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Development of E-Module Learning Media on Android-Based Alternating Current Materials to Improve Student's Critical Thinking Ability

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Abstract

This study aims to determine the feasibility perception of the development of android-based e-module learning media. This research is a continuation of previous research, which is limited to the analysis stage. The research method used is descriptive and is part of research and development (RnD) with the ADDIE model. This media consists of concept maps, material descriptions, learning videos, worksheets, and practice questions that are packaged in such a way that students can be more active in the learning process in class. The research instrument used was a validation sheet consisting of validation by material experts, media experts and linguists. The results of expert validation obtained a percentage of 84% and the results of student perceptions obtained a percentage of 82% in other words this e-module is feasible to use.

***Keywords**: Android, E-Module, Flip Pdf Corporate, Learning Media*

A. Introduction

Human resources are very important to advance a country. One of the important efforts in improving and developing the quality of human resources is quality education. Various new breakthroughs are needed as an effort to improve the quality of education. The world of education cannot be separated from the learning process which includes teachers, students, and the learning environment that influence each other. There are many fields that take advantage of this technological development, which has already been mentioned, namely in the field of education [1]. Considering that the learning process has changed due to ICT, ICT-based learning is defined as an effort to unite information and communication technology in a new learning culture that utilizes electronic devices, both analog and digital, such as the use of mobile phones, personal computers, tablets and laptops, both stand-alone and use an internet connection.

Along with technological developments and conditions that are still in the era of the Covid-19 pandemic or "New Normal" civilization, forcing education to leave the old learning concept that still relies on 100% face-to-face interaction between educators and students, shifting to using information and communication technology (ICT) bases [2]. The education unit decided to work from home (Work From Home) so that the learning process was carried out online or distance learning. Online learning is expected to be able to grow the ability, knowledge and potential of students as well as learning in the classroom. To support this, it is necessary to use learning media that are dynamic and able to explain conceptual material and apply it to facts [3].

The development of increasingly advanced technology, of course, affects various sectors of human life. This development also plays a role in the development of a learning media. According to (Arsyad, 2011) in [4] Learning media is an inseparable part of the teaching and learning process in order to achieve educational goals in general and learning objectives in schools in particular. Learning media is needed in helping teachers deliver learning materials. Learning media is becoming more interesting and more concise even though it does not reduce the essence of the material [5]. Learning activities become more alive with the media. To improve the learning atmosphere morelively is a supporting factor for learning itself. One of the factors that support the quality of learning is the availability of adequate learning resources and media.

One of the learning media that is in accordance with the development of the 21st century is media that can be accessed by smartphones. Learning media that is operated on a smartphone device with the Android operating system. According to StatCounter (2015) currently, the Android operating system is the most popular operating system and is widely used by the public, especially among high school students. This

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statement is in line with (Anggraeni & Kustijono, 2013) in [6] Android is the most popular operating system in the community because it has advantages such as the nature of open source which gives developers the freedom to create applications. Android users in Indonesia until June 2015 reached 65.9% of all smartphone users [7]. The function of the Android operating system is to connect the device with various applications, so that users can run applications to help with work or daily needs [8]. Based on these results, it can be concluded that android is familiar in life, especially in the world of education so that it can be used as a learning medium.

Physics is a natural science that studies matter and describes how the universe works [9]. According to (Wijayanti, Maharta, & Suana, 2017) Physics is a branch of natural science that is supernatural in nature and difficult to visualize in real aspects. Learning physics at this time still has several problems, including the results and learning motivation of students in learning physics is low. In addition, learning physics is classified as difficult material so that students have difficulty understanding physics concepts [10]. One of the physics materials that is said to be difficult to learn is the alternating current electric material which is taught to class XII high school students.

The results of observations, interviews and the distribution of questionnaires can be drawn previously by Oktavia, et al (2022) regarding the Analysis of the Response Needs of High School Students and Teachers of South Bengkulu Regency to the Development of E-Modules for Alternating Current Electricity Materials, it can be concluded that at SMAN 1, SMAN 6 and SMAN 7 in Bengkulu Selatan district requires an android e-module learning media to support the student learning process.

Based on the description described above, it is necessary to develop learning media, namely an Android-based electronic module. This module discusses physics material about alternating electric current because this material is generally difficult for students to learn. It is hoped that this android-based electronic module can attract the attention and interest of students to learn and understand the concepts of physics correctly. This study was conducted to determine the results of the validation and students' perceptions of the e-modules that have been developed.

B. Research Methods

This research is a research and development (Research and Development) with the ADDIE model. The ADDIE model has five stages, namely, Analyze, Design, Development, Implement, Evaluation. The development carried out is the manufacture of learning media in the form of an android-based e-module with alternating current material for high school students.

This research was conducted in Bengkulu Selatan district from July to December 2021 with the research population taken, namely students from SMA N 1, SMA N 6 and SMA N 7 in Bengkulu Selatan for the analysis stage. After developing the learning media, validation tests were carried out by material, language and media experts and continued with testing students' perceptions of product development. Validation test and perception test were conducted using google form.

