



Development of Learning Media Innovation for Android-Based Web Programming Courses

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ABSTRACT

This study aims to develop a learning media for the Android-based web programming course and evaluate the validity, practicality, and effectiveness of the learning media. The Research & Development (R&D) method was used with the Analysis, Design, Development, Implementation, & Evaluation (ADDIE) model. The research subjects consisted of 39 students from the Computer Science and Informatics Education Program who took the web programming course in the odd semester of the 2022/2023 academic year. Data was collected through validation sheets, questionnaires, and test sheets. The results showed that the Android-based learning media product developed had high validity according to expert assessments, effective criteria that met high interpretation, and practicality based on the analysis of student responses to the learning media. Therefore, it can be concluded that the Android-based learning media for the web programming course is feasible to use with the categories of validity, practicality, and effectiveness in the learning process in the Computer Science and Informatics Education Program, Department of Computer Science and Informatics, Faculty of Engineering, Makassar State University, in the Web Programming course.

Introduction

Education plays a vital role in human life. The quality of education a person receives influences their abilities and potential. According to Melmambessy Moses, as quoted by Adi (2022), education is a structured process of transferring knowledge from one person to another, following the standards set by experts. In the field of education, the learning process involves interaction between teachers, students, and the learning environment. All these components are interconnected and play a crucial role in achieving learning goals. One important factor in the learning process is learning media.

According to Karo and Rohani (2018), the use of learning media can clarify the presentation of messages and information intended for students. This helps facilitate the learning process and improves learning outcomes. Learning media can also facilitate a more creative and interactive learning process. The appropriate use of media can engage students more effectively, thus enhancing their interest and motivation to learn.

The current development of digital technology has made various tasks easier, including in the field of education. One of the most popular technologies used is smartphones. The large number of smartphone users opens up opportunities to use these devices as learning media. According to Amirullah and Hardinata (2017), the use of smartphones as learning media is called mobile learning. Mobile learning provides an efficient alternative for students, as it can be easily accessed and learned anywhere and anytime.

Web technology is currently a vital aspect of life in the digital era. This is due to the increasing use of the internet, advancements in mobile technology, and the business need for responsive and interactive websites. In the field of computer science and information technology education, students learn various fundamental concepts and the latest technologies related to computers and information systems, such as programming, computer networks, web design, database management, cybersecurity, and cloud technology.

Computer Science and Information Technology Education (PTIK) is one of the study programs offered by the Department of Computer Science and Information Technology, Faculty of Engineering, Universitas Negeri Makassar. The program aims to produce competent graduates who are ready to face challenges in the field of information technology and computer science. One of the courses taught in the PTIK program is web programming. Based on the aforementioned reasons, the researcher has decided to develop a learning media for the Android-based web programming course.

Literature Review

Learning outcomes are related to the learning activities because learning activities are a process. Learning outcomes encompass all psychological aspects that occur as a result or impact of students' learning experiences and processes in the classroom at school. According to Nasution (2000), learning outcomes include the abilities possessed by learners after going through the learning process. The learning experiences gained by learners encompass three domains: cognitive, affective, and psychomotor (Nabillah and Abadi, 2019).

Media refers to all types of devices used to transmit messages, data, or knowledge from one person to another. Media can be in the form of inanimate objects such as books, pictures, models, and teaching aids, as well as moving media such as films, videos, animations, and multimedia presentations. According to Ramli (2015), instructional media refers to objects that can be perceived through sight and hearing, which are used as tools to facilitate the learning process in order to enhance students' learning outcomes (Slameto, 2013).

Website is an application that contains various documents in different forms such as text, images, sound, animations, and videos. All of these documents use the HTTP protocol and can be accessed through web browser software. Meanwhile, according to Hasan and Muhammad (2020), a website is a collection of pages that display information in various forms such as text, still or moving images, animations, and sound. All of these pages are

interconnected through hyperlinks, both static and dynamic (Arfianto and Nugrahanti, 2018).

