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Development of Phymol Integrated Media (Physics Mobile Learning) on Temperature and Heat in High School Physics Learning

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Abstract

This study aims to develop learning media in the form of learning videos of Phymol (Physics Mobile Learning) Integrated Games on the material of Temperature and Heat. The research method used is the R&D (Research and Development) research method with the ADDIE development model, including the stages of Analysis (analysis), Design (design), Development (development), Implementation (implementation) and Evaluation (evaluation). In this study, the product was validated using an expert validation instrument which was distributed to two lecturers and three teachers and a limited trial was conducted using student response questionnaires. The results of product validation show an average percentage of 92% with a very feasible category. The limited trial conducted by the researcher involved 30 students of SMA Negeri 5 Cilegon. Student responses showed an average percentage of 86% with a very good category. Based on the results of expert validation and student response questionnaires, physics learning media in the form of Phymol learning videos (Physics Mobile Learning) integrated Games on Temperature and Heat material is very feasible and can be used as a physics learning medium.

Keywords: *Phymol, Integrated, Media, Mobile, Learning*

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1. Introduction

The rapid development of technology in the 21st century is fairly fast, even to all corners of the world. Advances in technology and information, provide changes to human lifestyles, both in terms of work, socialization, playing and learning. The entry of technological advances in various aspects of life, including in the field of education, both educators and students are required to have the ability to learn and teach in accordance with developments in the 21st century [1]. Teachers as educators must be able to prepare their students to live in the digital age, one of which is using learning media in learning activities by utilizing technology systems to facilitate student experiences.

One of the technological developments that are familiar among the public is the use of *Android* - based *smartphones* . The use *of* this *smartphone* is considered to be able to interfere with one's activities, if the smartphone is only used to play *games* or *social media* [2], [3] especially for students. It's different during this pandemic period, all members of the community, including employees, students and college students, require using a *smartphone* to carry out their activities. For students learning that should be done face-to-face has to be done online (in a network).

Likewise for private employees, educators and others who require them to work from home. In this case, the use of *smartphones is* currently used not only as a communication tool, but is widely used as a learning medium [4].

The use of *smartphones* in education makes this device used as an alternative to learning activities in terms of media development [5], [6]. The use of *smartphones* in education is known as *Mobile Learning (m-Learning)* . According to [7], [8] the use of *Mobile Learning* technology can make a good contribution to students in accessing materials, sources and even learning media. In addition, the existence of *smartphones* used in education can make technology like this have a central role so that it can be used to provide information to students through this *Android* -based *smartphone* device [9], [10]. This is also accordance with [11] which states that the existence of learning media that utilizes *smartphone* technology can provide opportunities for students to be able to develop learning through searching from the internet.

The result of observations activity at SMA Negeri 5 Cilegon during this pandemic, learning activities were carried out using *smartphones,* this was due to the demands of online learning (in the network). However, the learning activities carried out at SMA Negeri 5 Cilegon are only limited to Whatsapp groups. so that learning activities rarely use learning media. Some teachers use learning media in the form of Video, Power Point to deliver the material. However, the learning videos provided only utilize sources from *YouTube*. Not infrequently, students are bored in learning activities, because teachers who only provide material are then given assignments. In this case, the learning carried out is less effective, especially in physics subjects, many students do not understand the material given, because the teacher only provides material in the form of formulas. The learning outcomes obtained by students are also quite low, especially in the matter of Heat and Temperature.

The concept of temperature and heat is one of the physics materials in high school that must be understood by students. To make it easier for students to understand it, students must experience it themselves in the form of observing and practicing directly the problems regarding the concept. The application of temperature and heat material that is often found in everyday life and not all of these concepts can be presented directly into the classroom for students to observe. Therefore, it needs to be videoed, so that students are able to understand the concepts of temperature and heat.

The development of media by utilizing *smartphone* technology has been carried out by many other researchers. However, in previous studies, the material presented was only limited to explanations such as on *powerpoint* slides . This causes a lack of student understanding of the learning provided by the teacher. In addition, learning physics in particular needs a concrete understanding. So this allows researchers to develop an application that utilizes *smartphones* packaged in the form of learning videos.

Based on the description above, the application of learning videos that utilize *smartphone* technology is one way to motivate students to take part in learning according to the material provided by the teacher [12]. The addition of *games* in learning videos is also an alternative for teachers to overcome student boredom. Therefore, it is necessary to develop learning media in the form of integrated learning video games on temperature and heat material that are packaged using an application that can be accessed using a smartphone for each student. Thus, the researchers chose a study about development of integrated Phymol (*physics mobile learning*) learning videos on games on temperature and heat learning materials.

