

## CREATION OF ANDROID-BASED MOBILE LEARNING MODULES USING GUIDED INQUIRY MODELS FOR HIGH SCHOOL PHYSICS MATERIALS

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### ABSTRACT

*Technological developments have an impact on the world of education. Especially since Covid-19 hit Indonesia, it is known that direct learning is diverted to online learning, based on observations in the high school of 2 Pariaman, the learning media used is too monotonous and does not involve students actively in building their knowledge. The solution to this problem is the creation of android-based mobile learning modules using guided inquiry models for high school physics materials. The purpose of this study resulted in an android-based mobile learning module using a guided inquiry model for valid high school physics materials. The type of research conducted is Research and Development (R&D). The model used in this study is the four D model (4D model) developed by Thiagrajan. In this study is limited to the develop stage, so it only goes through 3 stages, namely define, design and develop. The data analysis techniques used are quantitative descriptive statistics and qualitative data analysis. The data obtained from this study comes from a validity test through a validation sheet. Based on the results of validation by experts using aiken's V formula, the average value of total validation in all aspects is 0.7 with a high category. From this research, it can be concluded that the android-based mobile learning module using the guided inquiry model is in accordance with the curriculum used and is suitable for use in schools.*

**Keywords:** Module Mobile learning; Inquiry guided, Aiken's V; 4D model.



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## I. INTRODUCTION

Along with the development of the times and the era of globalization which is characterized by the rapidness of products and the use of technology, the development of this technology provides convenience to humans to carry out all activities. daily activities. One example of technological development is smartphones. Nowadays everyone who shares a layer of society has a smartphone because this technology is very helpful and beneficial for human life. However, not all Indonesian people are able to make good use of this technology.

The development of Science and Technology (IPTEK) which is increasingly advanced must be utilized by educators in the education environment. The development of Information and Communication Technology (ICT) is happening so fast that it changes people's mindset in finding and getting information. The field of education is one of the areas that have been impacted by technological developments [1]. The implementation of the 2013 Curriculum emphasizes the use of ICT as a learning medium. This makes a teacher required to master ICT in learning.

The use of ICT in learning has several advantages, learning using ICT is able to help learners describe something abstract for example by using images, photos, videos, animations, charts, schemas, etc. Similarly, in complex materials, it must be explained in a simple way and the level of thinking of learners, so that it becomes easier to understand [2]. Submission of information is the focus of multimedia use with the aim of being easily accessible, easily used repeatedly and can be used by every individual [3].

Android-based learning media can support students in the physics learning process or activities [4]. The use of an android smartphone application can increase the learning independence and understanding of students' concepts [5]. It can improve students' creative thinking skills and problem-solving abilities [6]. The development and use of Android-based learning media can improve students' understanding [7]. Android-based learning media was developed in line with the development of the internet and technology [8]. Android-based learning media makes students accept interactivity, accessibility, and comfort from the system [9].

Curriculum is a tool used to achieve education and implementation guidelines for all levels of education. In 2013 the Indonesian government designed the 2013 curriculum as a further step of the development of the KTSP curriculum. Indonesia has used the curriculum system in the implementation of education both at the elementary level to higher education.

Law No. 20 of 2003 on the National Education System explains that the curriculum is a set of plans and arrangements regarding the objectives, contents, and lesson materials and ways used as guidelines for the implementation of learning activities to achieve certain educational goals. Based on this understanding, there are two dimensions of the curriculum, namely: first about the rules and plans regarding the purpose, content, and material of the lesson, while the second is the steps or ways used for the learning process.

Physics is the subject that is the basis of the creation of technology as we find it today. Many discoveries are applicative in nature which is basically from the understanding of physical concepts. Physics subjects give birth to a lot of technology that can help in facilitating every business in human life, therefore physics learning is a very important learning. It is important to be learned and understood by learners in the middle class [10]. Physics learning is the activity of studying symptoms or phenomena that occur in the universe, especially those close to daily life. Physics as part of science is essentially: (1) body of knowledge, (2) way of thinking, (3) way of investigating about the universe, (4) interactions with technology and social [11]. Physics learning provides ability to someone regardless of gender in order to have knowledge and problem solving skills in the era of globalization in the 21st century [12]

