Online Class UI/UX Design Using Design Thinking Method in Virtual Reality Environment

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Abstract. The development of Virtual Reality (VR) technology opens up new opportunities to improve the quality of online learning through more interactive and immersive learning experiences. This study aims to design the user interface (UI) and user experience (UX) of VR-based online classes using the Design Thinking method to meet students' needs in a virtual learning environment. The Design Thinking method, which includes the stages of empathy, definition, ideation, prototype, and testing, is applied to produce a user-friendly interface design that supports student engagement and social interaction during the learning process. The results of the study show that the VR-based interface is able to increase student engagement through more active interactions, intuitive navigation, and collaboration features that approach interactions in a physical classroom. Testing of the prototype shows that this design can meet students' needs in increasing engagement and learning comfort. It is hoped that this study can be a reference in the development of an effective and efficient VR-based online learning platform.

Keywords: User Interface, User Experience, Virtual Reality, Online Classes, Design Thinking, Interactive Learning.

1. INTRODUCTION

Education, in particular education internet based, has Lots experience change consequence progress technology information and communication (ICT) for two decades last . During COVID-19 pandemic, online learning has become choice main for Lots institution education . With method this , students from various background behind can to obtain more access comprehensive , so that allow learning without limitation time and geography . Problems like lack of involvement students , lack of interaction social , and difficulties create experience interesting learning often need help from online platforms (Smith & Johnson, 2020).

Reality (VR) in effective overcome limitations This with offer experience interactive and simulation depth that enhances understanding students and encourage they For learning (Brown, 2020). In virtual reality, students can involved direct with virtual objects , which allow they learn material lesson in a way more deep than conventional online learning platforms (Chen & Wang, 2018). Davis (2019) points out that virtual reality allows student For explore material lesson in a way more deep

In addition to implementing virtual reality (VR), user interface (UI) design and user experience (UX) are very important For support the success of virtual education platforms based on virtual reality . According to Li and Zhao (2021), the UI designed with Good can

increase comfort users , engagement , and efficiency moment using online platforms, allows student For focus on learning without experience difficulty in navigation . Tata Sutabri (2014) stated in his book that design system information must user - centered and capable make it easier access information specifically For online learning .

Design Thinking methodology in general efficient develop user - centered interface and enhance experience optimal learning in virtual reality . Design Thinking is methodology repetition that is centered on understanding deep about desires and preferences user through five stages : empathy , definition , ideation , creation prototype , and testing (Martin et al., 2019). Methodology This allow developer For to design customized solutions with need user end , especially students and educators , and help overcome challenge in VR- based online education (Hansen, 2021).

2. THEORETICAL STUDY

UI/UX Design in Online Education

Designing interface user (UI) and experience User experience (UX) of online learning platforms is very important For produce environment useful learning . According to research , design simple , intuitive and easy interface used can increase understanding and involvement students (Lee et al., 2021). Success learning in online learning is greatly influenced by features design like legibility text , convenience navigation , and clarity information (Nguyen & Lee, 2021). Sutabri (2014) emphasized that understanding comprehensive about system information can help development friendly UI/UX design users and fulfill need user end .

In addition , the approach user - centered UI/UX design own implications important in overcome common problems faced in online education , such as decrease desire For learning and difficulties in navigating the platform. Tata Sutabri's book use approach based on system information For build interface with understand need user in a way holistic (Sutabri , 2014).

Virtual Reality in Learning

Virtual Reality (VR) has become increasingly advanced technology relevant in education , in particular environment online learning . Brown (2020) argues that VR allows experience learn more interactive and immersive , which is believed can increase motivation and understanding student to material . VR provides various feature typical , including simulation environment nature that allows student feel material learning in a way more authentic (Chen & Wang, 2018).

Davis (2019) found that use of VR in the classroom science increase involvement students and enrich knowledge conceptual . This is consistent with findings of Garcia and Lewis (2020), who found that VR in education can help overcome constraint conventional online learning , which often fail involving visual and spatial senses student .

In addition , through methodology VR based , students can access difficult simulation applied in education physical , such as virtual tours or investigation laboratory . Thompson (2019) showed that VR can give experience learn more comprehensive with increase understanding draft through experience kinesthetic besides visual experience .

Design Thinking Method in UI/UX Design

Effective Design Thinking methodology in UI/UX development , in particular in framework education . Design Thinking helps designer in understand desires and aspirations consumer through five phases : empathy , definition , ideation , creation prototype , and testing (Martin et al., 2019). This phase allow team design For concentrate on the problem user in a way direct and productive relevant and appropriate solutions .

