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Design of an Educational Learning Application to Increase Interest in Learning about Optical Instruments: A Feasibility Study

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ABSTRACT

TPACK is one of the methods in education that can utilize technology in the learning process. The TPACK method can be used to increase interest in learning physics, especially in the topic of optical instruments. Learning media can be created with an application-based learning design. The purpose of this research is to produce a viable application design that can enhance interest in learning about optical instruments. This research uses the 3-D research and development method, which consists of the stages of definition, design, and development. The research subjects are expert lecturers in the field of physics, physics practitioners, and students. The data in this study were collected by distributing a feasibility test questionnaire for the application design. The data analysis used SBi analysis. (Standar Baku Ideal). The results of the feasibility test obtained indicate that the design of the learning application falls into the very feasible category.

Keywords: Optical Instruments, Applications, Learning Media, Learning Interest, Feasibility Test

INTRODUCTION

PACK is one of the methods in education, which is an effort to prepare the next generation of the nation to face and welcome the developments of the times in the global era [1]. According to [2], education is also referred to as an effort carried out in a planned and conscious manner to create a comfortable and effective learning atmosphere and process. The goal of education is to actively enhance all the abilities within the students. Essentially, education can be realized through a more active and interactive teaching and learning process, so that they possess good skills, attitudes, and good intelligence [3]. The learning provided by educators can be implemented using several teaching methods, one of which is the TPACK method.

Technological Pedagogical Content Knowledge, commonly referred to as TPACK, is a theoretical framework that results from the development of Pedagogical Content Knowledge. (PCK). The combination of Pedagogical Knowledge (PK) and Content Knowledge (CK) requires educators not only to provide learning media but also to possess knowledge about teaching methods to create a conducive learning environment [4]. To achieve good teaching and learning activities, educators are required to master and understand the procedures for designing and implementing learning activities, one of which is by applying a structured learning device system based on TPACK [5].

The very dense structure of the physics curriculum and the presence of many abstract physics materials make educators seem lazy and unwilling to seek solutions related to learning media that can enhance student activity [6]. This reason causes educators to be accustomed to not planning the implementation of teaching [7]. With this problem, it can be seen that educators generally still use learning media in the form of presentation materials,

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which leads to boredom among students with teaching activities that seem monotonous [8].

Learning that seems monotonous makes the learning material difficult to understand. Students who lack interest in learning and experience difficulties in their studies ultimately achieve low academic results [9]. The low academic results are caused by the lack of interactive multimedia-based learning in the classroom [10]. The accuracy in selecting adaptive learning media using the application of various fields of science, knowledge, and technology makes the teaching and learning process run smoothly [11]. Because of this, an educator needs to choose and prepare interactive multimedia-based learning. With interactive multimedia learning, it will motivate and encourage students to speak, write, and learn, as well as stimulate their imagination [12].

An example of the development of multimedia learning is the existence of applications that can support the concept of learning through play [13]. Students will prefer to learn using various interesting and entertaining methods, but without leaving out the educational elements. Students tend to prefer following educational learning applications without leaving out the educational aspects [14].

pplication design that has been created. The researcher incorporates physics materials and concepts into the optical instruments material to attract students' interest in learning and enhance their abilities and understanding of optical instruments. The materials that can be included in the educational application design are optical instruments such as sensory organs like the eye, lenses, mirrors, cameras, microscopes, magnifying glasses, telescopes, and periscopes. From the presentation of these materials, it is hoped that students will become more familiar with and understand the uses and workings of optical instruments. With the presence of this educational learning application, it is also hoped to attract students' interest in learning and change their mindset about physics, which was previously considered complicated, into a subject that is easy, interesting, and more enjoyable. Interest in learning physics material can be measured by several indicators, including interest in the material, feelings of enjoyment, attention, and involvement in learning [15].

RESEARCH METODH

This research uses the 3-D development method, which has been reduced from the 4-D development. The development design begins with the definition stage, then moves to the design stage, and finally the development stage. (develop). The 3-D model was chosen and used as a reference for the research because it aligns with the design of the learning media to be developed, as it is easy to understand, systematic, simple, and involves experts to assess its feasibility.
This research has three stages as follows.

