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Optical Games as Alternative Learning Media to Increase Students' Learning Interest in Interference and Light Diffraction Material

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ABSTRACT

The COVID-19 pandemic, which has occurred for more than two years, has affected all aspects of life, including the world of education. Along with the increasingly sloping case of the spread of the COVID-19 virus, now many schools are starting to re-implement the offline learning system. Students accustomed to learning with an online pattern must get used to returning to learning with an offline pattern. In this transitional period, of course, various problems arise, one of which is the decline in student interest in learning. This study develops one of the learning media in the form of an application game to increase student interest in learning. This study aims to determine the feasibility of game-based learning media to increase student interest in light interference and diffraction. The research method used is the research and development method with the 4D model method. The findings in this study are games can be used as an alternative learning media to increase students' interest in learning the material. Based on the stages that have been carried out, the results of the feasibility test of the Instagram comic learning media product are declared very feasible.

INTISARI

Pandemi covid-19 yang sudah terjadi lebih dari dua tahun ini telah mempengaruhi seluruh aspek kehidupan termasuk dunia pendidikan. Seiring dengan kasus penyebaran virus covid-19 yang kian melandai, kini banyak sekolah yang mulai kembali memberlakukan sistem pembelajaran secara luring. Siswa yang sudah terbiasa belajar dengan pola daring harus membiasakan diri untuk kembali melaksanakan pembelajaran dengan pola luring. Dalam masa peralihan ini tentunya muncul berbagai masalah, salah satunya adalah menurunnya minat belajar siswa. Penelitian ini mengembangkan salah satu media pembelajaran berupa game aplikasi untuk meningkatkan minat belajar siswa. Penelitian ini bertujuan untuk mengetahui tingkat kelayakan media pembelajaran berbasis game untuk meningkatkan minat belajar siswa pada materi interferensi dan difraksi cahaya. Metode penelitian yang digunakan adalah metode penelitian pengembangan (Research and Development) dengan metode 4D model. Temuan dalam penelitian ini adalah game dapat digunakan sebagai alternatif media pembelajaran untuk meningkatkan minat belajar siswa pada materi interferensi dan difraksi cahaya. Berdasarkan tahapan-tahapan yang telah dilakukan, hasil uji kelayakan produk media pembelajaran berbasis game ini dinyatakan sangat layak.

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A. Introduction

The COVID-19 pandemic, which has occurred for more than two years, has affected all aspects of life, including the world of education. Along with the increasingly sloping case of the spread of the COVID-19 virus, now many schools are starting to re-implement the offline learning system [1]. This follows the Circular Letter of the Minister of Education, Culture, Research, and Technology Number 2 of 2022 concerning Discretion in Implementing a Joint Decree of four Ministers on Guidelines for Implementation of Learning in the Covid-19 Pandemic Period, Limited Face-to-Face Learning (PTM) can be carried out with a total of 50 students. % (fifty percent) of the capacity of classrooms in educational units located in areas with Community Activity Restrictions (PPKM) level 2 (two) [2]. After almost two years of carrying out online learning, students need a re-adaptation process. Students who are used to learning with an online pattern must get used to returning to carrying out learning with an offline pattern. In this transitional period, various problems arise, and various obstacles arise such as decreased student enthusiasm for learning, less active students during classroom learning, and learning that is felt to be boring, causing a decrease in student interest in learning.

Based on research conducted by Sulistyorini [3] stated various obstacles experienced by students when the pandemic started, such as (1) The psychological condition of students who suddenly took a long vacation for fear of the impact of Covid-19, (2) Good learning resources. At first, students can borrow textbooks alternately automatically, but it can't be done, (3) The decline in students' critical thinking skills is due to adjustments from school activities to being at home, (4) The only source of learning at home is the internet, (5) Student practice facilities which are inadequate, (6) Almost all students in the class have smartphones but not all have applications that support and internet quota, (7) Students do not yet have awareness in collecting assignments given by the teacher. This was experienced by students for approximately 2 months, causing a decrease in student interest in learning. The decline in students' interest in learning after a long period of online learning requires teachers to innovate so that learning objectives can be achieved. One of the things that can be done to increase students' interest in learning is by implementing