2. Methods

The research method used is the *Research and Development* research method, which is a research method that produces a product, it can be in the form of modules, models or others, besides that there is also the effectiveness of the products that have been made [13]. The product here is defined as a product in the form of hardware or software, such as interactive learning models, guidance models and others [14]. This development research is an educational development research, the purpose of which is to develop a video learning Phymol (*Physisc Mobile Learning*) Integrated Games on Physics material in high school, especially on temperature and heat material. This research includes several processes, including the development process, product validation, and product readability testing.

The product produced in this research is an application called "PHYMOL *(Physics Mobile Learning)* ". This research procedure uses the ADDIE development model, the ADDIE development model is a development model consisting of 5 stages, namely: (1) *Analysis* , at this stage is a needs analysis in the form of literacy studies about *Smart Apps Creator* media as a support for making applications , then analysis of learning materials, and environmental analysis according to the product to be developed. (2) *Design* , at this stage is the design stage of the product to be developed. (3) *Development* , at this stage is the process of realizing the design that has been designed into a real product. (4) *Implementation* , at this stage the application of the product that has been developed, in this research the implementation stage is only limited to testing in small groups. (5) Evaluation, at this stage the process is shown to see how the products that have been developed have been successfully made and are suitable for use or not.

The location of this research is SMA Negeri 5 Cilegon, which is located on Jl. Sunan Bonang Link. Hamlet Kel. Banjarnegara Ciwan and Cilegon City, Banten. In this study, the subjects of the research trial were 30 students of class XI MIPA. The existence of this stage is carried out to determine the response of students to the developed Phymol application. In addition, the object of this research is an integrated Phymol Learning Video *game* to help physics learning activities on temperature and heat material.

Data collection techniques used by researchers are as follows: (1) Interview, In this study, the researcher conducted an interview with Mr. Agus Setiawan, as a physics teacher at SMA Negeri 5 Cilegon, with the aim of knowing the problems that occur in physics learning activities. (2) Observation Observation is carried out during learning activities. The aim is to find out the models and methods used by teachers in learning activities, especially in learning physics. In this study, observations were carried out at SMA Negeri 5 Cilegon. (3) Questionnaire or questionnaire. The questionnaire used in this study is an expert validation instrument sheet and a questionnaire to determine student responses to the developed learning media.

The data collection instruments in this development research are as follows: (1) Interview Guidelines. Interviews are structured, and the research and development interview process is carried out openly. So in this case, the interview guide only contains the essence of the interview regarding the problems that occur in classroom learning activities. (2) Observation Guidelines. This observation was carried out to find out about the completeness of facilities and infrastructure, models and methods, the use of media and student attitudes towards learning carried out in the classroom.

The existence of an observation sheet is used by researchers as a reference in developing media that can be used in the learning process. (3) Instrument Validation Sheet. The use of this validation questionnaire is filled out by media experts, material experts, which in this questionnaire are closed in nature. The use of this questionnaire aims to get advice and value from experts regarding the product being developed. (4) Student Response Instrument Sheet. The student response questionnaire was used when testing the product being developed. The aim is to find out the responses regarding the media products developed, and filled in by students [11].

Data analysis techniques are very important in the scientific method, because with data analysis, we can find out whether the data can be given meaning or meaning that is useful in solving problems of a research [12]. The data analysis technique used in this research is quantitative data analysis technique. Where, the assessment data obtained from the results of the validator and questionnaires or student response questionnaires which were analyzed descriptively qualitatively. The assessment of the validator's results will be used as a reference for revising a product to be feasible. The product design that has been developed will be assessed by the validator using a validation instrument. In addition to the validation instrument, the reference used as an assessment of the learning media that has been developed by the researcher is the student response questionnaire instrument, which then the results of the assessment of all aspects will be measured using *a Likert scale. Likert* scale is a measurement scale in the form of a number of positive or negative statements towards an attitude object [13].

In this study, the answers to the validation instrument items were grouped into five choices. Each indicator will be measured and given a score on a scale of 1-5 in accordance with the guidelines for assessing the feasibility of a learning media that has been prepared by the researcher. In addition, each indicator of the student response questionnaire will be given a score of 1-5 scale, namely 5 (strongly agree), 4 (agree), 3 (disagree), 2 (disagree), and 1 (strongly disagree).

3. Results and Discussion

The results of this development research are (1) a learning media in the form of an *Android* application called Phymol *(Physics Mobile Learning)* which contains video *games* integrated learning on the subject of Temperature and Heat, (2) an assessment of the feasibility of Phymol learning media by media experts and experts. material, (3) student questionnaire data on phymol learning media. The first step used in conducting this research is to determine potential problems and collect data. After these steps are carried out, researchers can begin to design and develop phymol learning media.

