JSinAja: Javascript Programming Learning Application (React JS, React Native, Node JS) Mobile Based Using Problem Based Learning Method

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Article Info

ABSTRACT

This article describes the design of a mobile-based learning application for JavaScript programming using React JS, React Native, and Node JS. This application aims to provide an interactive and engaging learning experience for beginners and advanced JavaScript programming users. This application is designed to cover the basics of JavaScript programming, such as syntax, data types, control structures, functions, and objects. This application also covers more advanced topics, such as asynchronous, functional, and object-oriented programming. The application uses the React JS library for web interfaces, React Native for mobile application development, and Node JS for the backend. The app's user-friendly design has a simple and intuitive interface that guides users through the learning process. This application is also equipped with features such as materials, tutorial videos, and discussions to help users apply their knowledge and test their abilities. In the future, this application is designed to be developed further by adding new modules and features. The app also includes user feedback and analytics to improve the learning experience continuously. This application uses one of the software development methods, namely the waterfall development method, which is based on a structured and sequential sequence of stages. Hopefully, this application will provide a valuable resource for anyone interested in learning JavaScript programming, from beginners to advanced users.

I. INTRODUCTION

JavaScript programming has become one of the most popular technologies in web and mobile development. The ability to master JavaScript will give you a massive advantage in a career in technology. However, learning JavaScript is not always easy, especially for beginners. Therefore, an interactive and easy-to-use learning application is needed to help users learn JavaScript programming. This paper will describe the design of a mobile-based learning application for JavaScript programming.

This application uses React JS, React Native, and NodeJS technologies. The design of this app is based on the principles of interactive learning, which provides users with an engaging and practical learning experience. This app covers all the topics needed to learn JavaScript programming, from basic to more advanced. This application also has exciting features, such as materials, tutorial videos, and discussions, to help users apply their knowledge and test their abilities. This application's design also considers the needs of different users. The app is designed to be easy to use for users with no prior experience in programming but also offers challenging material for users who are already proficient in JavaScript. This application is also designed to be further developed by adding new modules and features in the future.

Through this paper, we hope to provide inspiration and guidance for application developers to create interactive learning
applications that are effective and easy to use, especially for JavaScript programming.

A. Literature Review

1) Problem-Based Learning Theory

The basic theory of JavaScript programming applications is a learning method that places students as active subjects in the learning process. Problem-Based Learning focuses on learning through solving complex real problems, so students must think critically and creatively to find the right solution [1]. In the Problem-Based Learning method, students work in groups to solve a given problem and must find the information needed to solve the problem [2].

The JavaScript Programming Application provides contextual and authentic learning, where students must apply their knowledge and skills to solve problems that are relevant to the real world [3]. This helps students to understand the learning material better and strengthens the link between theory and practice.

Learning mobile-based JavaScript programming (React JS, React Native, Node JS) can be an effective learning method because students will face problems relevant to mobile application development [4]. Students can also develop the ability to work together in teams, communicate, and independently seek information.

This method can be an attractive alternative learning method to enrich students' learning experiences in learning mobile-based JavaScript programming (React JS, React Native, Node JS).

2) JavaScript Application Roles

JavaScript programming learning applications are essential in teaching, especially in mobile-based learning using the Problem-Based Learning method [5]. This application can assist students in accessing learning resources such as tutorials, videos, and websites related to JavaScript programming. It allows students to practice directly on the programming codes they have learned.

JavaScript learning applications can also help students deepen their understanding of programming concepts and principles related to React JS, React Native, and Node JS. With the application, students can study independently and flexibly without being limited by time and place.

JavaScript learning applications can help students test their programming skills by providing exercises or interactive quizzes. Students can also get immediate feedback and see improvements directly on the programming codes they have learned.

In the context of learning mobile-based JavaScript programming with the Problem-Based Learning method, learning applications can present cases relevant to the real world and enable students to collaborate with classmates in solving given problems [1]. Thus, students can develop critical thinking, creativity, and teamwork skills.

Mobile-based JavaScript programming learning applications support an effective and efficient learning process with the Problem-Based Learning method [4]. The application can assist students in accessing learning resources, deepen their understanding of concepts, test their programming skills, and help students develop critical thinking skills, creativity, and collaboration skills.