Since the beginning of Covid-19 hit Indonesia, it is known that direct learning is diverted to online learning / distance learning. Based on observations made during the educational field practice at 2 Pariaman High School, information was obtained that learning was carried out through edmodo. Learning resources used in the form of Power Points. Learners are asked to study the material from Power Point, after which the teacher gives some exercise questions related to the material. Occasionally the teacher also gives learning videos from youtube. From the learning resources used, it can be seen that there is no opportunity for learners to explore and develop their abilities because learners only read Power Points and watch videos given by teachers. The learning resources used also tend to be monotonous and do not involve learners actively in building their knowledge. As a result, the achievement of the goal of learning physics becomes not optimal. In addition, the observations revealed that during the learning process it turns out that there are still many learners who have not mastered the elasticity material and hooke law is proven by still relatively low learning outcomes in the material.

Regulation of the Minister of National Education Number 16 of 2007 concerning Standards of Academic Qualifications and Teacher Competencies which states that teachers must be able to use learning media and learning resources relevant to the characteristics of learners and subjects that are covered to achieve learning goals as a whole.

Therefore, it is necessary to find the right solution so that the above problems can be resolved. One of them is by developing and designing a relevant teaching material such as an android-based mobile learning module. Android-based mobile learning modules are developed to keep learners actively involved in the learning process and can develop learners' abilities even if learning takes place online. Modules are a set of teaching materials that are presented systematically so that users can learn with or without a facilitator/teacher [13]

In addition to using android-based mobile learning modules, the learning model largely determines the success of the learning process. One of the learning models that can be combined with this module is guided inquiry. Guided inquiry is a learning model that can improve students' learning outcomes by designing and discovering physical concepts themselves will make the material longer stored in the student's memory. In the guided inquiry the role of students is more dominant and students are more active while teachers direct and guide students in the right direction [14].

It is undeniable that the world is getting more and more rapid development. No exception for the world of education. In the next few years along with the development of technology, distance or online learning can be carried out thoroughly, not only because of Covid-19. Therefore, educators must prepare and familiarize themselves with various technological developments in the world of education. With the pandemic that has changed all learning activities from face-to-face methods in the classroom to online methods / distance learning,

then this is the right time for educators to be able to develop an interesting, innovative and information technology-based learning activity and can facilitate the needs of students even if they cannot meet in person.

The effort that can be done to overcome the above problems is to use concise teaching materials, one of which is a mobile learning module in the form of an interactive media application that can be operated through an android-system smartphone device. Android is one of the mobile operating systems that grew in the middle of other operating systems that are developing today. Android is the operating system that people are most interested in because it has advantages such as open source properties that give developers the freedom to create applications [15] This is certainly very good and makes it easier for teachers to prepare teaching materials, and learners when using them during the learning process. The purpose of the research to be achieved in this study is to produce android-based mobile learning modules using guided inquiry models for high school physics materials that valid.

## II. METHOD

This type of research used is research and development or research and development (R & D). The research used is a scientific method to research, design, produce and test the validity, practicality and effectiveness of The resulting product [16]. Development research is a method of producing a particular product or refining an existing product and testing the effectiveness of that product. Four D Model (4D model) consists of four stages, namely: define, design, develop, disseminate [17]. In this study, researchers limited it only to the validation stage. The research object is an android-based mobile learning module using a guided inquiry model for high school physics materials on elasticity matter and hooke law.

a) This defining stage is carried out to define learning needs using android-based mobile learning modules using guided inquiry models. This stage includes five main steps, namely: (1) front end analysis; (2) student analysis; (3) task analysis; (4) concept analysis; (5) specification of learning objectives. b) The design phase aims to design teaching materials in the form of android-based mobile learning modules using guided inquiry models based on analysis results Define stage. c) The development phase aims to produce android mobile learning module using a guided inquiry model that has been revised based on input from experts. This stage consists of three steps, namely validity test, revision and trial. d) The stage of dissemination, the approval of this stage is to disseminate the teaching materials that have been made. But for this stage the researcher did not do it, because it was limited to the validation stage by experts only.

The research instrument used consists of validity instruments. These validation test sheets are organized based on the categories specified for the module. The validity instrument is in the form of questionnaire filled by experts consisting of four components. Each component has an assessment indicator.

