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Application of Learning Technology in Domino Card Games on a large scale and individually to the responses of senior high school students

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ABSTRACT

Learning by applying game technology in learning media will attract students' attention. This study uses a domino physics game with quantities and units as materials. Each card will be printed with a barcode containing information regarding the principal amount, unit, symbol, and dimensions. The process of making physics domino card media uses the ADDIE development model. The trial was conducted on 133 class X students at one of the SHS in the Pamekasan and Surabaya Regencies. The results of the validation of the physics domino cards in the media aspect obtained a very valid average category value, and the material aspects got a very valid average category value. The results of the average percentage of responses of Al Amien Pamekasan senior high school students after using the domino physics media with indicators of ease of obtaining, interest, and usefulness obtained scores in the very good category. The results of the average percentage of responses from Pamekasan 4 senior high school students after using the domino physics media with indicators of ease of obtaining, interest, and usefulness obtained scores in the very good category. The average percentage of senior high school 9 Surabaya responses after using the domino physics media with indicators of ease of obtaining, interest, and usefulness received scores in the very good category. Domino physics learning media can make it easier for students to understand the material in quantities and units and instill a strong will to learn physics.

INTRODUCTION

Learning media is a tool in learning so that education runs effectively and efficiently. Learning media can help students understand the material and increase students' interest and attention in the teaching and learning process. Currently, many learning media are being developed, but not a few teachers, when learning in class, do not use learning media (Putera et al., 2022). Based on the observations in several schools, it was found that most physics teachers had not used instructional media supported by technological developments, and few teachers still used conventional teaching aids to implement learning. Physics learning still seemed monotonous to students, so students needed to be more enthusiastic and motivated to study in school. In learning physics, learning media is needed so that students can understand physics material very clearly (Ulfida & Pahlevi, 2021).

Many media can be used by teachers or educators, one of which is media in the form of games. Game media should be able to increase learning activities to be active, not boring, increase understanding of the material, and foster interest in learning. This is in line with research (Fauziddin & Fikriya, 2020) that card games can foster enthusiasm for learning so that learning activities become more effective, students look more active, and teachers can create effective learning activities using the card game media. Through learning media, students can build a learning atmosphere that is

Dynamic, full of enthusiasm and enthusiasm creates a fun reading atmosphere (Sulastri et al., 2020).

Along with technology development, learning media has also transformed from manual to digital by utilizing existing internet technology. The media also positively impacts students' scientific processes in learning physics. Learning in the classroom is the main activity carried out by students. These learning activities will show students' satisfaction levels (Basith et al., 2020). Besides that, the use of the internet in learning has yet to be maximized, including smartphones. At the same time, the development of information technology requires using technological devices in learning (Hasyim et al., 2020). Other studies state that game media based on the Android system can improve conceptual understanding and student learning outcomes (Wardani et al., 2017). From the description above, it is found that in the process of learning physics, media is needed that can integrate students' needs with current technological developments.

Physics domino cards are a learning media in the form of a game (Wiyono et al., 2020). Domino is a generic card game. In Indonesia, it is usually in the form of a small card measuring 3cm x 5cm, colored yellow with endols which function as a substitute for numbers. Domino card games are learning methods and strategies that attract students' interest in learning (Wiyono et al., 2020). Using domino card media can be an alternative to increasing students' understanding of concepts and motivation in learning (Fitrah, 2020). In this study, domino cards were chosen as the media and will be integrated with current technological advances. The use of digital technology as a learning medium has a better and more effective impact than other approaches (Wardani et al., 2017).

The developed domino cards will have collaborated with a software/application on Android. This application is useful as a support in the use of domino cards during learning because the domino card media will include a barcode on each card. The use of online-based learning media can increase student learning interest and student learning outcomes in class (Ulfaida & Pahlevi, 2021). This application will assist in accessing web pages via barcodes on domino cards which contain the meaning of the image/contents of each card and how to play domino cards. The domino card will contain various quantities, symbols, units, and dimensions of the fundamental quantities. Quantity and units are basic materials in physics lessons. The existence of units, symbols, and dimensions of the principal quantities will make it easier to learn physics in the following material.