Games is one of the alternative learning media. This is in line with research conducted by Sujalwo [4] one of the methods that can be used in game-based learning, namely the use of games as learning media. learning that includes cognitive, social, emotional, and physical development. According to Ramadhan, et al [5] , Learning games are game applications that contain educational materials or information. Some of the advantages that can be obtained by utilizing games as learning media include: (1) creating active learning because students as game players are required to complete tasks independently, (2) providing entertainment and different colors than just listening, and (3) provides direct examples of the topics studied [4].

Based on research conducted by Lutfia [6], it was found that light wave material contains the subject of light interference and diffraction which is one of the physics materials that are considered difficult for most students. Therefore, we offer a solution in the form of developing learning media in the form of application games to increase student interest in learning, especially on light interference and diffraction materials.

B. Method

This research is a type of research and development research that aims to develop the design of learning media in the form of application games to increase student interest in learning, especially on light interference and diffraction materials. The product produced in this research is a game application design called optics game. The development model that will be used in this research is the 4D model. The 4-D development method (Four-D model) is a model for developing learning tools [7]. This model consists of 4 main stages, namely define, design, develop and disseminate.

The first stage is define, the activities in this stage are initial - final analysis, student analysis, material analysis, task analysis, and specification of learning objectives. The problem that the researchers got after conducting the analysis was related to the lack of interest in student learning, especially after going through approximately 2 years of online learning. The second stage is design, the purpose of this stage is to produce a learning device design. The design of learning media that researchers want to develop is learning media in the form of optical games. This optical game contains material about physical optics that will be packaged in an interesting way.

The third stage is develop, in this stage the researcher makes designs related to learning media in the form of optical games. After making the optical design of the game, then we conducted a feasibility test to determine the level of optical feasibility of this game if it is used as an alternative learning media to increase student interest in learning, especially on light interference and diffraction materials. The method used is a survey by distributing feasibility test questionnaires to 30 respondents consisting of 30 students with the criteria of having studied light interference and diffraction materials. Filling out the questionnaire using Google Forms by ensuring that one respondent can only fill out the questionnaire once. The aspects that were tested were the media aspect, the motivation indicator aspect, the material aspect, and the design aspect. With the following assessment indicators:

Table 1. Feasibility Test Indicator

Aspect	Indicator
Material Eligibility	1. Content compatibility with interference and diffraction materials. 2. The level of ease of the material to be understood. 3. Feasibility of optical games as an alternative learning media to increase student interest in learning.
Language	1. The language used is easy to understand. 2. The language used is in accordance with PUEBI.
Media	1. Feasibility of display design. 2. Display color match.

As for this research only until the third stage of the 4D model research method, this is because the purpose of this study is only to determine the feasibility level of the game's optical design. The game optical feasibility analysis technique is used using SDi (ideal standard deviation). The assessment criteria based on the standard deviation can be seen in the table 2 below.

Table 2. Standard Deviation and Category

Quantitative score range	Category
$X \geq M\text{i} + 1,5\ SB\text{i}$	very feasible
$M\text{i} + 1,5SB\text{i} \geq X \geq M\text{i}$	feasible
$M\text{i} > X \geq M\text{i} + 1,5SB$	Not feasible
$M\text{i} + 1,5SB\text{i} > X$	Very unfeasible

The equation of the criteria above is then changed in a scale range of 1-4

$$\text{Mi} = 1/2\ (4 + 1) = 2,5$$
$$SB\text{i} = 1/2\ (4 - 1) = 0,5$$

Based on the assessment criteria for a value scale of 4, the assessment criteria for research are obtained in the tabel 3:

Table 3. Assessment Criteria and Category

Quantitative score range	Category
$X \geq 3,25$	Very feasible
$3,25 \geq X \geq 2,5$	feasible
$2,5 \geq X \geq 1,75$	Not feasible
$1,75 > X$	Very feasible

C. Results and Discussion

This study used the 4D model and limited to Development stage to determine the feasibility level of the game's optical design. The result of the learning media development in this study is a game design which was named "optics game". The physics material presented in the conversation was related to light interference and

diffraction. The following is a product design from the development of optical game learning media.

