

Mobile Live Coding Interaction and User Interface Design for Informatics Students

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Abstract

This research was conducted to design a user interface design in the form of a prototype for learning media for mobile-based basic programming courses using a User-Centered Design approach. Where this approach uses four stages in its implementation, including: 1) Analysis, 2) Design, 3) Build or Revise, and 4) User Test. The use case diagram in this user interface uses two actors, namely students and admins. The test was conducted on 10 students and vocational high school students using the short-type User Experience Questionnaire (UEQ) test method. From the tests carried out, the average results of Pragmatic Quality are 1.70, Hedonic Quality is 1.39, and Overall is 1.54. From the results of the study, it was found that the mobile learning media interface for basic programming subjects was comfortable and easy to use.

Keywords: mobile learning; design; programming education

Abstrak

Penelitian ini dilakukan untuk merancang desain user interface berupa prototype media pembelajaran mata kuliah pemrograman dasar berbasis mobile dengan menggunakan pendekatan User-Centered Design. Dimana pendekatan ini menggunakan empat tahapan dalam implementasinya, antara lain: 1) Analisis, 2) Desain, 3) Build atau Revisi, dan 4) Uji Pengguna. Diagram use case pada user interface ini menggunakan dua aktor yaitu mahasiswa dan admin. Pengujian dilakukan terhadap 10 orang siswa dan siswi SMK dengan menggunakan metode tes User Experience Questionnaire (UEQ) tipe pendek. Dari pengujian yang dilakukan diperoleh rata-rata hasil Pragmatic Quality sebesar 1,70, Hedonic Quality sebesar 1,39, dan Overall sebesar 1,54. Dari hasil penelitian diperoleh bahwa antarmuka media mobile learning mata pelajaran pemrograman dasar nyaman dan mudah digunakan.

Kata kunci: pembelajaran mobile; desain; pendidikan pemrograman

1. Introduction

In the study program related to information technology, it is mandatory to master basic programming courses. An understanding of this course is very much needed to take future courses and as a fundamental for a developer, software engineer, and/or work in other technology fields. This is due to the breadth of knowledge in the field of technology and will continue to grow (Martha et al., 2018). Therefore, good programming fundamentals are needed to continue to exist in the programming world.

In programming learning activities, many hours of practice are needed. Programming learning activities can be done using text editor software tools, compilers, and hardware such as PCs or laptops. In addition, programming learning can also be done using a cellphone or commonly called Mobile Learning (Pratama et al., 2021).

Using cell phones in programming learning activities certainly makes learning can be done anywhere and anytime. In Indonesia alone, the average duration of cell phone use for each

person can reach 5.4 hours, the highest in the world after beating Brazil in second place (Noor Santi, 2018). If used properly, the use of mobile phones can be a very potential learning method. In addition, as a result of Covid-19, students become less active and productive (Hidayat, Patmanthara, et al., 2021).

Learning media needs to be integrated with the learning process to order maximize learning outcomes (Hidayat, Sutikno, et al., 2021). One type of learning media that is applied in the Informatics Engineering Education study program, at the State University of Malang is mobile-based learning. However, unfortunately, mobile-based learning media that have been made so far have not paid attention to user comfort, both from interaction factors, interfaces, and user experience (Hidayat et al., 2018). So in practice, many of these mobile-based learning media are not reused (Astuti et al., 2017). This research was conducted to design a user interface design in the form of a prototype for learning media for basic mobile-based programming courses using a User-Centered Design approach. So that in a further stage this research can be implemented into a product that is comfortable and easy to use.

1.1. Mobile Learning

Mobile Learning is a learning method that utilizes mobile devices as a medium for learning (Martha et al., 2018; Nur Hidayat et al., 2020). The use of this mobile platform is widely used in everyday life and is flexible to be carried anywhere. The mobile application operating system itself is generally divided into two, namely: IOS and Android (Aripin, 2018a; Hardinata et al., 2018; Hendrianti et al., 2021; Rahmat et al., 2019).

