. In contrast, playing is fun learning so that children feel interested and focus their attention. This is in line with Alessei & Trollip (2001) that games have various advantages for the learning environment. Games are able to provide self-motivation to students, in some cases, even encourage students to learn, and games make the learning process more fun. Games may be especially useful for students who are not successful with conventional learning methods because they can adapt reading more easily to learning. Games may not require as much knowledge as before school lessons. And

Dickey (2005) says that play activities can increase children's involvement in learning, stimulate multisensory use and stimulate players' skills to think and create meaning.

Conclusion

Learning by using the media is a challenge in itself to the creativity of educators in conveying material to students. In accordance with this research to develop domino card media products in science learning about the solar system. It is hoped that this product will encourage educators to use media in learning so that they are able to increase the active participation of students in the learning process so that students can receive more meaningful learning and the learning atmosphere in class becomes more enjoyable.

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