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DEVELOPMENT OF LEARNING MEDIA AND ONLINE TEST BASED SMARTPHONE ANDROID IN PHYSICS LEARNING ON WORK AND ENERGY TOPIC

Muh. Makhrus[1*], Joni Rokhmat[2], Kosim[3], and Ahmad Harjono[4]
[1,2,3,4]Science Education Study Program, Postgraduate Program, University of Mataram, Mataram, Indonesia
[1,2,3,4]Physics Education Study Program, Faculty of Teacher Training and Education, University of Mataram, Mataram, Indonesia
*Email: makhrus.fkip@unram.ac.id

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Abstract. Technological developments affect the development of learning. Along with this, the development of covid throughout the world makes learning required to present creative learning with innovative media. This research aims to develop learning media and online HOTS tests based on smartphone android in physics learning. This research using a procedural model. The analysis in this development research uses ideal standards to analyze the validation or feasibility of the physics learning media. The media and online HOTS tests were analyzed by 4 experts in the field of physics education. The results of the analysis show that the learning media is categorized as feasible or valid based on three categories, namely in terms of the media display, software, and material.

Keyword: *Learning Media, Online Test, Smartphone Android, Work and Energy*

INTRODUCTION

The rapid development of information technology has an impact on the learning system, especially in science learning. Learning now leads to the use of interactive learning media according to the times. The challenges of 21st century learning also affect the implementation of the learning carried out. This 21st century science learning is directed to prepare students to face global challenges [1]. This poses a challenge for educators to create interesting learning according to technological developments and the times.

Along with that, the COVID-19 pandemic that has occurred in the world has also made the learning system change from face-to-face to online learning. This online learning has several weaknesses, especially in science learning because it is limited to providing material without any detailed explanation. As it is known that science learning is more specifically physics learning has many abstract concepts. Online learning that has occurred so far is only limited to providing materials and assignments by teachers to students so that learning becomes monotonous and uninteresting [2]. Along with this, the development of smartphones among students is so rapid. The phenomenon that is really felt today is that people tend to spend time with their Android smartphones, especially among students [3].

In this case, an innovation in the use of learning media is needed that is able to foster student interest and attract students' attention to be active in online learning. The use of learning media is expected to be able to support students' independent learning and is one way to improve the quality of learning [4]. One example of a suitable learning media is learning media based on smartphone android. The use of learning content. The use of this learning media based on smartphone android makes it easier for students to learn without being bound by space and time. It is also can make learning persuasive and increase student learning motivation [5]. Learning media based on smartphone android has the advantage of being easy to access, efficient, and attractive. Media like this is also a fun learning media innovation in exact learning such as physics [6].

HOTS online tests also need to be developed to complement the learning media. The HOTS online test combined with learning media based on smartphone android is able to minimize the occurrence of cheating during tests so that educators have valid data regarding students' abilities [7]. Based on the results of these problems, this study aims to develop learning media and HOTS online tests based on smartphones android.

RESEARCH METHODS

This research uses a research development model that aims to produce certain products. The products referred to in this research are learning media and online HOTS tests based on smartphones android in physics learning especially on topic work and energy. The product is made using several software such as powerpoint, ispring suite 10, and web 2 apk builder. Powerpoint works as software that is used to design learning media so that it is simpler than using other software or applications. Furthermore, after the media is finished, the HOTS online test is inserted into the media using the ispring suite 10 software The type of development research used is a procedural model consisting of three stages, namely: the planning stage, the development or production stage, and the assessment or evaluation stage [8]. At the planning stage, products in the form of

learning media and smartphone-based HOTS online tests were made based on the results of the needs analysis into the initial design. The design stage includes the preparation of product development guidelines, preparation of learning media and HOTS online tests, and fixation of the initial design of the product. At the stage of product assessment or evaluation, it is carried out by 4 experts in the fields of physics and physics education. The assessment is carried out in three categories, namely in terms of media appearance, software, and material. Product feasibility analysis is carried out using the following formula.

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

Description

$\bar{X}$ = Average score

n = Data total

$\sum x$ = Score total

The average score from the results of the 4 expert assessments is then interpreted into Table 1 below.