Descriptive statistics is a data analysis technique used in this study is by analyzing validation. Weighting using the likert scale. The value obtained for each component using aiken's V formula [18].

$$V = \frac{\sum s}{[n(C-1)]} \quad (1)$$

where

$$s = r - l_0 \quad (2)$$

Information:

V= expert deal index

$l_0$  = lowest scoring number (e.g. 1)

C = highest number of assessments (e.g. 4)

r = the number given by the appraiser

n = number of respondents/ appraisers

After the results are obtained, quantitative data is converted into qualitative data with eligibility criteria, can be seen in Table 1.

**Table1.** Eligibility criteria  
Validity    Category

>0,80-1,00	Very high
>0,60-0,80	High
>0,40-0,60	Medium
>0,20-0,40	Very low
>0,00-0,20	Invalid

(Source: [19])

### III. RESULTS AND DISCUSSION

#### A. Research Results

The results of this study are in the form of teaching materials, namely android-based modules using guided inquiry models for high school physics materials, using 4D models (four models). The 4D model consists of four main stages: (1) Define; (2) Design; (3) Develop; and (4) Disseminate. Researchers limit the development stage to this study only to the develop stage. This is due to limited time and cost.

The data assessing the validity of android-based mobile learning module products using the guided inquiry model that has been developed is obtained from questionnaires distributed to experts. The assessment was carried out by 3 validators who were physics lecturers who were experts in their fields. The validity test on this product consists of five components, namely the feasibility component of content, presentation, language, infographics, and software utilization.

The first component is the feasibility of content. The assessment results of each assessment item are changed to a score. The validation value is placed on the x-axis and for each indicator of the assessment item is placed on the y-axis. The results of the data plot are displayed in Figure 1.

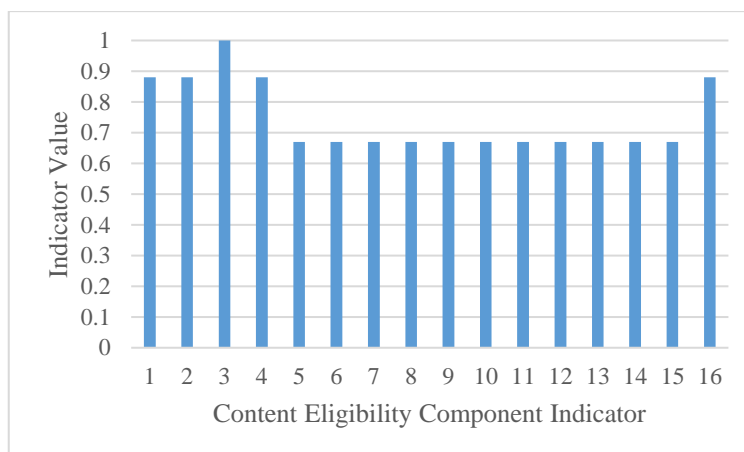
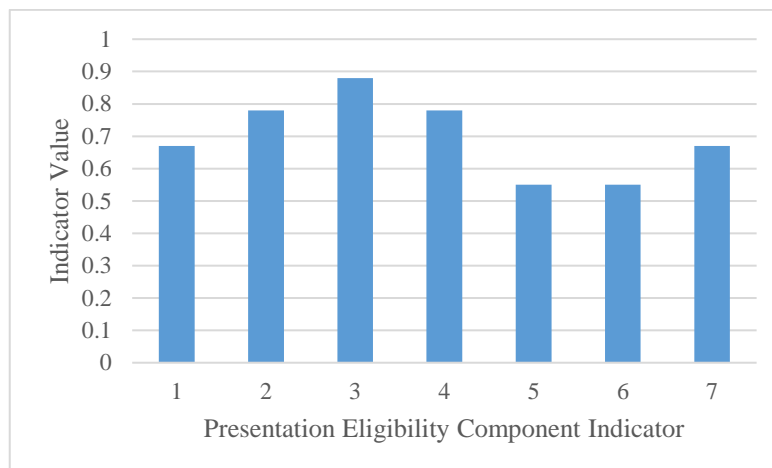


Fig. 1. Content eligibility validation results

Based on the analysis of the data in figure 1 it can be explained that the values on the feasibility component of the contents vary from 0.6 to 1. The average in this component is 0.74 with a high category. The value can already be considered to have the validity of adequate content eligibility.