This media has been developed and researched using the ADDIE development model which consists of five stages, namely *Analysis*, *Design*, *Development*, *Implemetation*, and *Evaluation*. However, in this study, the *implementation* stage was not carried out, because at the trial stage it was limited to small group trials, namely the XI IPA class students of SMA Negeri 5 Cilegon. After carrying out these stages, learning media in the form of applications are produced in the form of phymol learning videos *(physics mobile learning)* integrated games on temperature and heat material. The following Figure 1 are the results of the development of a Phymol learning video *(Physics Mobile Learning)* integrated with Games on the Material of Temperature and Heat.

Start page view and menu page view

Learning Video Display

Games Page View

Quiz Page View

Score Gain Page View

Info Page View

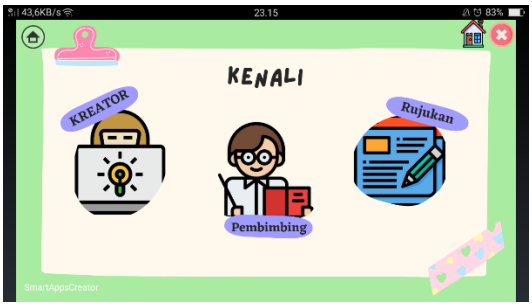

Figure 1. Results of Phymol Learning Video Development

In this study, validation was carried out by five expert validators who provided an assessment based on aspects of the assessment including: content feasibility aspect, feasibility of presentation aspect, language eligibility aspect, aspect of contextual assessment, aspect of feasibility of graphics. Expert validation result show overall average 92% on valid criteria. In addition to being presented in tabular form, the following are the results of validation by experts related to media developed by researchers, which are presented in Figure 2.

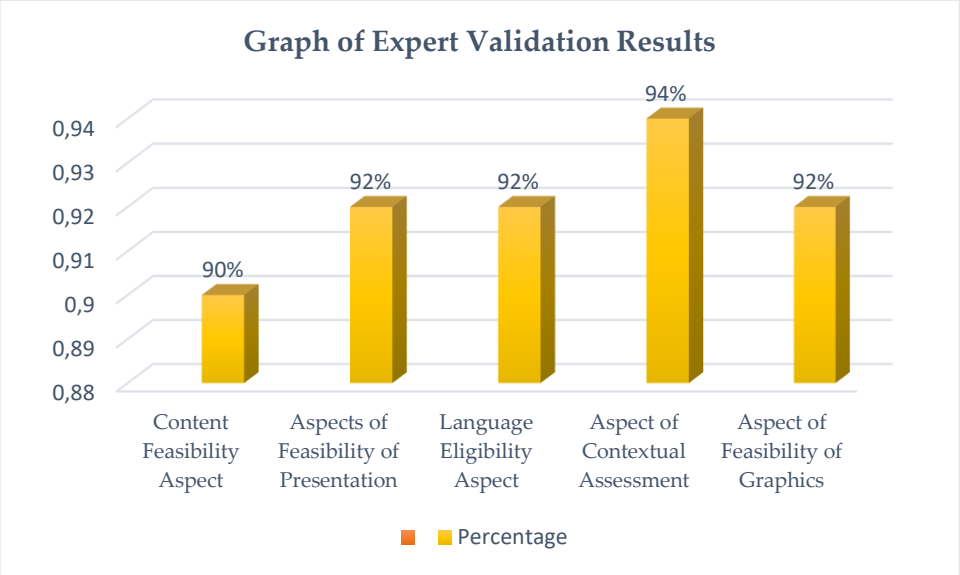

Figure 2. Graph of Expert Validation Results

The results of student responses related to physics learning media in the form of learning videos of Phymol integrated games on temperature and heat material including three assesment aspect, skill 86% in very good category, contents 84% in very good category, and language 89% in very good category. In addition to being presented in tabular form, the assessment of student response questionnaire results is presented in Figure 3.

Designing an integrated learning media phymol games on temperature and heat material is one of the interactive learning media that can be used by students in learning activities that are intended so that students understand more about learning materials, especially on temperature and heat material. In addition, students are not easily bored in participating in learning activities because in this phymol learning media, several games are connected that can be played by students. In addition, in the phymol learning media there is a quiz which is used to find out how far the students' understanding has been after doing their special learning on temperature and heat material.