Table 1. Product Quality Category

No	Value range	Category
1	$\bar{X} \geq Mi + 1.8\ \text{SB}i$	Very feasible
2	$Mi + 0.6\ \text{SB}i < \bar{X} \leq Mi + 1.8\ \text{SB}i$	Feasible
3	$Mi - 0.6\ \text{SB}i < \bar{X} \leq Mi + 1.8\ \text{SB}i$	Decent enough
4	$Mi - 1.8\ \text{SB}i < \bar{X} \leq Mi - 0.6\ \text{SB}i$	Less feasible
5	$\bar{X} \leq Mi - 1.80\ \text{SB}i$	Not feasible

This learning media contains material, sample questions, animations/videos, and HOTS online tests. This HOTS online test refers to Bloom's taxonomy, namely C4 (analysis), C5 (evaluation), and C6 (create).

RESULT AND DISCUSSION

Based on the objectives of this research, learning media based on smartphone android has been developed on the material of work and energy. The software used to develop the media and HOTS online test is PowerPoint, ispring suite 10, and web 2 apk builder.

Planning stage

This stage contains several activities, namely needs analysis, compiling an outline of media content, selecting materials, and designing drafts of learning media based on smartphones android [9-10]. A needs analysis was carried out through observations in the school environment where the research was conducted as well as through literature studies. The results of the needs analysis show that learning media based on smartphones android are needed. These results form the basis for the preparation of the media.

Development stage

This stage contains the initial product development of learning media based on smartphones android which will later be used in learning. The results of the development of android-based learning media can be seen in the following picture 1.

This learning media can only be used on smartphones that use the Android system. This learning media is equipped with animations and videos as well as evaluation questions that are useful for determining students' abilities [11-13]. Student test results on the media will be recorded or sent to the maker's email of media and the HOTS online test.

Assessment and evaluation stage

This activity contains an assessment or evaluation of learning media which aims to determine the feasibility of the learning media. The teams of evaluators or validators in this learning media are 4 lecturers (experts) in the field of physics education. In learning media [14-15], the four experts assessed three aspects, namely 1) media display consisting of 6 indicators, 2) software consisting of 2 indicators, 3) material consisting of 5 indicators. The results of expert assessments related to learning media are presented in table 2.

Table 2. Validation Results of Learning Media Based on Smartphones Android

Aspect	Number of Indicators	Validation Score				Average	Category
		V1	V2	V3	V4		
Media Display	6	21	18	20	20	19.75	Feasible
Software	2	8	7	7	7	7.25	Very Feasible
Material	5	19	15	17	19	17.5	Very Feasible

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Figure 1. Prototype of learning media based on smartphones android. (a) Cover, (b) menu display, (c) sample content, (d) initial display of the HOTS online test, (e) questions for evaluation.

The results of the assessment of the four experts showed that the learning media was included in the category of appropriate use in the lesson based on the three aspects assessed. However, there are several inputs from the validator that serve as material for improving and perfecting learning media such as correcting typos, using colors that are too contrasting, increasing the size of the text, and reducing the number of images or animations that do not match the material. Overall, the expert considered that the learning media and the HOTS online test based on smartphones android had an appeal when used in learning. This is in line with previous research which says that android-based media can motivate students in learning. Media like this can also be used in online and offline connection conditions [16-21]. Furthermore, regarding the assessment of the HOTS online test instrument, the results of the expert assessment are presented as follows table 3:

Table 3. Validation Results of HOTS Online Test Based on Smartphones Android

Type of Test	Validator	Score	Criteria Validity	Decision
Multiple Choice	V1	2.67	Feasible	Feasible to use after minor revision
	V2	3.55	Very Feasible	
	V3	3.11	Feasible	
	V4	2.67	Feasible	

Based on the results of the assessment, it was found that the HOTS online test was feasible to be tested in research after making several minor/minor revisions. In line with that, online tests based on smartphones android make it easy for teachers to evaluate learning because test results are recorded quickly and easily [10].

CONCLUSION

Learning media based on smartphones android on the topic of work and energy is suitable for use in learning. Media like this is able to make learning interesting so that it helps students understand the material when learning online during the COVID-19 pandemic. The HOTS online test provided also

makes it easier for educators to conduct tests and evaluations related to students' abilities.

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