In addition, students will be directed to fill out a response questionnaire on the Google form prepared for a student response after using the domino physics media. Mobile web-based interactive learning can be used as an alternative medium in learning to support independent learning processes (Aurum & Surjono, 2021). Other research also states that using information technology-based learning media, besides being effectively used in learning, is also very practical for use by both students and teachers (Anjani, 2022). Android-based game media can improve students' conceptual understanding of chemistry learning and student learning outcomes (Wardani et al., 2017).

Web-based learning media can be used as a medium to make the learning process more optimal. Its use has a high level of flexibility and portability, allowing students to access material and information related to learning anytime and anywhere (Pertiwi & Irfan, 2021). Web-based interactive learning media can also improve the quality of

student learning from the minimum student completeness criteria (Wedastama et al., 2013). So that in this study, it will produce domino physics learning media that integrates Android, web, and Google form software/applications to make it easier for students to learn so that students can be motivated to learn physics.

RESEARCH METHOD

This study developed a web-based physics domino card game learning media on quantities and units. This media was developed with the ADDIE development model (Rizki et al., 2023). The flow of developing learning media with the ADDIE development model is as in Figure 1.

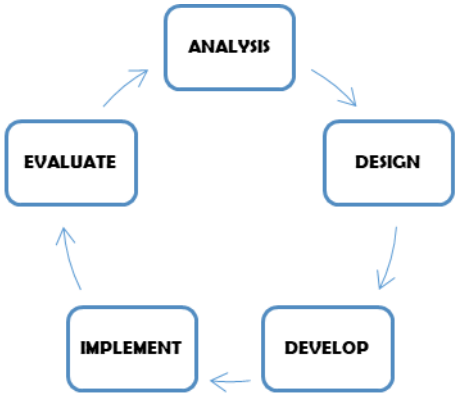

Figure 1. The ADDIE model development flow.

The stages in the development of instructional media go through several stages, namely: Analyze, Design, Development, Implementation, and Evaluation which emerged in the 1990s and were developed by Reiser and Mollenda. The object of this research is high school grade X students who have received material on magnitude and measurement. The trials were conducted in several different schools, namely the senior high school Al Amien Pamekasan, senior high school 4 Pamekasan, and senior high school 9 Surabaya, with a total of 133 students. This research instrument used a student response questionnaire with ease of use, interest, and usefulness indicators. Media and material experts then validate the physics domino card media that has been developed. This validation is to determine the feasibility of the media that has been developed. The validation category can be seen in Table 1.

Table 1. Criteria for validation test results.

Average score interval (%)	Category
81.25 < score ≤ 100	Very Worth it
62.5 < score ≤ 81.25	Worthy
43.75 < score ≤ 62.5	Less Eligible
25 < score ≤ 43.75	Not feasible

Source: Modification (Sugiyono, 2017)

After being validated, the domino physics media was tested limitedly in 3 different schools. The trial was carried out in the classroom by learning to use the media of domino physics cards. After the media was used, students were asked to fill out a response questionnaire regarding the media that had been used. The categorization of student responses is shown in Table 2.

Table 2. Student response category.

Rating Score	Category
4	Strongly agree
3	Agree
2	Disagree
1	Disagree

Source: Modification (Sugiyono, 2017)

The data analysis technique from this study's results was quantitative descriptive (Sugiyono, 2017). The average percentage results for each student response questionnaire indicator are then categorized based on Table 3. The guidelines for calculating the percentage of student response questionnaire scores are as follows (Sugiyono, 2017).

$$P = \frac{f}{N} \times 100\%$$

Information:
P = percentage number
f = score obtained by the respondent
N = Maximum score

Table 3. Percentage of student response scoring categories.