Android is a mobile operating system based on Linux, including the operating system itself, middleware, and core applications that have been modified. Additionally, Ramadhan et al. also emphasize that Android provides an open platform for developers, allowing them to create their own applications (Ramadhan et al, 2021).

The advantages of Android include being a complete, open, free, and affordable platform. Android is considered complete because it provides various features and services. It is open because it is open source and allows developers to develop their own applications. It is free because it does not restrict users from accessing the system. And it is affordable because it is available on various types of devices at an affordable price (Gunadi and Nurafifah, 2020).

The research and development method is used to create a specific product and test its effectiveness. On the other hand, according to Syamsuddin and Fuady (2020), research and development is a method used to test the effectiveness of a product that has been created (Sugiyono, 2017).

Research Methods

The research method used in this study is research and development, commonly known as R&D (Research and Development). The product to be developed in this research is a learning media for Android-based web programming courses.

The development model that will be used in developing the Android-based web programming learning media is the ADDIE model. The ADDIE model is chosen because of its systematic approach and advantages in each stage of the process. This development model will consist of the following stages: Analysis, Design, Development, Implementation, and Evaluation.

Research Result

This research utilizes the Research and Development (R&D) method, which aims to produce a specific product and test the effectiveness of the resulting product. The research and development model used is the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The researcher has gone through all of these stages in developing the Android-based web programming learning media product. Here are the detailed steps undertaken by the researcher:

1. Analyze

To determine the initial requirements for developing learning media, the following steps are needed: (1) User needs analysis, (2) Content analysis, and (3) Hardware and software requirements analysis. Before proceeding to the user needs analysis stage, problem identification and determining the necessary solutions are conducted.

2. Design

After completing the analysis stage, the next step is the design stage. In this stage, the design of the learning media interface should be prioritized to create an appealing and user-friendly media. The design of the learning media interface includes selecting the appropriate color combinations, fonts, and layout to ensure the effective development of the learning media. The following is the interface design of the Android-based web programming learning media that has been developed.

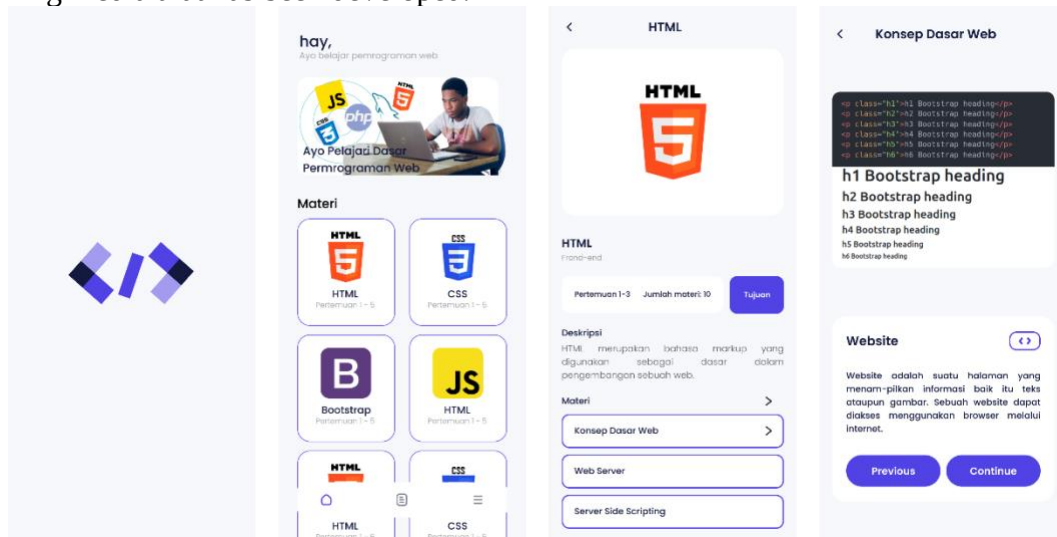


Figure 1. Material Page Design

Figure 1 shows the learning material page and the page when one of the materials is selected.