Design Thinking techniques are useful For develop attractive interface visually and friendly users in the UI/UX realm for VR- based online classes (Hansen, 2021). This allow student For concentrate in to obtain knowledge without face challenge navigation .

Zhao and Morgan (2018) emphasized that Design Thinking is very important in digital education because reduce gap between developers and users . This method increase efficiency interface and grow experience personalized learning in accordance with need student .

Implementation of UI/UX in Environment Virtual Reality Learning

Designing virtual interface requires understanding deep about how people interact with room three dimensions . Due to the differences virtual interface of two dimensional interface conventional , problem design and experience user become more difficult (Li & Zhao, 2021). However , the design virtual interface possible make student more involved and comfortable with the learning process .

Easy VR application used can increase motivation Study students , according to Foster and Green's study (2021). In addition , the method based on virtual reality (VR) allows student interact with more Lots things and environment than method conventional online learning , which allows they Study together in virtual environment (Harris & Walker, 2020). Chang (2020) claims that friendly VR interface users greatly reduce confusion and tension cognitive for users , especially those who are new know technology .

3. RESEARCH METHODS

Study This apply design thinking method . The design thinking method has 5 stages. that is Empohatize, Define, Ideate, Prototyping , and Usability Testing.

Empathize : At this stage This We must empathize with the candidate users to be able to understand What needs and wants users . Research This use qualitative For collect data with method interview . The interview was conducted aiming For look for know What only what is needed in to design online classes in virtual reality (VR). Target speakers is students who have ever do online classes and aged 19 to with 26 years . Question in interview nature open and unbiased so that the source Can tell his experience alone . There are 5 questions asked that is :

1. How your experience during This in follow online classes ? What are they? what do you enjoy most and what do you find most challenging ?

2. What do you usually need to be able to focus and feel comfortable during online classes ? How do you think VR can help or influence matter This ?

3. When you imagine online classes in VR form , what just what comes to your mind ? Features or experience like what do you think is ideal?

4. How method best for you to accept bait come back or directions from lecturer in VR class ? What will help you feel more connected with lecturer ?

5. What is the matter important anything else you think is necessary There is in experience Study VR class so you can useful and effective for student like you?

From 5 questions above what was asked . Resource person own various answers but can We tapered to keypoint from statement resource person . Most of them from source person want the atmosphere online classes become more interactive to support learning focus . And they want feature For interact direct and board write to be able to more focus and can get "feedback" directly direct .

Define : After Already get information from empathize stage then carry on to define stage . In the research This We get some key points that can We apply to research This . From the results the interview that has been done can concluded a number of important keypoint For design online classes in virtual reality (VR) namely :

1. Lack of interaction at the time do online classes .

2. It happens often distraction at the time do online and offline classes support focus Study .

3. Atmosphere online classes are still not enough Enough immersive .

From the results stages This We get 3 keypoints For do design online classes in a virtual reality (VR) environment . From the points that have been We get on stage This We Can continue to the next process that is ideation .

Ideate : After important points in design system Already collected , then at the stage This We Can start For make feature What only that can be implemented in the system created in the research this . One of method For do ideation is with method do HMW? (How might we?) in stages This We look for solution What only one can finish problems at the "define" stage of third key points that have been found . "How might we make the class more interactive and give students a live feedback" after find HMW? (how might we?) we continue study For formulate Features What only what is needed For design online classes in virtual reality (VR). There are several features that are ideated at the stage This is :

1. Chat room feature inside online classes and ask answer .
2. Board features write .
3. Slide show feature.

After Features Already determined so stages ideation can to be continued to stages furthermore that is prototype design .