The data obtained through the assessment instrument at the time of the trial were analyzed using statistics to find out further data. The results of data analysis are used as the basis for revising the developed product. The feasibility questionnaire was filled out by a physics lecturer at Bengkulu University and a high school physics teacher with three aspects, namely aspects of material presentation, media, and language. Furthermore, the calculation of each item statement is carried out. Each item of the questionnaire based on the answers of the teacher and students is processed using the following formula:

$$P = \frac{\sum Scrore}{Score\ Maxsimum} \times 100\%$$

After obtaining the percentage of the teacher's answers through the formula above, then the next step is to analyze the results of calculating the percentage [11]. After knowing the results of the percentage obtained, it will be adjusted to the eligibility criteria as shown in the following table:

Table 1. Eligibility

Percentage	Interpretation
0% - 20%	Very inappropriate / very invalid / very suitable for use

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Percentage	Interpretation
21% - 40%	Inappropriate/invalid/inappropriate to use
41% - 60%	Sufficiently appropriate/sufficiently valid/enough to be used
61% - 80%	Appropriate/valid/fit to use
81% - 100%	Very appropriate / very valid / very suitable for use

From the data from this interpretation, the Android-based E-Module learning media can be said to be feasible or not to be used.

C. Results and Discussion

The development of an android-based e-module with alternating electric current is an adaptation of the development of the ADDIE model. The development of the ADDIE model consists of the design Analysis, Design, Development, Implementation, and Evaluation stages [12].

The analysis phase is carried out to obtain data as an initial step in development. At the analysis stage, the thing to do is to obtain information. Information gathering consisted of literature study, field survey, needs analysis, and curriculum analysis. The field survey was conducted by observing, interviewing and distributing questionnaires at SMAN 1, SMAN 6 and SMAN 7 in Bengkulu Selatan district. The results of the analysis stage conducted by Oktavia, et al (2021) in 3 SMA N in Bengkulu Selatan district that the percentage obtained is 85.36% of students and 87.82% where this percentage shows that both students and teachers strongly agree to be held Development E-Module Learning Media on Android-Based Alternating Flow Materials To Improve Students' Critical Thinking Ability [13].

The development of this e-module was carried out using Pdf Corporate with Appgeyser. The product output is in the form of an apk file extension that can be opened on the appropriate Android device and then will automatically install learning media on the Android device.

Product Development

The product developed in the form of alternating current physics learning media that can be operated on Android devices. Broadly speaking, the menus contained in the learning media include: 1) Instructions, 2) Basic competencies, 3) Materials, 4) Questions, 5) Lkpd, and 6) About (containing developer profiles).

The development stage includes activities to combine material content and images into one file using the Microsoft Office PowerPoint program and then save it. After that, screenshots using the Lightshot application and compiled into one file using the Microsoft Office Word program and then saved. The next step is to convert the word file into a pdf file. The pdf file is included in the corporate pdf and edited for the creation of interactive menus. Video editing using the Microsoft Office PowerPoint program. The video format must be in MP4 format and uploaded to YouTube so that the module only inserts a link that the user can later access. After all the required files are complete, the next step is to publish the file in html form, then the html folder that is formed is uploaded to Google Drive. After that, the drive link is inserted into drv.tw and the link is taken to be inserted into the Appgeyser application to turn the module into an application.

Figure 1. Application icon when it is installed

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When the application is installed and on Android, it looks like in Figure 1. After that, just open it. After opening it will look like picture 2. Then you will be directed to the main menu or view the creator's profile. When you enter the main menu, you will be presented as shown in Figure 3. In the main menu, you can choose what menu you want to open. On each slide provided several buttons such as the before button, after button and the main button. Of course, these buttons function to create interactive modules or make it easier for us to access the contents of the e-module.

Figure 2. Homepage

Figure 3. Main Course

In Figure 2. This is the main screen when the application is opened, there will be a choice, namely to go to the main menu or to the profile of the e-module maker. If we go to the main menu, it will look like picture 3. Which contains several menus, namely instructions, SK/KD, concept maps, materials, videos, questions and bibliography.