Average score interval (%)	Category
81.25 < score ≤ 100	Very good
62.5 < score ≤ 81.25	Well
43.75 < score ≤ 62.5	Not good
25 < score ≤ 43.75	Not good

Source: Modification (Sugiyono, 2017)

RESULTS AND DISCUSSION

Development of Web-Based Physics Domino Cards

The development of the web-based physics domino card game media is carried out using the ADDIE development model. Five stages must be carried out to develop a web-based physics domino card game media: Analyze, Design, Development, Implementation, and Evaluation. The advantage of the ADDIE development model is that there is an evaluation at each stage to minimize errors or product deficiencies at the final stage of this model (Sulastri et al., 2020). The analysis is the first stage performed. This process analyzes the state and specifications of the media required. At this stage, physical quantities and units are adjusted with the concept of domino card game media. Domino cards are games based on points or endols on the card's front side (Nurhamidin, 2019). So researchers have to modify the game based on principal quantities, including units, symbols, and dimensions. This study only uses base quantities without derivative amounts because they adjust to the number of domino cards, which generally consist of 28 cards in one set.

Design is the second stage of the media development process. In this process, the design of physics domino card media is carried out by the analysis in the previous stage. Next, design a physics domino card whose concept is almost identical to domino cards. Nevertheless, for this physics domino card, a bar code is added to each card's back to provide information regarding the image or writing on the front side of the

card. Digital technology has a better and more effective impact as a learning medium than other approaches (Wardani et al., 2017). The results of the design stage will be used as the basis for implementation in the development stage.

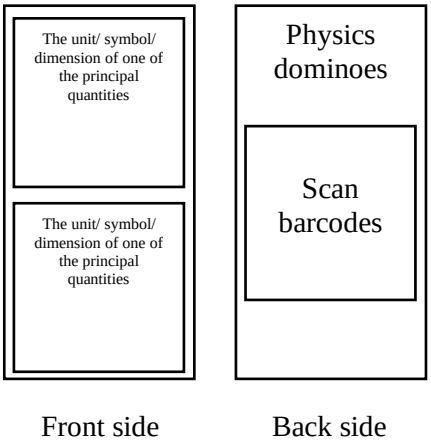

Figure 2. Side physics domino card design.

Development is the third stage in this development process. In this process, the researcher compiles and makes web-based physics domino cards whose concept is the same as domino cards in general, namely 28 cards in each set, and on the front side, there are two parts, namely the top and bottom (Eneng & Ruswandy, 2019; Faisal et al., 2021; Goadrich & Droscha, 2020; Mavros et al., 2022), while on the back side, there is a bar code that contains an explanation regarding what is on the front side of the card (Fitrah, 2020). The results of the development stage will be applied to the implementation stage.

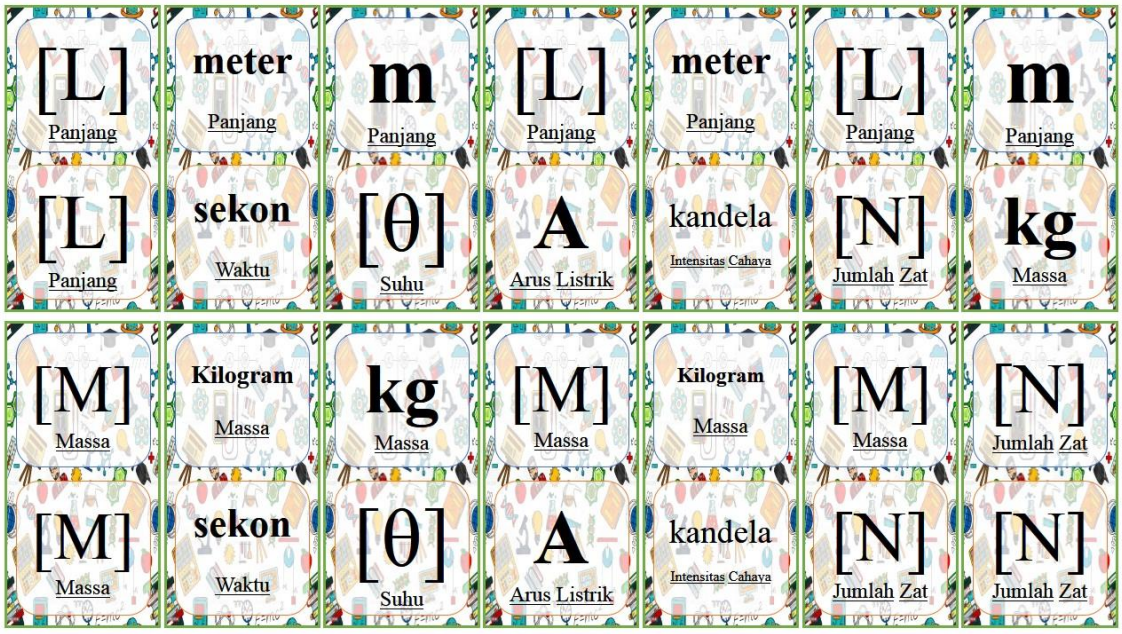

Figure 3. The results of the development of the front side of the physics domino 1.