Mobile learning has characteristics among others (Warsita, 2018): (1) Implementing ICT digitization; (2) Ease of access; (3) Implementing interactive and attractive features; (4) Only certain materials can be applied. Mobile learning has advantages, including (Aripin, 2018b): (1) Can be used anywhere and anytime; (2) The price of the equipment is relatively affordable; (3) The device has a lighter and smaller size; (4) Can be used for distance learning models; (5) Improving student-centered learning; (6) The creation of high interaction between teachers and students.

1.2. User-Centered Design

User-centered design is one of the methods used to describe the formation process that is influenced by the end user. This method is centered on the understanding, nature and special features of the target user. Data collection in this method is obtained from interview and observation techniques (Akay et al., 2015; Grizelda & Septiani, 2020; Nurhabibie et al., 2020; Pratama et al., 2021).

UCD principles according to IBM UCD development community, including [3]: (1) Define goals; (2) Analyze users; (3) Measuring competitiveness; (4) Design the overall user experience; (5) Assess the design; (6) Maintenance.

2. Methods

The research developed is implementation where the solution to the problem is the result of the product design being developed. The final result of this research is the system design. Solutions will be created with a User-centered design approach.

The stages of UCD include: (1) Analysis is an activity in collecting information related to user needs; (2) Design is an activity to describing or making assumptions related to the data that has been obtained; (3) Building or Revising is the process of designing a prototype; (4) User test is an assessment stage of the developed prototype (Fitriani et al., 2022; Santi, 2018; Simanullang et al., 2021; Supardianto & Tampubolon, 2020).

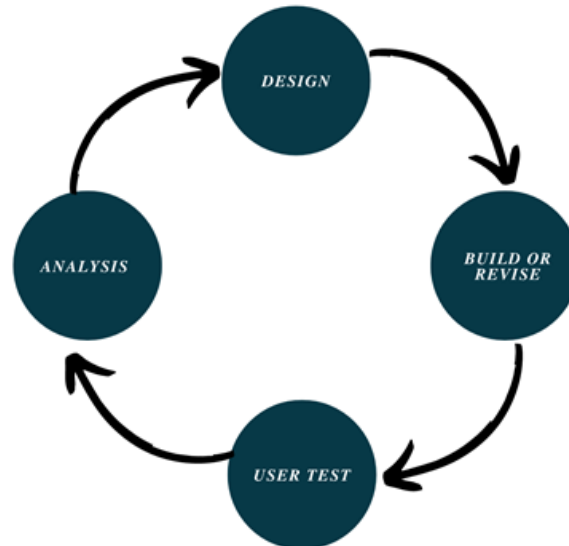


Figure. 1 Flowchart User-Centered Design.

3. Results and Discussion

The results and discussion will discuss the results of designing interactions and mobile live coding user interfaces using a User-centered design approach in basic programming subjects. The results of the discussion include the stages of designing and designing learning media.

3.1. Analysis

3.1.1. User Needs Analysis

Analysis of user needs is obtained from observations and literature studies. The design of this interaction and interface is aimed at students, especially informatics engineering education who are currently taking or have taken basic programming courses. The design of these interactions and interfaces is done to overcome student problems in taking online learning due to the Covid-19 pandemic. In addition, interaction and interface designs are used to overcome their learning which takes a long time either during practicum or discussions outside the classroom. It also requires assistance from the teacher because of the difficulty in understanding the content of the material. The use of live coding in learning is an alternative solution to studying the material in a structured and easy-to-apply online manner.

3.1.2. User Persona

User Persona is a method of identifying user needs that are used to evaluate and improve user quality in user-friendly software design (Praadita et al., 2021). Interviews were

conducted with user groups and resulted in data that was processed into a user persona. It can be seen in the following image.