3) Usage of Mobile Learning in Learning JavaScript Programming

Mobile learning or learning using mobile devices such as smartphones or tablets can be a solution to facilitate learning JavaScript programming [6]. In the digital era, like now, mobile learning has become widespread and popular [7], [8]. Mobile applications provide learning opportunities to students anywhere, meaning they can access learning content anytime and anywhere with their mobile devices, increasing student engagement and motivation [5].

Learning JavaScript programming mobile learning can provide more accessible and more flexible access to students [9]. In addition, the use of mobile learning can also increase students' interest and motivation in learning JavaScript programming [10]. Mobile Learning can increase learner motivation and interest in programming by providing learners with a more flexible, personalized, and engaging learning experience [11].

With the help of mobile applications, students can learn JavaScript programming more effectively [12]. The application provides learning modules specifically designed for mobile devices that can be accessed anytime and anywhere. In addition, the application also offers interactive features that can enrich the learning experience of students.

4) Basic Concepts of JavaScript Programming

JavaScript is a programming language used to create web applications and improve the appearance of websites. The basic concepts of JavaScript programming include syntax, data types, variables, operators, flow control, and functions. In JavaScript, a program consists of statements that define variables, control the flow of execution, and perform operations. Variables store values that can be changed, and functions encapsulate collections of statements that can be called many times [13].

One of the basic concepts of JavaScript programming is data types. There are five basic data types in JavaScript: number, string, Boolean, null, and undefined. Numbers are used for calculations; strings represent text; Booleans are used for true/false logic; null and undefined represent empty values. In addition, variables are also an essential concept of JavaScript programming. Variables are used to store values or reference values that can be changed. Variables are containers for storing data values. You can think of variables as containers for data. This data can be of various types, such as numbers, strings, or arrays [14].

Flow control is also an essential basic JavaScript programming concept. Flow control regulates program flow by executing certain conditions or loops. JavaScript provides several constructs to control the flow of execution, such as conditionals, loops, and exception handling [13]. Apart from that, functions are also an essential basic concept of JavaScript programming. Functions wrap a series of statements in a block and can be used back in the program [15]. Functions let you group statements to perform a specific task. If different parts of a script repeat the same task, you can reuse the function (rather than repeating the same set of statements) [14].
5) **Advantages of JavaScript Programming Learning Applications**

Mobile-based JavaScript programming learning application (React JS, React Native, NodeJS) using the Problem-Based Learning method has several advantages, including:

- **Interactive Learning**: JavaScript programming applications provide an interactive and challenging learning experience. Students will learn through solving real problems to develop problem-solving skills valuable in their programming career.

- **Adaptive Learning**: JavaScript programming learning applications can be adapted to each student's needs and level of understanding. Applications can provide assignments according to students' ability levels and feedback that can help them improve their understanding.

- **Flexible Learning**: Learning applications can be accessed anytime and anywhere, so students can study according to schedule. In addition, students can learn JavaScript programming concepts relevant to the projects or assignments they are working on.

- **Use of modern technology**: Learning applications use modern technology such as React JS, React Native, and NodeJS. This can provide an engaging learning experience and help students develop skills relevant to current technology trends.

- **Student collaboration**: Applications between learning can also facilitate collaboration between students in completing a given task or project. This can help them gain experience working in a team and improve their social and communication skills.

- **Provide up-to-date material**: Learning applications can provide continuously updated material according to technological developments and trends in JavaScript programming. This can help students to stay abreast of technological developments, as well as gain industry-relevant knowledge today.

- **Accessible to students from various backgrounds**: Learning applications can be accessed from multiple backgrounds, both those who already have a programming background and those who are just learning programming. Apps can provide an equally good learning experience for all users.

- **Provide fast feedback**: Learning apps can provide immediate feedback to students so they can improve their understanding immediately. This can help to speed up the learning process and improve their skills.

- **Facilitate learning management**: Learning applications can facilitate learning management for teachers or tutors. Teachers or tutors can easily manage and monitor learning progress through the application.