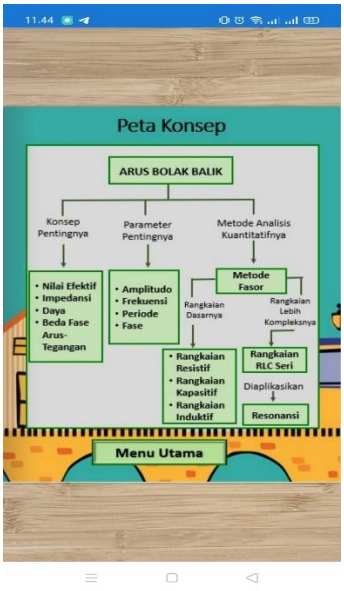

Figure 4. Concept

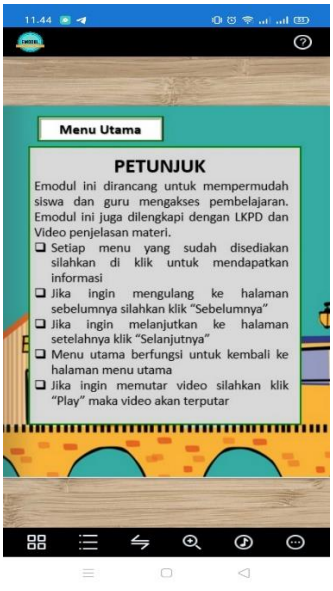

Figure 5. Instruction

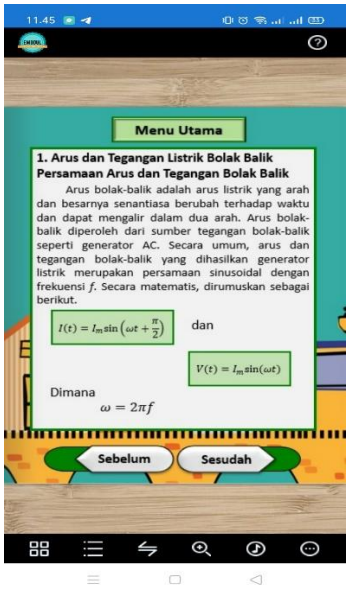

Figure 6. Theory

Figure 4 is a concept map that underlies the material to be discussed, while Figure 5 is a guide to the use of the developed e-module. Figure 6 is the beginning of the explanation of the material discussed in the e-module.

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Figure 7. Video

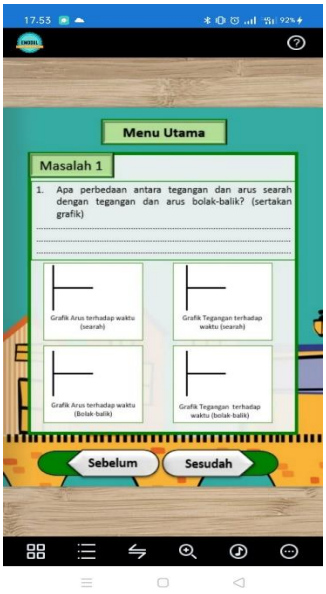

Figure 8. LKPD

Figure 9. Practice Questions

Figure 7 is a video display that contains an explanation of the material and problem solving. Figure 8 is the LKPD display contained in the material menu, in the LKPD there are 10 problems that must be done by students while Figure 9 is an exercise question that must be done to train students' abilities in mastering the material that has been explained and become evaluation material to find out the part that not understood by students through this e-module.

The results of the design and development at the design and develop stages are validated to determine the feasibility of using it in physics learning. The results of the validation of material aspects, language aspects, and media aspects can be seen in table 2 below:

Table 2. Validation Results

Aspect	Interpretation	Category
Theory	83%	Very Worthy
Language	86%	Very Worthy
Media	83%	Very Worthy
Average	84%	Very Worthy

Based on Table 2 above, it shows that the average percentage of product validation/feasibility results is 84% with very feasible criteria. This means that the developed product can be implemented in learning.

The development of the media that has been made will be tested for perceptions of students. This perception test was carried out in January 2022 using a questionnaire via Google forms. The questionnaire used was taken from a thesis questionnaire that has been validated by experts. This perception test was followed by 38 students from the three research schools. Based on the results of tests on students at SMA N 1, SMA N 6 and SMA N 7, South Bengkulu Regency, the percentage of 82% in other words is very feasible to use.

Thus, from the percentage results obtained from media experts, material experts, linguists, and students, it can be concluded that the E-Module on Android-Based Alternating Flow Materials to Improve Students' Critical Thinking Ability is worthy of being used as a learning medium. E-modules can add insight to students in learning independently or with teachers. The use of smartphones is very helpful in the learning process.

The results of this study are relevant to the research "Development of Android-Based Learning Media During the Covid-19 Pandemic To Improve Students' Scientific Literacy" shows that the results of the feasibility study of android-based learning products show validity of 84% in other words very valid so that the product can be used [14]. Another relevant research was carried out by D. Masruroh and Y. Agustina (2021) "Android-Based E-Modules as Support for Online Learning and Efforts to Improve Student Learning Outcomes" which obtained the results that the developed Android-based e-modules had been tested for feasibility, based on the test. validation by media experts obtained an overall average score of 99.05% and the material expert validation test obtained an average overall score of 96.47%.[15].

D. Conclusion

E-Module Physics of alternating current electric material using the ADDIE model can build an understanding of the concepts of physics in it and is equipped with pictures and video explanations so that it can be used as an independent learning medium for high school students. The results of the percentage of media development that have been carried out are 84% and 82%, in other words this media is very feasible to use.

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