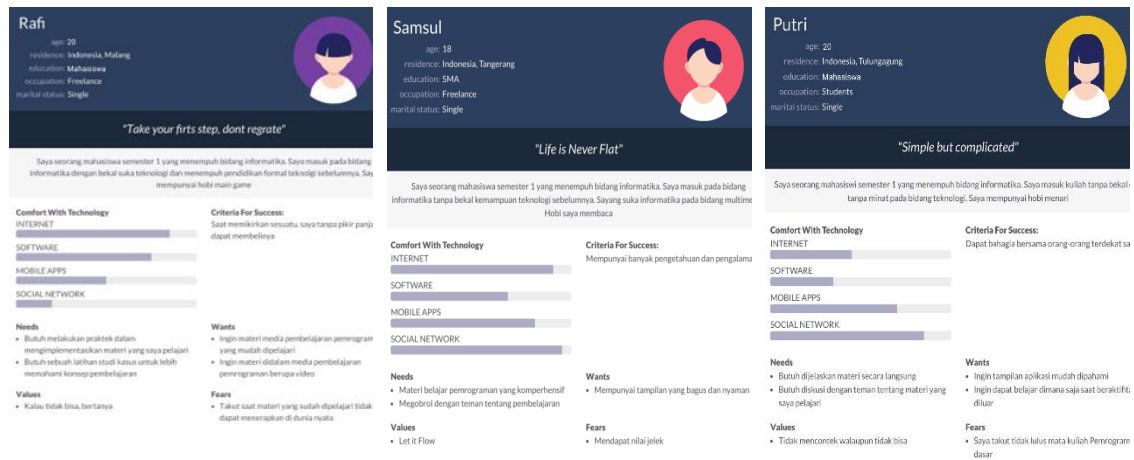


Figure. 2 User Persona

3.2. Design

3.2.1. Material Design

Basic programming material is a subject that must be mastered by Informatics Engineering Education students. Basic programming is the basic material that must be understood and will later become the basis for taking the next course. This application is equipped with modules that discuss basic programming material in a structured manner. There is an introductory feature that contains the flow of learning objectives and learning outcomes in each module. The material that can be accessed is in the form of text and video. This application also has a case study feature that can be solved by the user. This application is equipped with a live coding feature that can make it easier for users to directly practice the material obtained. The available discussion features can be used by users to exchange ideas on a problem. This application is equipped with an evaluation to measure the extent to which the user understands the material that has been given.

3.2.2. Use Case Diagram

A use case diagram is a diagram that describes a system from the point of view of people outside the system (Rohmanto & Setiawan, 2022). The following is a Use Case Diagram of the developed application.