- **Increase learning motivation**: Learning applications can increase learning motivation through features such as awards or points given to successful students who complete assignments well. This can improve students' enthusiasm for learning and encourage them to continue studying hard.

II. **METHODS**

This application aims to improve the learning experience of JavaScript programming, especially React JS, React Native, and Node JS. The programming language. React JS, React Native, and Node JS are popular and widely used technologies in modern web and mobile application development.

By studying these three technologies, students can comprehensively understand web and mobile development and develop applications that run across multiple platforms and devices. In addition, students can develop strong JavaScript programming skills and build effective and efficient web and mobile applications. Students can use JavaScript as a programming language to create products that run on multiple platforms and devices, including desktop, web, and mobile.

This application uses the MySQL database as data storage. By using MySQL as a database, application users can store, access, and manipulate data quickly and effectively in learning JavaScript programming. Furthermore, the application may provide links to online learning resources such as documentation, forums, and tutorials related to the topic the user is studying. In solving problems, this application can also provide users with interactive programming exercises and real projects relevant to the learning topic. With these exercises and projects, users can practice and apply their knowledge and skills in real time, strengthening their understanding and skills in JavaScript programming.

A. **Research Method**

This research was divided into two main phases, namely 1) application development and 2) application testing/validation. In the first stage, the product that we will develop is a web-based and mobile software. Therefore, the development model refers to the waterfall model (Figure 1). This model has five systematic stages that need to be carried out sequentially, including 1) Requirements definition, 2) System and software design, 3) Implementation and unit testing, 4) Integration and system testing, and 5) Operation and maintenance.

In the second stage, the application is tested by media and material experts to ensure the validity and feasibility of the application for learning activities. Furthermore, the application will also be tested on prospective users (students).

![Waterfall model](image-url)
B. Application Design

1) User Interface Design
The user interface in this application is designed with a user-friendly and modern concept. The use of a minimalist appearance and unobtrusive colors is expected to make users comfortable using the application. In addition, the interface will be adjusted according to the type of device used, be it a smartphone or tablet.

2) Application Architecture
This application uses a client-server architecture. On the client side, applications are built using React Native technology, allowing cross-platform mobile applications to be created. Meanwhile, the server-side uses Node JS technology to process requests from the client side and provide the necessary data.

The HTTPS protocol with the RESTful API method communicates between the client and server. The data stored on the server will be accessed by applications via API requests. The data includes information on learning modules, learning materials, questions, and assignments.

3) Application Features
This application is equipped with several features that can help users learn JavaScript programming more easily and interactively, including:

- Learning Materials: Users can access well-structured learning materials. Each material has a sample code that can be directly run and studied.
- Practice Questions: After studying the learning material, users can test their understanding with the exercises provided.
- Tasks: After completing each module, the user will be given a task to finish. The system will evaluate the task and provide feedback to the user.
- Quiz: After completing each module, users will be tested with short quizzes to test their understanding and knowledge of the material they have studied.
- Discussion Forum: Users can interact with other users through the discussion forum feature. This feature allows users to discuss learning materials, share experiences, and ask for help from other users and teachers.
- Personalization: This application has a personalization feature that allows users to customize the application's appearance according to their preferences. Users can choose the desired theme, font, and display size.
- Notifications: This app is also equipped with a notification feature that provides users with reminders about assignments and quizzes to complete, as well as information about app updates.

C. Learning Model

This application applies a problem-based learning model. This model engages students in solving real problems involving programming concepts and skills. In this model, students are given complex programming problems or assignments and must solve them through exploration, investigation, and programming practice. Students should seek resources and information independently and use their acquired skills and knowledge to design appropriate programming solutions.

Students will receive support from teachers or tutors who provide guidance and feedback in developing their solutions. In this model, students learn more actively and deeply because they must apply the knowledge and skills acquired in real situations.

The problem-based learning model also allows students to learn independently and develop metacognitive skills, such as planning, monitoring, and evaluating their progress. In addition, this model can help students develop the social and collaborative skills needed in the actual programming industry.

D. Implementation of Learning Activity

The learning model used in Mobile-Based JavaScript Programming Learning Applications (React JS, React Native, Node JS) is Problem-Based Learning (PBL). PBL is a learning model focusing on problem-solving and developing students' critical thinking skills.