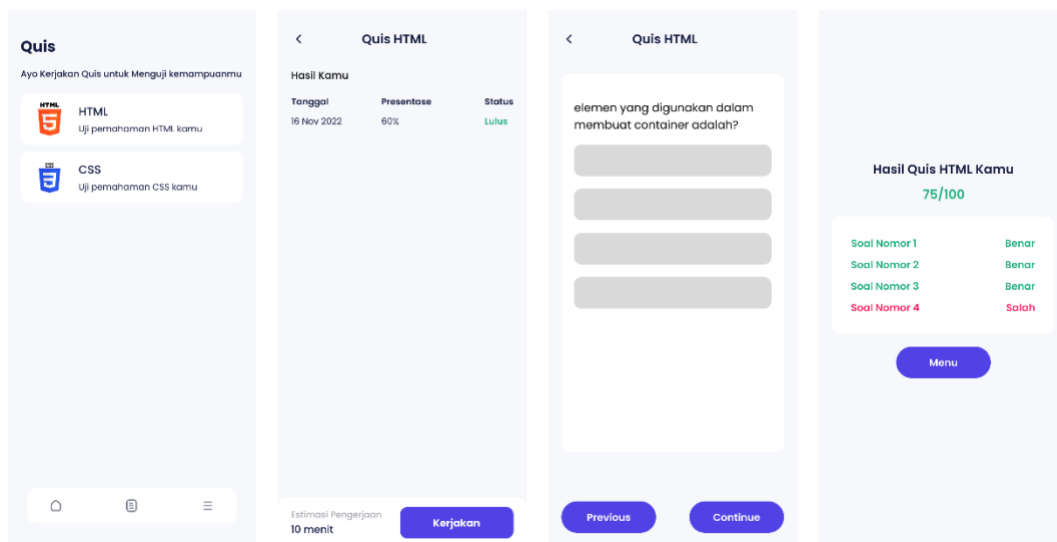


Figure 2. Quis Page Design

Figure 2 depicts the design of the initial quiz page and the page when one of the quizzes is selected, as well as the page when the quiz begins.

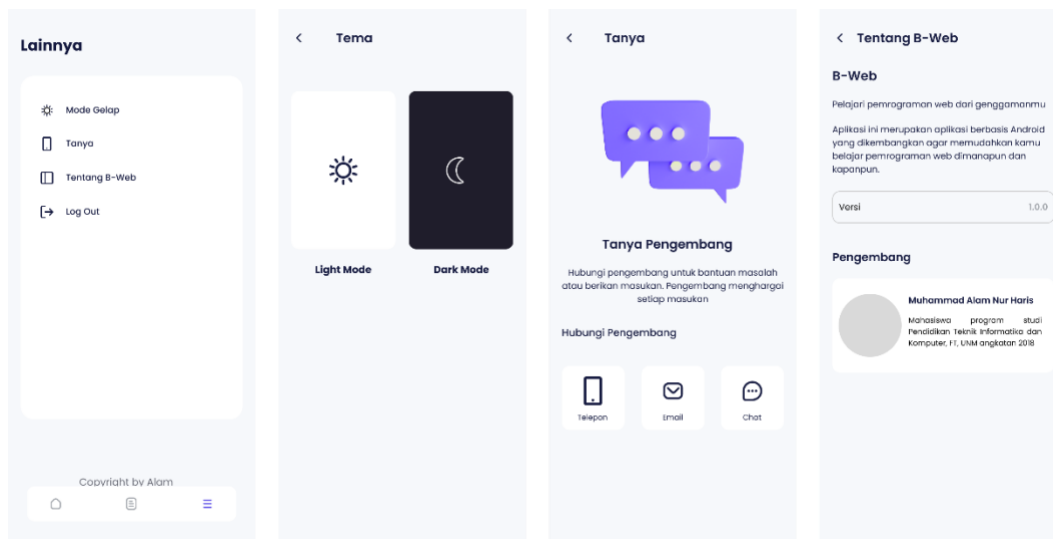


Figure 3. Other Page Design

Figure 3 illustrates the design of another page that includes various menus such as dark mode, font customization, and application information.