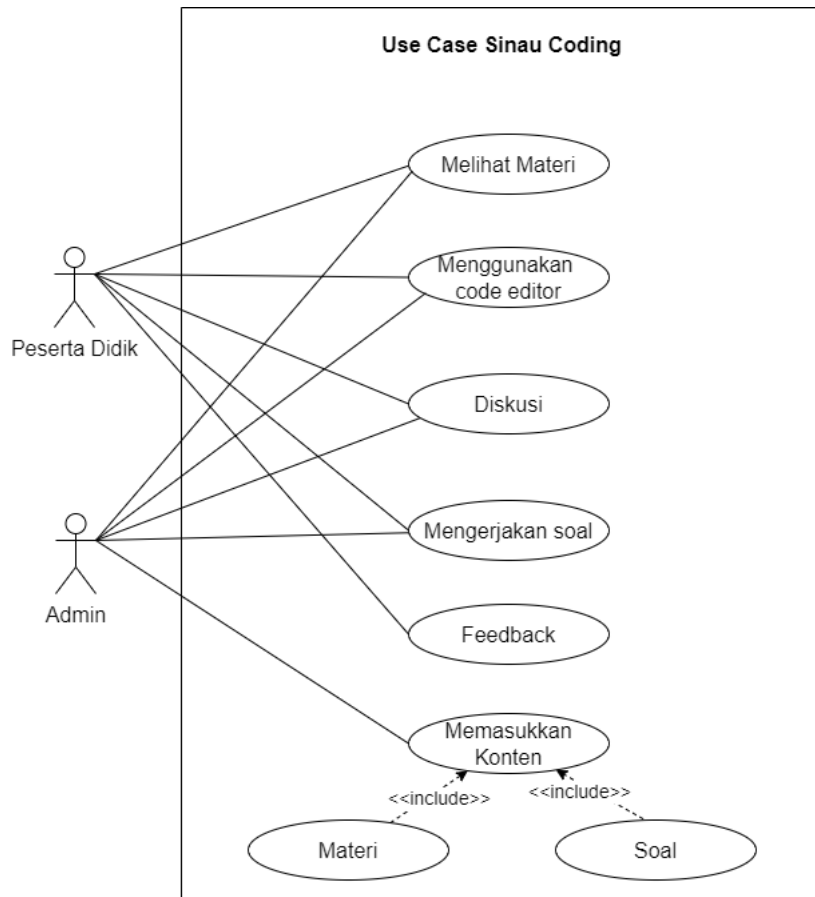


Figure. 3 Use Case Diagram

3.2.3. Flowchart

A flowchart is a graph of the process and logic of the procedure flow of a program systematically (Rejeki & Tarmuji, 2013). The following is a Flowchart of the Sinau Coding application.