Figure 1. Modification of the 3-D Development Model

The first stage of this research is definition (define). This stage aims to determine the content of the learning media to be created by referring to and considering the needs of the students. At this stage, a learning application will also be provided as a solution, tailored to the problems and conditions experienced by the students. This stage will also involve the formulation and design of learning indicators, learning competencies, materials, and the content of the learning application design. The implementation of this stage will continue to pay attention to and

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consider the current curriculum and regulations regarding the learning system.

The second stage of this research is design. This stage consists of the design and development of the design in a massive and structured manner. The designs to be created in this phase include main and supporting designs. The main designs to be created are the main display design, home display design, material design, educational games design, and various other designs. Then, supporting designs will be provided, such as supporting buttons like the next button, finish button, and other buttons.

In the development stage, it consists of feasibility testing by several experts. The feasibility of the learning application design will be evaluated by 2 expert lecturers and 2 practitioners (teachers) in the field of Physics. In addition, a questionnaire was distributed to 77 university students and high school students to gauge their responses to the learning application design. The feasibility test of the application design has the following instrument grid.

Table 1. Blueprint of the Feasibility Test Instrument for Learning Application Design

Material Feasibility Test		
No.	Aspek	Question
1	material/content	The alignment of the material with basic competencies
2		The alignment of the material with the indicators
3		The alignment of the material with the curriculum
4		The explanation of the material is easy to understand.
5		The question is in accordance with the material.
6	Presentation	The illustration presented is in accordance with the material.
7		The material is presented in a sequential manner.
8		The learning media that has been prepared is already systematic.
9		Consistency in presentation systematics
Language Suitability Test		
No.	Aspek	Question
1	Language	The language used is clear and precise.
2		The language used is in accordance with PUEBI
3		The arrangement of words in language use
4		The language used is appropriate for use.
5		The language used is easy to understand.
6	Write Structure	Relevance of subtopic order
7		The material is easy to read.
8		Consistency of terms/spelling used

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9		Clarity of structure in writing
10		Typography specifications for application content in font usage
Media Feasibility Test		
No.	Aspek	Pertanyaan
1	Design	Font size compatibility
2		The color combination used is attractive and suitable.
3		The image display used is in accordance with the theme.
4		The quality of the application's design display is attractive, creative, and dynamic.
5	Layout	Suitability in image placement
6		Regulation on the layout of symbols and text

This research will collect data using the questionnaire method. The questionnaire will be used to assess the feasibility of the educational learning application development design. This questionnaire is used to evaluate the learning application design based on feasibility tests from experts, practitioners, and responses from students or learners.

The questionnaire will then be analyzed to determine the feasibility of the educational application design. This questionnaire uses a Likert scale. According to the explanation [16], the Likert scale is used to measure opinions, attitudes, and views of others regarding social events. Then the data analysis used employs SBi analysis. (Simpangan Baku Ideal).

Tabel 2. Score and criteria

No.	**score**	**criteria**
1	$x > \bar{x}_t + 1{,}8\ SBi$	Sangat Layak
2	$\bar{x}_t + 0{,}6\ SBi < x \leq \bar{x}_t + 1{,}8\ SBi$	Layak
3	$\bar{x}_t - 0{,}6\ SBi < x \leq \bar{x}_t + 0{,}6\ SBi$	Cukup Layak
4	$\bar{x}_t - 1{,}8\ SBi < x \leq \bar{x}_t - 0{,}6\ SBi$	Kurang Layak
5	$x \leq \bar{x}_t - 1{,}8\ SBi$	Sangat Kurang Layak

The average component score can be calculated using the following formula:

$$\bar{x} = \frac{\sum x}{n}$$

Then, to convert the score, it can be done by:

Using the equation to calculate the ideal average :

$$\bar{x}_t = \frac{1}{2}(skor\ maksimum\ ideal - skor\ minimum\ ideal)$$

maximum score ideal:

$$Skor\ maksimal\ ideal = \sum butir\ kriteria \times skor\ tertinggi$$

minimum score ideal:

$$Skor\ minimal\ ideal = \sum butir\ kriteria \times skor\ terendah$$

a) Use Formula to find standard deviation (SBi).

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$$SBi = \frac{1}{6}(skor\ maksimum\ ideal - skor\ minimum\ ideal)$$

find criteria result score look tabel 2.