3. Development

The development of Android-based web programming learning media is carried out using the Flutter framework. This means that the process of creating the learning media is done through coding using the Dart programming language to produce an Android application in accordance with the designed interface. The Android-based web programming learning media is then validated by four experts, consisting of two content experts and two media experts.

Based on the obtained results, the average rating from the content experts and media experts is 95.24%. These results indicate that the Android-based web programming learning media is highly valid and suitable for use, as demonstrated by the following scale of media validity assessment percentages:

Table 1. Media suitability categorization

Percentage (%)	Kategori
95,24% $\geq$ 75%	Very Valid
$55\% \leq x < 75\%$	Valid
$40\% \leq x < 55\%$	Adequate
$x < 40\%$	Less Valid

After the validation by the experts is completed, the next step is to conduct a trial with a small group and a large group to assess the practicality of the developed learning media.

The researcher administered a user response questionnaire to 10 students to gather user feedback on the developed learning media. The obtained questionnaire responses were analyzed, and the results of the analysis for the small group can be seen in the calculations below.

Table 2. Category of results for small group

Percentage (%)	Category
91,75% > 75%	Highly Practical
$50\% < x \leq 75\%$	Practical
$25\% < x \leq 50\%$	Less Practical
$x < 25\%$	Not Practical

after the small group test was carried out, then the large group test was carried out. after the data from the large group test was obtained, an analysis of the data was carried out. the results obtained are as follows:

Table 3. Media practicality category large group test results

Percentage (%)	Category
94,83% > 75%	Highly Practical
$50\% < x \leq 75\%$	Practical
$25\% < x \leq 50\%$	Less Practical
$x < 25\%$	Not Practical

based on media validity tests from experts and small and large group practicality tests, the learning media developed are stated to be valid and practical to use in the learning process.

4. Impelementation

After the Android-based web programming learning media is accepted and declared feasible and practical, the next step is implementation. This learning media is applied to students of Informatics and Computer Engineering Education batch 2021 class F. Before applying the learning media, students are given a pretest on Javascript to find out their level of initial understanding of the material.

After students are given a pretest, then students are given Android-based web programming learning media with Javascript material. After providing learning media for Android-based web programming, students are given a posttest to find out student understanding after being given media specifically on Javascript material.

After the pretest and posttest data were obtained, data analysis was then carried out to determine the effectiveness of the developed learning media. As for the results of data analysis to test the effectiveness of learning media using the N-Gain test are as follows:

Table 4. Interpretation of the effectiveness of learning media

Gain Amount (g)	Interpretation
$0,7 \geq 0,7$	Hight
$0,3 \leq g < 0,7$	Currently
$0 < g < 0,3$	Less

based on the results obtained in table 4, the learning media developed is declared effective with high interpretation.

5. *Evaluation*

at the evaluation stage an evaluation and revision of the learning media was carried out based on the advice obtained from experts. revisions and suggestions made, among others, related to the appearance of the media and the addition of some functionality in the learning media being developed.

Discussions

In the world of education, the learning process involves interactions between teachers, students, and the learning environment. All of these components are interrelated each other and play an important role in achieving learning goals. Wrong one very important factor in the learning process is the media learning. The media used in learning has a very important role very vital in achieving the learning objectives that have been set. The use of appropriate and varied learning media can improve motivation to learn from students in the learning process.