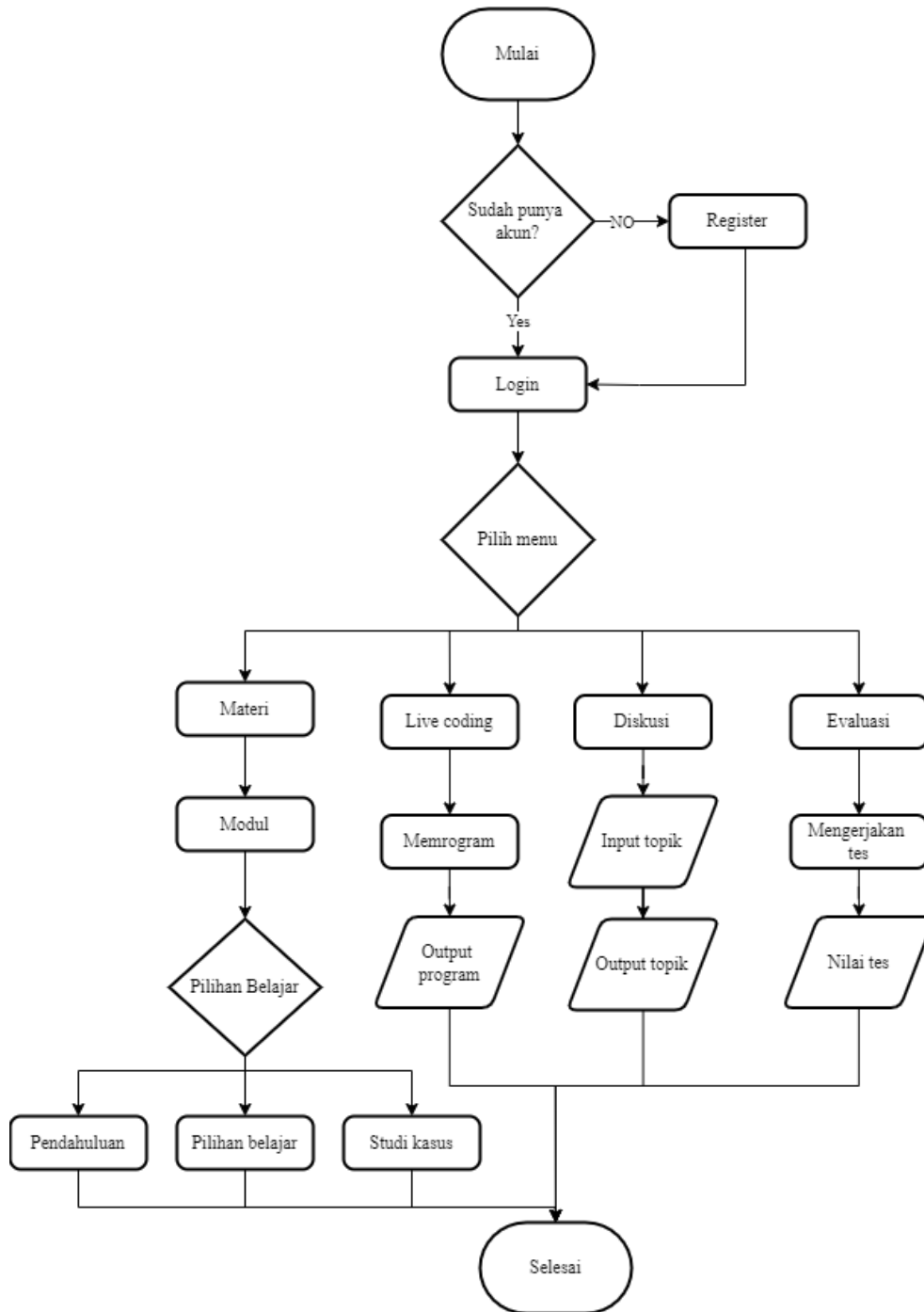


Figure. 4 Application Flowchart

3.3. Build or Revise

3.3.1. Wireframe

A wireframe is a framework or initial design of a system that has not been given colors and images that will be used as a reference for high-fidelity prototypes to make it easier to develop. (Ramadhan et al., 2021). The following is a Wireframe Diagram of the developed application.

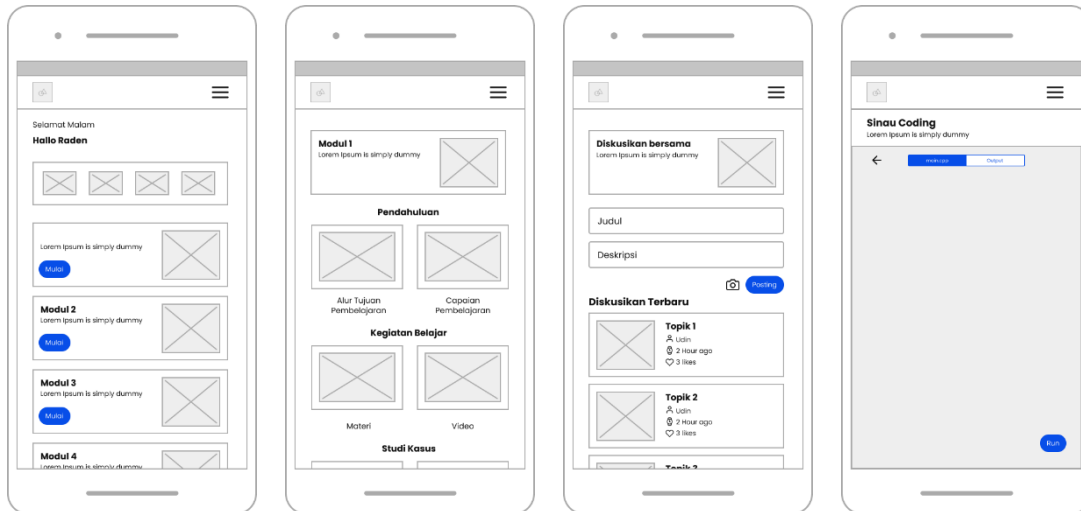


Figure. 5 Wireframe Design

3.3.2. Prototype

A prototype is an implementation of a physical product design or concept from a design concept (Martono, 2018). From the results of the planning that has been made, the following is a prototype that has been developed.

