Development Of Android Physics Applications (APA) As Learning Media On Dynamic Fluid Concepts

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Abstract. Android is one of the learning media based on 21st-century learning styles. Android is open source and provides opportunities for users to develop other application features as needed. This study aims to create Android-based physics learning media using the Smart App Creator on Dynamic Fluid material. Media is developed using the methods of research and development R&D (Research and Development) Model FODEM (Formative Development Method) consisting of Need Analysis (NE), Implementation (I), and Formative Evaluation (FE). The results of the validity of the Android Physics Applications (APA) media obtained an average score of 83% in the very feasible category, while the results of the limited trial of students obtained an average score of 82.1% with the very good category. Based on these results, it can be concluded that the Android Physics Applications (APA) media can be used as a learning medium in the classroom. The development of Android-based Physics Applications is expected to be an alternative for educational institutions or educators to develop learning media that use multimedia.

1. Introduction

Learners in the 21st century should have the opportunity to reflect on their ideas, hone skills analysis to them, strengthen the capacity to think critically and creatively and show initiative in solving problems [1,2]. In solving problems it is necessary to have a learning media. The selection of technology-based learning media has a very important role [3,4]. The Android operating system is one of the 21st-century learning media [5], android media is an open-source media and provides an opportunity for users to develop other application features as needed [6,7], and can be accessed easily anywhere, anytime and anywhere [4,6,8].

Physics is one of the basic sciences that plays an important role in the development of science and technology [9,10]. One of the topics in physics is Fluid Dynamics [11,12]. Abstract fluid dynamics concepts such as Bernoulli’s principle and ideal fluid concepts need to be visualized so that students have a complete concept [13,14]. The next step is that teachers need to change their role from content deliverers to content creators, creating content and applications to turn technology into a tool for learning [1,15].

Android media is a complex mixture of OS, middleware, and applications that can increase the interest and attractiveness of students with a multi-representative presentation [16,17]. Mobility is one of the main factors that attract distance learners to use mobile learning [18]. Learning media using the android system is more attractive and flexible [19-21] the device may smartphone also minimalist so that students can bring the material easily [21].

Technology-based learning innovation is assessed as a medium that has strong potential in improving the quality of education [22]. The selection of technology-based learning media has a very important role [14,24,24], therefore, physics learning innovation is needed as a solution
to problems that arise in every school [8,25]. Researchers late this developing learning media in the form of Android Physics Application (APA) on material Dynamic fluid in high school.

2. Method
In this study, the method used is R & D [26], using the FODEM ( Formative Development Method ) model [27] which consists of three components, as follows:

![FODEM circuit](image)

**Figure 1.** FODEM circuit [27]

In the first stage of Needs Analysis (NA), at this stage, the needs and shortcomings of android media design and development are analyzed. In the early stages of development. The definition of pedagogical objectives can be based on both theory and practice. Design context requirements can be based on previous development experience in similar situations. A needs analysis can also include the effects of other sets.

In the second stage of implementation (I), at this stage, a trial and evaluation of learning are carried out so that the android media that has been made can be used optimally. The emphasis in the implementation component is on rapid prototyping of the design ideas specified in the requirements analysis. Its main purpose is to test design ideas for information about feasible and failed solutions.

The last stage is Formative Evaluation (FE), at this stage as a revision between stages starting from the Need Analysis stage to Implementation and this stage also measures the extent to which the android application can function.

3. Results and Discussion
The product produced in this research is a learning application, hereinafter referred to as APA ( Android Physics Application ). This application was developed based on the FODEM development model, with the Needs Analysis (NA) stage carried out by analyzing problems, needs, media materials, development specifications, and media creation tools.

The Implementation (I) phase begins by integrating the APA (Android Physics Application) concept into the dynamic fluid concept. by making learning media according to the needs of students with specific media development specifications. This development is carried out by utilizing the Smart App Creator application as software for developing this learning media. Then carried out by conducting a small-scale test. The Formative Evaluation (FE) stage was carried out by analyzing the validation of material data and media expertise, as well as the results of the implementation of small-scale media tests.

3.1. APA Development
The display will be visible after clicking the application tab on the mobile screen. The screen contains sub-menus, guides, materials, videos, simulations, practice questions. APA development flowchart on dynamic fluid materials can be seen in Figure 2.
3.2. Final Product Review
Android Physics Application (APA) is a medium of learning physics on the concept of dynamic fluid. This application contains guides, materials, videos, simulations, and practice questions. This application is developed, analyzed, and improved based on comments and suggestions at the validation and implementation stages. Overall the media developed is feasible to use.
Based on Figure 3. there are several main menus in APA development including 1) guide icon, 2) material icon, 3) video icon, 4) simulation icon and 5) practice questions icon. Students can select each menu by clicking each icon. Based on Figure 4. there is a description of each icon in the main menu of the developed APA application. There is a next button to change the explanation of the icon on the main menu, and there is a back button. Based on Figure 5. contains material about dynamic fluid equations and concepts in full, and there is a simulation icon to go to the simulation menu to make it easier for students to understand the material with the simulation. Based on Figure 6. contains learning videos about dynamic fluid concepts. Figure 7 contains practice questions as student evaluations in learning.

3.3. Discussion
The results of the research conducted by the researchers were then compared with the results of previous studies. Based on research conducted by Aji, et al [25] Astra, et al [6] Saputra & Kuswanto [5] and Rosyid, et al [7].
The results obtained that the three studies are categorized as suitable for use in the learning process. The results of the study are not much different from the results obtained by the researchers, the results of the validity of the Android Physics Applications (APA) media obtained an average score of 83% with a very feasible category, while the results of the trial were limited to students obtaining an average score of 82.1%, with very good category. Android Physics Applications (APA) is an innovative learning media that can adapt to technological developments. This application can be used offline on all Android smartphone resolutions.

4. Conclusion
The results obtained that the three studies are categorized as suitable for use in the learning process. The results of the study are not much different from the results obtained by the researchers, the results of the validity of the Android Physics Applications (APA) media obtained an average score of 83% with a very feasible category, while the results of the trial were limited to students obtaining an average score of 82.1% with very good category. Physics Education Game Application is an innovative learning media that can adapt to technological developments. This application can be used offline on all Android smartphone resolutions.

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