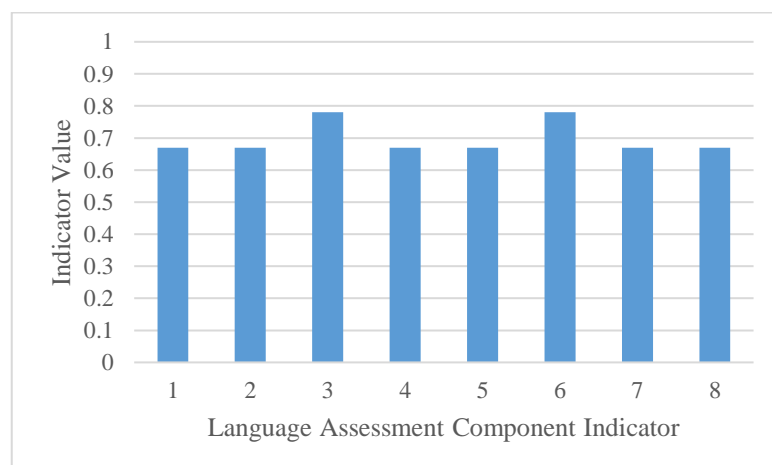
The second component is the feasibility of presentation. The assessment results of each assessment item are changed to a score. The validation value is placed on the x-axis and for each indicator of the assessment item is placed on the y-axis. The results of the data plot are displayed in Figure 2.



**Fig. 2.** Results of validation of presentation eligibility

Based on the analysis of the data in figure 2 it can be explained that the values on the feasibility component of the presentation vary from 0.5 to 0.9. The average in this compound is 0.69 with a high category. This value can already be considered to have the validity of adequate presentation eligibility.

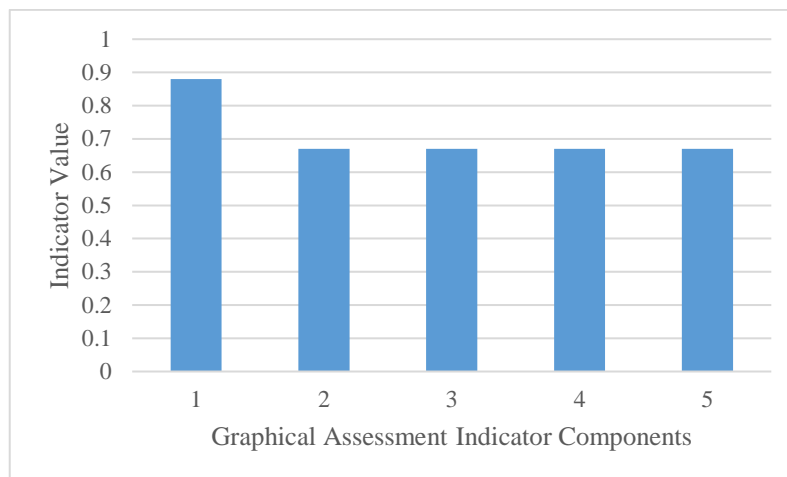
The third component is language assessment. The assessment results of each assessment item are changed to a score. The validation value is placed on the x-axis and for each indicator of the assessment item is placed on the y-axis. The results of the data plot are displayed in Figure 3.



**Fig. 3.** Language assessment validation results

Based on the analysis of the data in figure 3 it can be explained that the values on the feasibility component of the language assessment vary from 0.6 to 0.8. The average in this compound is 0.69 with a high category. Such values can already be considered to have the validity of adequate language assessment.

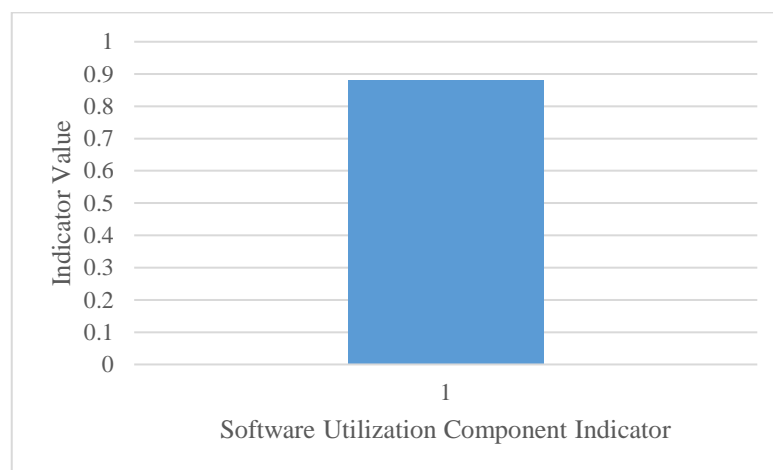
The fourth component is a graphic component. The assessment results of each assessment item are changed to a score. The validation value is placed on the x-axis and for each indicator of the assessment item is placed on the y-axis. The results of the data plot are displayed in Figure 4.