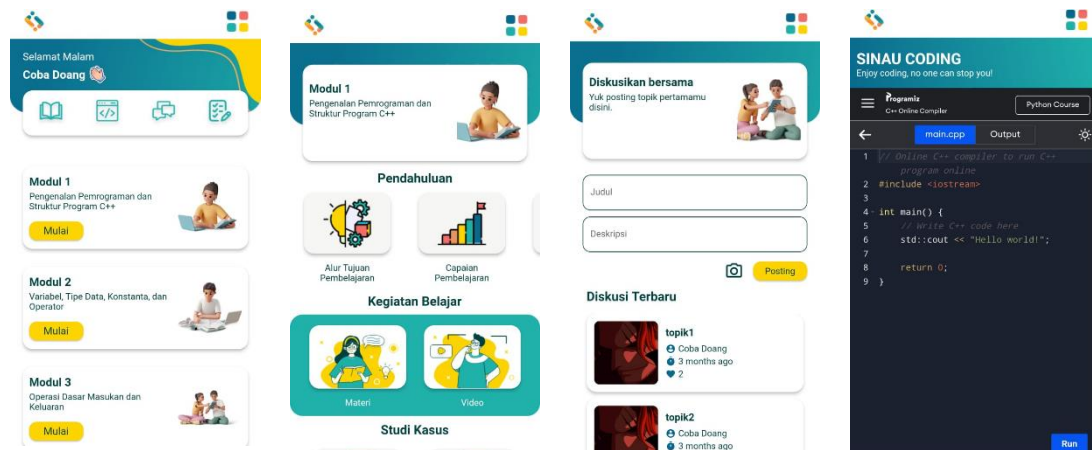


Figure. 6 Desain prototype

3.3.3. User Test

A User Experience Questionnaire (UEQ) is a classic form of usability testing to get an extensive impression of user experience based on usability and experience aspects. (Novitasari et al., 2020). The test was conducted using a user experience questionnaire or a short UEQ model. The indicators used in this research are Pragmatic Quality, Hedonic Quality, and Overall. From the research conducted, the following results were obtained.

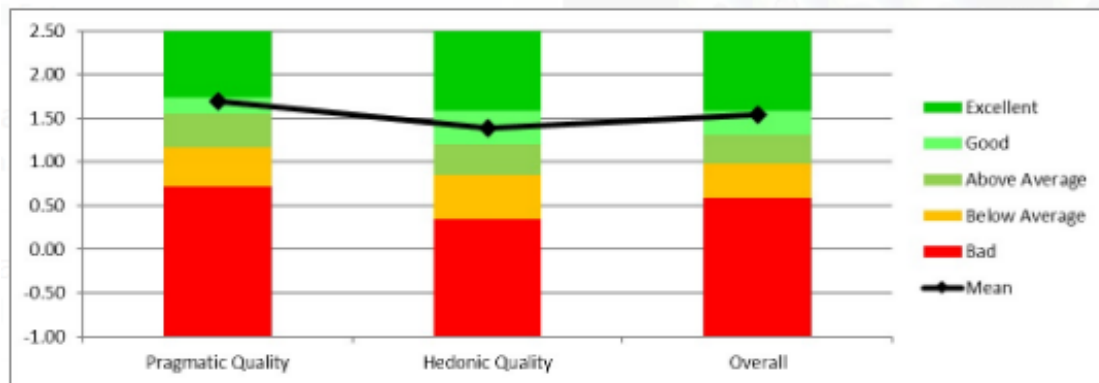


Figure. 7 Test results

Based on the comparison results using the Benchmark Scale aspects of Pragmatic Quality, Hedonic Quality, and Overall, it shows that the Sinau Coding application prototype is good with all variables in an excellent position. So the results of this study can be used as a basis for developing the Sinau Coding application into an application that is comfortable and easy to use.

4. Conclusion

The conclusion of the research is Mobile Live Coding Interaction Design and User Interface Using a User-Centered Design Approach in Basic Programming Courses to produce an interface that is suitable for user needs and is easy to use. This can be seen from the identification of user needs obtained from observations, literature studies, and interviews. In addition, the program flow is also clear with the material design, use case diagrams, and flowcharts. After that, the solution is compiled using wireframe modeling by the specifications that have been previously made. Then proceed with making a high-fidelity prototype. The testing process is carried out using UEQ indicators used are Pragmatic Quality, Hedonic Quality, and Overall. From the tests carried out, the average results of Pragmatic Quality are 1.70, Hedonic Quality is 1.39, and Overall is 1.54. From the comparison of the benchmark scale to the indicators, the results show that the results of the interaction and interface design are comfortable and easy to use.

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