RESULT AND DISCUSSION

The definition stage is carried out by identifying and formulating the problems experienced by students and also occurring in the educational environment. The identification and formulation activities yielded results indicating that the problem at the school is that physics learning, such as optics material, appears monotonous and difficult to understand due to the lack of variation in the use of learning media. After identifying the problem, the researcher narrowed it down to the material on optical instruments. To address this issue, the researcher created a learning application design that could help enhance learning. Subsequently, the objectives were specified, aiming to produce a suitable application design to increase interest in learning about optical instruments. Then, the identification of learning indicators, learning competencies, and learning materials to be included in the design of the learning application was also carried out.

The design phase is carried out by creating the learning application design with several features such as the initial display, home, usage instructions, developer information, material display design, educational game design, and several other displays. In addition, in this section, the design and formulation of questions to be used as exercises are also carried out. The initial design results of the application, particularly the initial interface, will be shown as follows.

Picture 2. Application Home Screen

The design of the my optik application includes various features within it. In this application, there is an information feature that will inform users about how to use the application. Additionally, this application also includes developer information, application information, and user profiles that will make it easier for users to find information about the application.

Picture 3. Design Home to Aplication

The design of this application is in line with previous research from [17] that discusses optical learning applications. However, the design of this application has a more comprehensive content with a combination of materials, practice questions, and educational games. In this application design, learning competencies, materials, summaries, practice questions, games, and references are presented and can be easily accessed. The games in this application also feature three different types:

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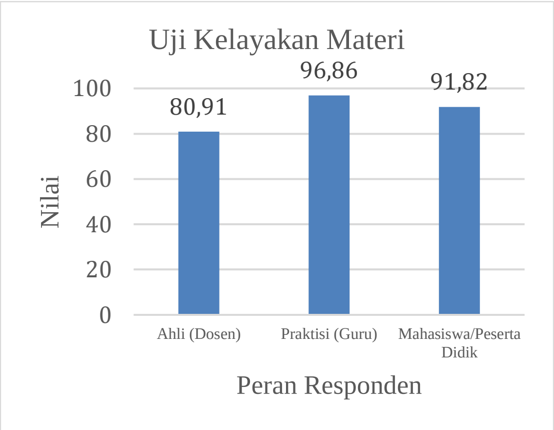
super optical games, optical puzzles, and find the optical word.

After the design phase is completed, a feasibility test on the educational application design is conducted by experts, practitioners, and students/university students. The validators of the application design are 2 physics experts (lecturers), 3 physics practitioners

Table 3. Score and criteria

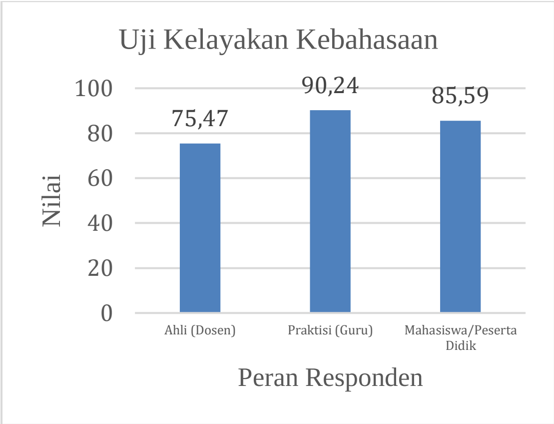
No.	Result	criteria
1	$x > 83,94$	Sangat Layak
2	$67,98 < x \leq 83,94$	Layak
3	$52,02 < x \leq 67,98$	Cukup Layak
4	$36,06 < x \leq 52,02$	Kurang Layak
5	$x \leq 36,06$	Sangat Kurang Layak

Here is a recap of the feasibility test of the content, language, and media from the educational learning application design to increase interest in learning about optical instruments. The results of the feasibility test of the educational learning application design will be presented in the following diagram:



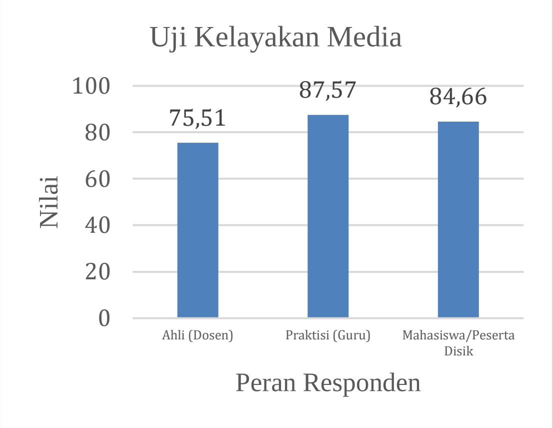
Picture 4. Results of the Material Feasibility Test