1. Media Preview

Figure 1. Media Preview of Optics Game

2. Help Page

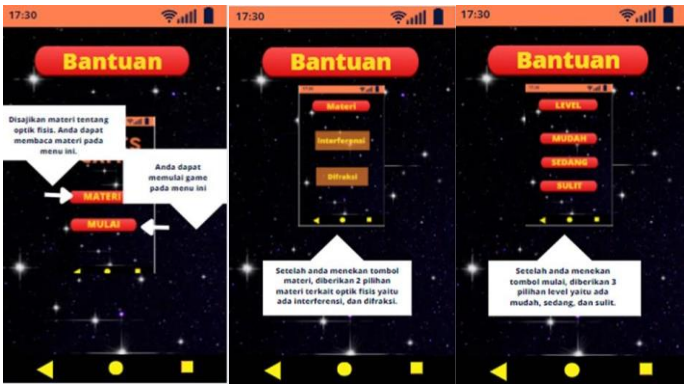


Figure 2. Help page of Optics Game

3. Material Page

Figure 3. Material Page of Optics Game

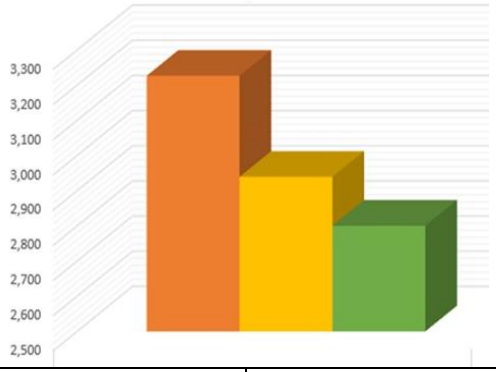
4. Physics Phenomena Page

Figure 4. Physics Phenomena of Optics Game

5. Evaluation

Figure 5. Evaluation Page of Optics Game

In this study, the feasibility of the optics game design was assessed based on the assessment of 30 respondents consisting of students with the criteria of having studied physical optical material related to light interference and diffraction. The aspects that were tested for feasibility were the media aspect, the language aspect, and the material aspect.



	media feasibility	3,227
	language feasibility	2,940
	material feasibility	2.801

Figure 6. Graph of Comparison of Feasibility Test

Based on all aspects of the assessment, the results obtained where the media feasibility aspect received the highest points of 3,227. This is because many examiners consider that the design of the optics game that we have developed is attractive so that it supports the learning process carried out. The feasibility aspect of the media being tested is related to the color and design of the game optics. The second highest aspect is the aspect of language feasibility by obtaining 2,940 points. Then the third aspect is the aspect of material feasibility with 2.801 points obtained. Aspects of the feasibility of the material, in this case, include the feasibility of the content of the material, the behavior of the ease of the material to be understood and the level of feasibility of the material to increase student interest in learning. Several examiners considered that this optics game was feasible of being used as an alternative media to increase students' interest in learning. This is in line with research conducted by Sujalwo (2017), one of the methods that can be used is game-based learning, namely the use of games as learning media. There are several suggestions from the examiners regarding the material that should be made more concise, providing more varied examples of images, using brighter colors, and also regarding choosing a more attractive font style.

From the results of the feasibility test, it can be seen that the optics game learning media is in the feasible category. Therefore, we hope that this research can be continued in the manufacture of products and can be widely published. So that later it can be used as an alternative to increase students' interest in learning , especially in light interference and diffraction .

D. Conclusion

The conclusions obtained from the research conducted are that the learning media in the form of optics game is used as an alternative learning to increase students' interest in learning about light interference and diffraction materials. The results of the feasibility test of the optics game product were declared eligible.

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