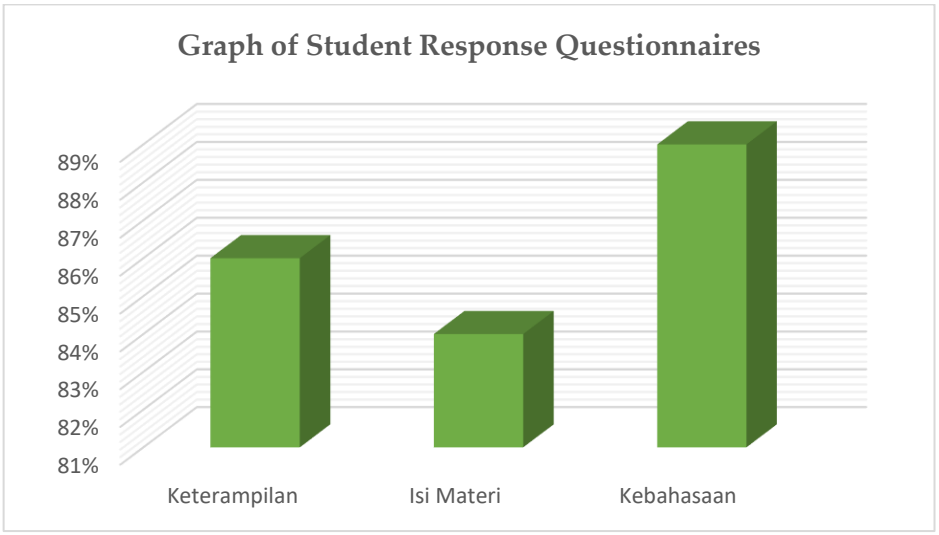

Figure 3. Graph of Student Response Questionnaires

The beginning of making this phymol media is to conduct an analysis related to media needs, analysis of learning materials that will be used as the subject of making this phymol learning media, as well as conducting an environmental analysis of what media have been used in learning activities, especially in physics learning. The material chosen is Temperature and Heat, which contains learning videos presented in the form of pictures, illustrations and animations that are related to everyday life and are equipped with examples of questions and their discussions. The process of making phymol media is adjusted to the initial design that has been made at the *Design* stage .

Based on the results at the *Design* stage that has been carried out, it was found that this phymol learning media product has the advantage that in this application an explanation accompanied by animation and pictures related to everyday life can support students' explanations so that they understand more about learning concepts, especially on material. temperature and heat. Then this phymol application is accompanied by games and quizzes. This game can support students so they don't get bored easily in participating in learning activities. In addition, the quiz is here to test students' conceptual understanding skills after studying temperature and heat. After the media creation process in *Smart Apps Creator is* done, publish the file as an .apk extension. this is done so that the media can be run on mobile phones with *Android OS* to facilitate the learning process.

From the initial product that has been made, media validation tests have been carried out by experts with the aim of knowing the feasibility of learning media based on rational thinking. The assessment was carried out using a validation instrument. This assessment was conducted to determine the suitability, advantages and disadvantages of the developed media. If there are still deficiencies in the learning media, a revision and review of the learning media will be carried out based on the assessment as well as comments and suggestions from experts.

The results of the expert's assessment show that the learning media is feasible to use in learning as shown in table 4.9, with a media feasibility percentage of 92% with a very feasible category. Several experts gave suggestions and comments on the phymol learning media. One of them is Dr. Lukman Nulhakim, M.Pd who is a lecturer from the Science Education study program as validator 1, who provides suggestions regarding additions on the first page by including the name of the phymol media owner, the material being the subject of the discussion and including the supervisor. In addition, it is necessary to add a prologue or prefix sentence on the *games* and *quiz* pages that are used to inform phymol media users regarding the games to be played and the quizzes that will be done. Then, Cecep Faturrohman, S.Pd as validator 5 who is a teacher from MA Al-Inayah Cilegon, gave suggestions regarding the buttons used must be in accordance with their uses. This limited trial was carried out by distributing response questionnaires to students who were attended by 30 students of class XI IPA SMA Negeri 5 Cilegon. Based on the responses from students, the percentage of student responses to the phymol learning media was 86% with very good criteria, as shown Figure 3.

The final result of the validator's assessment of the experts regarding learning media in the form of the development of integrated learning video games on temperature and heat material, has met the criteria for being eligible to be used as learning media, so that further limited trials can be carried out on students. This result is in line with research by [15] has studied development electronic teaching media with local Kalimantans wisdom. Research by [16] development of android-based comics integrated with scientific approach in physics learning. Based on the results of research and data analysis can be concluded that the "Development of Video Learning PHYMOL *(Physics Mobile Learning)* is integrated *Games* on material temperature and heat" is already fit for use as a support for learning in physics on the subject of temperature and heat.

4. Conclusion

Based on the results of research and development of integrated Physics Mobile Learning Games on temperature and heat material, it can be concluded that the Phymol learning media was developed with reference to the ADDIE development model which includes the Analysis, Design, Development stages.), Implementation (implementation) and Evaluation (evaluation).

Based on the results of the research on the average feasibility value by experts, phymol media is categorized as very feasible, with a percentage of 92%. And the results of the limited test through the questionnaire instrument for student responses obtained an average score of 86% with a very good category which was carried out at SMA Negeri 5 Cilegon.

Based on the test results, the physics learning media in the form of Integrated Phymol (Physics Mobile Learning) Games learning videos on temperature and heat material is declared very feasible to be used as physics learning media in high school / MA, especially class XI on temperature and heat material.

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