Based on Figure 4, it can be seen that the lecturer gave a feasibility score of 80.91, which means it falls into the acceptable category, practitioners (teachers) gave a score of 96.86, which falls into the very feasible category, and students/learners had a feasibility score of 91.82, which also falls into the very feasible category. On average, the material feasibility test received a score of 89.86, which falls into the very feasible category. Respondents stated that the material provided in the learning application design was in accordance with the existing basic competencies and lesson indicators.



Picture 5. Result from Responded

Based on Figure 5, it can be seen that the feasibility test from the lecturers received a score of 75.47, which means it is feasible, practitioners (teachers) scored 90.24, which falls into the feasible category, and students/learners scored 85.59, which falls into the very feasible criteria. If the average score of the linguistic feasibility test is calculated, it received a score of 83.77, which falls into the feasible criteria. According to the respondents, there are still several elements that need to be improved, such as language and word usage to align with PUEBI.



Picture 6. Media Feasibility Test Results

Based on Figure 6, it can be seen that the lecturer's assessment received a feasibility score of 75.51, which falls into the feasible category, the practitioner (teacher) received a score of 87.57, which falls into the very feasible category, and the students/learners received a score of 84.66, which also falls into the very feasible category. When the average score is calculated, the media feasibility test received a score of 82.58, which falls into the feasible category. According to the respondents, there are still several designs that need improvement, especially in the media design used, to make it more harmonious and appealing. Based on the research, a feasibility test on the learning application design conducted by experts, practitioners, and students/college students resulted in an average feasibility score of 85.40 for the learning application design. Based on the overall average results of the feasibility tests on content, language, and media in the learning application design, it falls into the very feasible category. A learning application design can be considered feasible if it falls into the categories of fairly feasible, feasible, and very feasible. This means that the designed learning application has been aligned with and meets the aspects of content, language, and media. The results indicate that the design of the learning application is very suitable for use with some revisions. The results of the feasibility assessment on the educational learning application design have not yet reached 100% because there are still some shortcomings. There are several comments from the respondents of the feasibility assessment regarding the design of the educational learning application. In terms of content and presentation, it is still considered too lengthy and dense, so it needs to be revised. Then, in terms of language and writing structure, there are still some words that do not conform to PUEBI and some typos. Furthermore, in terms of design and layout, there are still some shortcomings, such as the font being somewhat too formal, the color combinations on each page being less suitable, and the images used not being varied. With these shortcomings, revisions are still needed to perfect the design of the application-based learning application on optical instruments to attract interest in learning. This educational application design can be used to attract interest in learning the material, participation in learning, and the desire to always learn. This research aligns with [18] which developed that digital media has a significant impact on increasing learning interest.

The design of this educational game application can optimize educators' time in explaining the material structurally. Furthermore, students will find it easier to grasp the material through the design of this educational game application because they will not be burdened solely by the material. Learning that involves educational applications will be more efficient because students will not feel overwhelmed. Teachers can encourage students to gather as much learning material as possible from experiences, books, and the content of this game application, so that the learning process using the game method shows how well the students

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understand the material. The design of this learning application has been able to increase interest in studying optical instruments. This can be proven by the comments from respondents in the questionnaire who stated that the design of the application was able to increase their interest in learning. The design of the application has also increased interest in learning because it has met the indicators of interest in the material, feelings of happiness, attention, and involvement in learning. Students and university students who filled out the questionnaire admitted that they were interested in the material and the design of the application that had been created. They also felt happy, focused their attention, and planned to use this application design for their future learning.

CONCLUSION

Based on the research results, it can be concluded that the educational learning application design is suitable for use, indicating that the learning application design is capable of increasing interest in learning about optical instruments. With a good and attractive learning application design, many people will be more interested in learning about optical instruments. Overall, the learning application design can be adjusted and revised to improve its delivery. It is hoped that the learning application design can increase interest in learning about optical instruments.

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