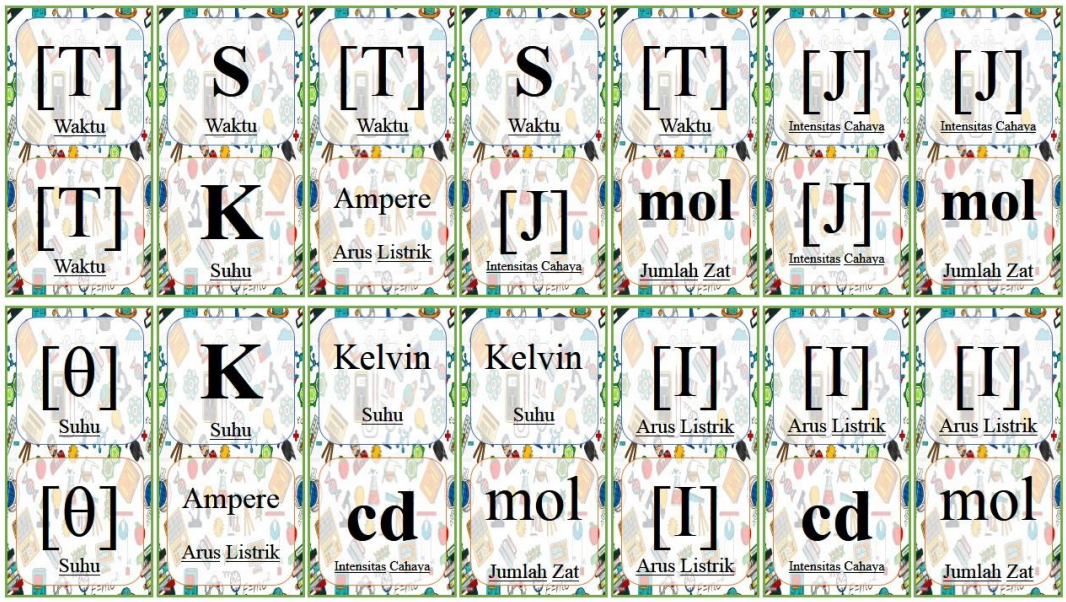

Figure 4. The results of the development of the front side of the physics domino 2.

Figures 3 and 4 are pictures of the front side of a domino card with a total of 28 cards. On the front side of the card are two parts, the top and bottom, which contain the symbols, units, and dimensions of the fundamental quantities. This section serves as a link from the first card to the next card during the game.

Figure 5. The results of the development of the physics domino card on the back 1.

In Figure 5 and Figure 6, the back of the physics domino card contains a different barcode for each card. The barcode is connected to the web, which contains an explanation or material related to the image on the front side. Implementation is applying the domino physics media developed in the scope of development. In testing the validity of the developed media, it is necessary to validate the developed media (Adawiyah & Kowiyah, 2021). Namely the scope of the expert validator (media and material) and trials on high school students or equivalent class X as users of web-based

physics domino card learning media. The results of this stage will be used as the basis for implementation in the following evaluation stage (Fadli, 2021).

Figure 6. The results of the development of the physics domino cards on the back 2

The results of validation calculations by two media validators can be seen in Table 4.

Table 4. Media aspect validation results.

	Assessment Aspects	Score	Category
1	Appearance	91,2	Very Worth it
2	Program	88,9	Very Worth it
Average		90,05	Very Worth it

Based on table 4 (Sugiyono, 2017), the physics domino card media obtains a very decent category value. The aspects assessed were the display and program of physics domino cards. Then, from the validation results from this media material expert, it obtained a score in the very decent category. The aspects assessed are content and presentation. The calculation results of the material validation assessment can be seen in Table 5.