The use of learning media can clarify the presentation of messages and information to be conveyed to participants educate. This will help in expediting the learning process and improve learning outcomes. In this context, learning media can assist in facilitating the process of students' understanding of the concept or material being studied. The media used can also help teacher in introducing and explaining concepts or material in more detail and thorough (Karo and Rohani, 2018).

The use of smartphones as learning media is called mobile learning. Furthermore, Amirullah and Hardinata explained that mobile learning is an alternative media more efficient learning for students because it is easy to learn anywhere anywhere and anytime. The results of Kuswanto's research (2020) show that the media mobile learning meets the eligibility criteria both on media and material experts, as well as get very good results on student testing (Amirullah and Hardinata, 2017).

Also shows that Android reigns supreme mobile device operating system market share in Indonesia from July 2021 to by July 2022. Android managed to grab a market share of 89.42%, which shows that Android is indeed a very popular operating system in Indonesia. The popularity of Android in Indonesia is also inseparable from various factors factors, such as ease of use, affordability, and support from leading smartphone vendors (Statcounter, 2022).

Website is an information page that is provided via the internet so that it can be accessed from all over the world as long as it is connected to the network Internet. In the context of information and communication technology, websites can be interpreted as a collection of web pages that are connected to each other via Internet Network. Websites are usually used for communication, information, and business (Suryadi and Zulaikhah, 2019).

Basically, web programming involves three main elements, viz programming languages, technologies, and platforms. Multiple programming languages commonly used in web programming include HTML, CSS, JavaScript, PHP, and Python. In addition, several technologies and platforms used in web programming including MySQL, Apache, React, Angular, and Vue.js.

At this time, web programming has become one of the most important aspects from the technology industry. This is due to the increasing use of the internet, development of mobile technology, and business needs to have a website responsive and interactive. Several types of web applications are popular today including e-commerce, social media, online games, and online banking applications.

Based on the results of the pretest and posttest data analysis, it can be concluded that Android-based learning media is effectively used as a medium learning in the learning process. This conclusion is supported by relevant studies that have been conducted by researchers. Therefore, the use of Android-based learning media can increase effectiveness learning and is expected to have a positive impact on achievement student learning outcomes.

The evaluation stage is carried out to improve the learning media developed web programming. Improvement of learning media is done by using the suggestions and input obtained from related media experts adding features and fixing some of the functionality of the media developed.

Based on the results of research on the development of learning media Android-based web programming, it was found that the learning media have been developed to have validity, practicality, and effectiveness. Those results relevant to previous studies which state that the media Android-based learning is effective, practical, and valid in the process learning.

As for the difference with previous relevant research is a learning media developed by researchers adding features to support user convenience. These features include features dark mode so users can use learning media with themes darker for user comfort when in a low-light space. Another feature is the feature to increase the font size so that users having trouble reading text in normal size fonts can read more content on material is better.

Conclusions

Based on the results of the research conducted, it can be concluded that the developed Android-based web programming learning media has a high level of feasibility. Material experts and media experts gave high average percentages, namely 95.62% and 93.75%, with an overall average of 95.24%. This shows that the learning media is very suitable for use in the teaching and learning process. In addition, the results of the practicality test also show that students' responses to the media reach an average of 94.83%, which indicates a high practical level. Furthermore, the effectiveness test using the Wilcoxon test produces an Asymp.Sig value. (2-tailed) of 0.001, which indicates an increase in learning outcomes. The average gain score from the N-Gain test also shows a high level of effectiveness, which is 0.7. Thus, it can be concluded that the developed Android-based web programming learning media is effective, feasible, and practical to use in the learning process.

Based on the results of the research that has been concluded, there are several suggestions that need to be submitted to improve the quality of education. First, future researchers who will conduct further research related to the development of Android-based web programming learning media need to propose the development of additional features and expand the material presented. Second, it is important for Android-based media to be applied to other subjects or subjects. Third, the importance of good time management in the learning process using the media is also suggested by researchers.

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