**Fig. 4.** Graphic component validation results

Based on the analysis of the data on figure 4 it can be explained that the values on the graphical components vary from 0.6 to 0.9. The average in this company is 0.71 with a high category. Such values can already be considered to have adequate validity of graphical components.

The fifth component is software utilization. The assessment results of each assessment item are changed to a score. The validation value is placed on the x-axis and for each indicator of the assessment item is placed on the y-axis. The results of the data plot are displayed in Figure 5.



**Fig. 5.** Software utilization validation results

Based on the analysis of the data in figure 5, it can be explained that the value in the software utilization component is 0.88 with a high category. This value can already be considered to have the validity of adequate software utilization.

### *B. Discussion*

The results of the preliminary analysis for developing the module are reviewed from the initial-end analysis, learner analysis, task analysis, concept analysis and learning objective analysis [20]. The first aspect results in an assessment of the learning process carried out by teachers in the school. The second aspect analyzed is the characteristics of learners, which is done by interviewing physics teachers about the characteristics of learners, including academic ability, motivation and learning outcomes of learners and others. The next aspect that is carried out is the analysis of tasks, concepts and learning goals that will be achieved by referring to the revised 2013 curriculum syllabus.

In the design stage, the module is developed by taking into account the characteristics of self instructional, self contained, stand alone, adaptive and user friendly [21]. The development of this module uses a guided in-curricular learning model consisting of 6 syntaxes. The first syntax is the formulation of problems in which it contains initial problems that will be solved by students by giving questions in accordance with problems close to the life of learners who refer to the material learned. The issues raised should be contextual and close to learners or problems can also be found by learners through reading materials or activity sheets. The second syntax is to

create a hypothesis in which students submit temporary answers that are relevant to the problem and which are the priority of the investigation. The third syntax is to design an experiment in which learners prepare tools and materials that will be used to conduct experiments. The fourth syntax conducts an experiment to obtain data in which learners conduct experiments to collect the data or information needed to test the proposed hypothesis. The fifth syntax is collecting data and analyzing data in which students write the data obtained and convey the results of the data collected. The sixth syntax is to make a conclusion in which learners describe the findings obtained based on the results of hypothesis testing.

After the module product is developed based on its components, a feasibility assessment of the product is carried out from the aspect of its validity. This assessment is obtained using the assessment instrument given to validators who are experts in their fields. The assessment instrument given to the validator is a validation instrument in which there are 5 aspects that will be assessed, such as the feasibility of content, presentation, language, infographics and software utilization. Based on the results of validation by experts, it was obtained that the product developed was declared valid for use in the learning process, with a total validation average value in all aspects of 0.74 with a high category. In the eligibility component, the contents of the assessment results from validators obtained validation of 0.74 with high categories. In the feasibility component, the presentation of the assessment results from validators obtained validation of 0.69 with a high category. In the language assessment component, the assessment results from validators obtained validation of 0.69 with high categories. In the infographic component, the assessment results of validators obtained validation of 0.71 with a high category. In the software utilization component, the assessment results from validators obtained validation of 0.88 with high categories. This data shows that android-based mobile learning modules using guided inquiry models are in accordance with the curriculum used and developed and are feasible to use in schools.

When conducting this study found several limitations, one of which is that this research is only traced to the validity stage. In conducting the validity test, the mobile learning module is based on android by three validators. It is expected to other researchers who will use this product to conduct practicality and effectiveness tests.

#### IV. CONCLUSION

Based on the results of the research conducted, the conclusion can be stated that the validity value of the android-based mobile learning module uses a guided inquiry model for SMA / MA physics materials developed with a 4D model of 0.74 with a high category.

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