Table 5. Material aspect validation results.

	Assessment Aspects	Score	Category
1	Fill	86,7	Very valid
2	Presentation	88,4	Very valid
	Average	87,55	Very valid

the web-based physics domino card media developed has been declared feasible. Furthermore, the media was tested limitedly on high school students of the same level (Setiawan et al., 2021). So that it will be seen how the process of using media directly in the field. Evaluation is the final stage in the development of this media, which is recapitulating the results of student response questionnaires that have used web-based physics domino cards. In the student response questionnaire, there are three indicators: the ease of use, interest, and usefulness of the media. Questionnaire data is in the form

of the average percentage of each indicator. Media evaluation is needed to find out the results of media trials that have been developed (Setiawan et al., 2021).

The results of the evaluation of the development of this media are related to the shortcomings of the media being developed (Setiawan et al., 2021). Namely in the form of a printout of web-based physics domino cards. The printing process for domino card media is still done independently using conventional printing tools, so the image quality still needs to be improved. The quality of the paper chosen still needs to be thicker so the cards are easily folded and even torn when played. It is necessary to improve the quality of print and paper on this web-based physics domino card so that this card can attract more students' attention.

Analysis of Student Response Questionnaires

Testing the domino physics media for students was carried out in three schools with a total sample of 133 students from grade X high school. Sampling was carried out in three schools, namely with the aim that students in each school have different backgrounds, namely schools based on Islamic boarding schools at AL Amien High School in Pamekasan and involving two state schools, namely Pamekasan State High School 4 and Surabaya State High School 9. Because school background greatly influences the mindset and habits of students at school (Novitasari & Septiana, 2021). This trial was carried out using students learning to use web-based physics domino cards on material quantities and units. Each class was divided into several groups consisting of 4 people. Each group is conditioned so that there are children who can understand how to play domino physics to make the game easier. Because playing dominoes in terms of dimensions and units is almost the same as playing dominoes in general (Fitrah, 2020).

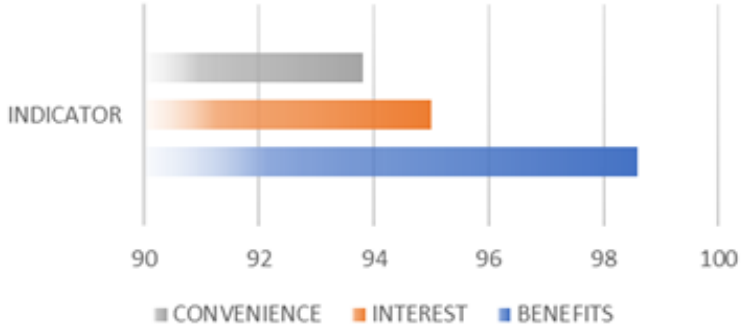

Figure 7. Percentage of student response questionnaires at AL Amien High School Pamekasan.

Based on Figure 7, it can be seen that the results of the average percentage of student response questionnaires after using the domino physics media in terms of quantities and units. Shows the results of the average percentage on the indicators of ease, interest, and usefulness of the media, all of which are in the very good category (Sugiyono, 2017). The ease indicators score 98.6%, interest 95%, and usefulness 93.8%. The lowest percentage is the usefulness indicator because this indicator contains a statement about the use of barcodes on physical quantities and units of domino cards. Moreover, during the trial in the classroom, students were not allowed to bring mobile phones because the school had a boarding school background (Cahyana et al., 2017; Cukurbasi & Kiyici, 2018; Hsieh & Tsai, 2017). So, when the learning process takes place, each group is lent

cell phones by the teacher and the companion team so that one group only has one cell phone. Currently, digital technology is very influential in learning (Wardani et al., 2017). A cellphone is needed to open the Bare Code link on the back of a physical domino card, size, and unit. Due to the limited cellphones in each group, students needed to be more optimal to try the barcode feature on physics domino cards.