In PBL, students will be given a complex problem or situation that requires a solution. Students will then investigate and collect the information needed to solve the problem. After that, students will design and implement possible solutions to the problem. Students will continue to be evaluated and given feedback to improve the resulting solutions during this process.

In programming learning applications, students will be given problems or projects that must be solved using React JS, React Native, or Node JS technology. Students will then investigate and study the technology, find possible solutions, and implement these solutions.

The advantage of using PBL in learning programming is that students will be familiar with solving problems and thinking critically in real situations. In addition, students will learn to collaborate with their friends in solving the problems given. In mobile-based learning applications, PBL can help students learn independently and improve their programming skills.

In addition, in PBL, students are also taught to be independent in learning. This can be very useful in mobile-based programming learning applications because students can learn anytime and anywhere without being bound by a specific time and place. Students can choose projects or problems that match their interests and expertise, so they will be more motivated to learn.

PBL can also help students to understand better and remember learning material. In PBL, students learn by solving concrete problems and require a deep understanding of the material. In solving these problems, students will connect the concepts they learn with real experiences to more easily remember and understand the material.

However, in using PBL in learning, it should be noted that the teacher or instructor must properly guide the learning process. Teachers must assist students in formulating problems or projects that match students' abilities and ensure that students understand the basic concepts needed to solve these problems.
In addition, teachers must also provide timely and constructive feedback so that students can improve the resulting solutions and continue to improve their abilities in programming.

III. DISCUSSION

The media is tested for its feasibility to measure the quality of the media in terms of media and material. Media feasibility data was obtained from an assessment by a media validator consisting of two media experts and two material experts through a questionnaire. There are four eligibility requirements for measuring media quality: content, language, presentation, and graphics. Furthermore, questionnaires were used to collect data on student and teacher responses about the app and its ease of use.

Based on Table 1, the media expert validation results were 86.93% and included in the very usable category. Furthermore, table 2 shows the results of the material expert validation of 87% and is included in the very functional category after the media is tested for feasibility, repaired, and ready to be tested in the learning process.

The following table shows the acquisition percentage for the ease and benefit of using mobile-based JavaScript learning applications.

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<th>TABLE I. MEDIA EXPERT SCORING RESULTS</th>
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<th>TABLE III. EASE AND USEFULNESS OF RESULTS</th>
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Based on Table 3, Most students and teachers think this media has excellent convenience and benefits so that it can be used in the learning process.”

IV. CONCLUSION

To improve mobile-based learning of JavaScript programming (including React JS, React Native, and Node JS), using the Problem-Based Learning (PBL) method can be a practical approach. The following are conclusions related to mobile-based JavaScript programming learning applications using the Problem-Based Learning method:

1) Problem-Based Learning (PBL) is a learning approach focusing on solving real problems. In the context of JavaScript programming learning applications, PBL will enable students to learn by actively solving programming problems relevant to practical needs.

2) The mobile-based JavaScript programming learning application will provide an interactive platform that students can access anywhere and anytime. This allows students to study independently, solve programming assignments, and face programming challenges offered in the application.

3) This app will focus on teaching JavaScript and related technologies like ReactJS, React Native, and NodeJS. This will give students a solid understanding of web and mobile development using these technologies.

4) In the Problem-Based Learning method, students will be faced with concrete programming problems and task them using JavaScript and related technologies. They must apply their knowledge and seek solutions through research, experimentation, and collaboration.

5) using the Problem-Based Learning method, mobile-based JavaScript programming learning applications will encourage students to become more creative and independent problem solvers. They will learn through hands-on experience solving real problems and develop more profound programming skills.

6) This application will provide support features in the form of study guides, tutorials, and code samples to help students understand complex JavaScript programming concepts. In addition, there is also a feedback mechanism that provides an evaluation of the solutions provided by students.

Using a mobile-based JavaScript programming learning application with the Problem-Based Learning method, it is hoped that students can develop their programming skills more effectively. They will better understand JavaScript programming concepts and related technologies and have a better ability to solve complex programming problems.

References