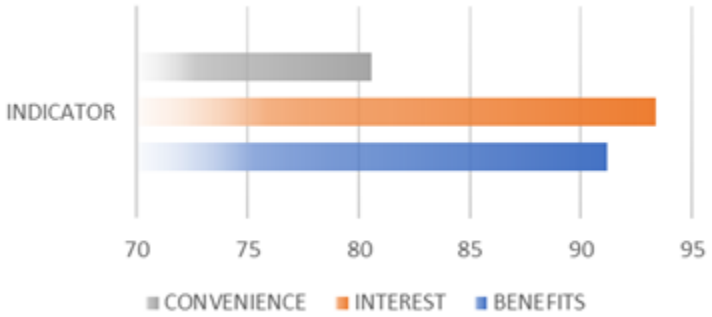

Figure 8. Percentage of student response questionnaires at State Senior High School 4 Pamekasan

In Figure 8, you can see the results of the average percentage of student response questionnaires after using the physics domino card media in terms of quantities and units. Shows the results of the average percentage on the indicators of ease, interest, and usefulness of the media, all of which are in the very good category (Sugiyono, 2017). The ease indicators scored 91.2%, interest 93.4%, and usefulness 89.4%. The lowest percentage is seen in the usefulness indicator, 89.4%. In this indicator, there is a statement about the usefulness of physical domino cards in terms of units and units. This is because the school rules at 4th state-SHS Pamekasan prohibit students from playing dominoes in class, so some students assume that playing dominoes does not have a good effect on learning physics. Then in Figure 9. You can see the results of the average percentage of student response questionnaires at SHS 9 Surabaya. Shows the results of the average percentage on the indicators of ease, interest, and usefulness of the media, all of which are in the very good category (Sugiyono, 2017). The ease indicators scored 83%, interest 81.7%, and usefulness 80.6%. The lowest percentage is seen in the usefulness indicator, which is 80.6%. In this indicator, there is a statement about the usefulness of physical domino cards in terms of quantities and units. This is because most students understand very well playing domino physics and understand the material of quantities and units, so the effect is insignificant for students at 9th state-SHS Surabaya.

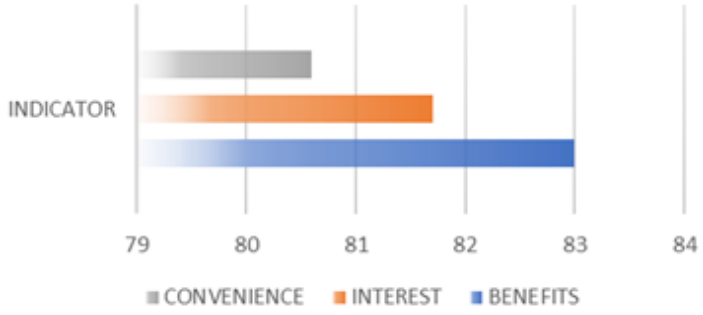

Figure 9. Percentage of student response questionnaires at State Senior High School 9 Surabaya

Overall the results of the percentage of student response questionnaires at Senior High School Al-Amien, Senior High School 4 Pamekasan, and Senior High School 9 Surabaya after using web-based physics domino card media belong to the very good category (Sugiyono, 2017). This web-based physics domino card game media helps students understand and remember fundamental quantities in terms of units, symbols, and dimensions (Etcuban et al., 2019; Herpich et al., 2017; Rachmaida & Mutiarani, 2022). Attractive and frequently used learning media will instill more vital material concepts in students (Ramadhan et al., 2020). Therefore, students will be more interested in learning and more easily understand the lesson when the learning process occurs.

CONCLUSION

This research succeeded in developing web-based physics domino cards on the subject matter of physics quantities and units of tenth-grade senior high school. One of the impacts of web-based physics domino cards on tenth-grade students is that students feel energized to study physics, especially in quantities and units. The validation results of the quantity and unit physics domino cards obtained a value with a feasible category. While the percentage of student responses from three schools, namely Al Amien High School, Pamekasan 4 Public High School, and Surabaya 9 Public High School, with indicators of ease, interest, and usefulness, obtained a very good category. The web-based physics domino card media on material quantities and units is very good and feasible. It can be further developed in physics subjects.

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