Prototyping : At this stage This We Can start make Sketch and fidelity wireframes low until with more detailed models available a number of choice applications that can used For to design interface one of them is figma . For study This I use figma For UI/UX design of online classes in virtual reality (VR). Some features that already exist determined at the stage previously like chat room features , boards write , and a slide show will be created the prototype is at the stage This . Here is design UI/UX components for features that already exist determined .
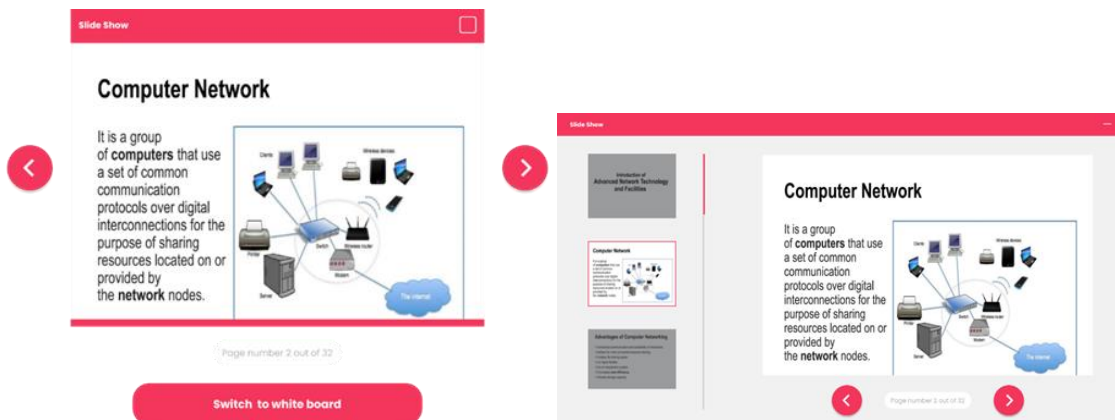
Chat room features
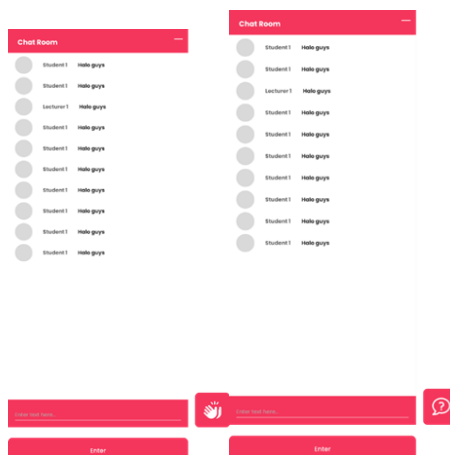
Picture 1

Whiteboard Features
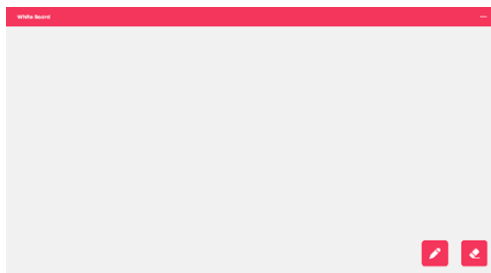
Picture 2

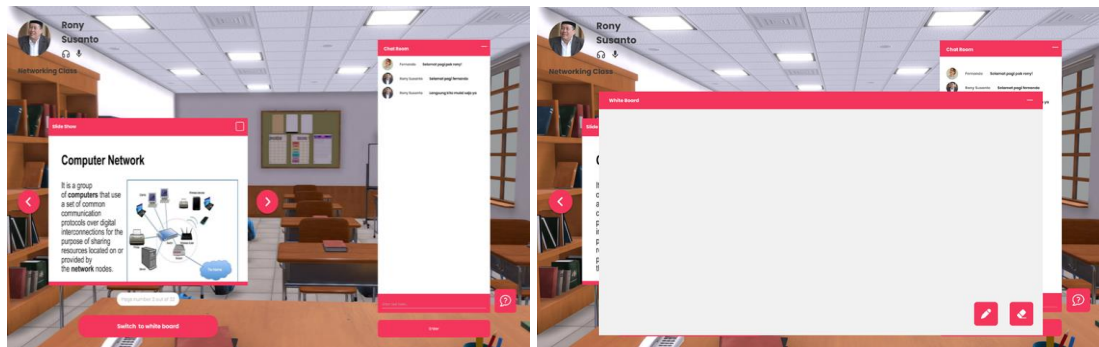**Slide Show Feature**

Picture 3

After component feature made We Can carry on For make mock up design interface online classes in virtual reality (VR). Here is UI/UX design of components in virtual reality (VR) .

Appearance Student

Picture 4

Appearance Teacher

Picture 5

After prototype finished so We Can carry on to stages next that is stages usability testing (UT). At the UT stage we must do a trial from the interface that has been designed to candidate users so that the book of Isa knows whether design that has been designed effective or No For used .

Usability testing : at stage This after design Already made , we test the results from prototype that has been designed . If the result Good Eat We Can give a conclusion to the design that has been made Already Good but If results Still Not yet in accordance so We Can do to ideate stage again For do design repeat for results design Can become more Good again . There are several method For conducting usability testing (UT) is one of them with using the Maze website. With using our Maze Can see user success rate results in use design design that has been made . If the average success rate reaches 70% then design Can rated OK . Next is results of usability testing (UT) conducted using maze.
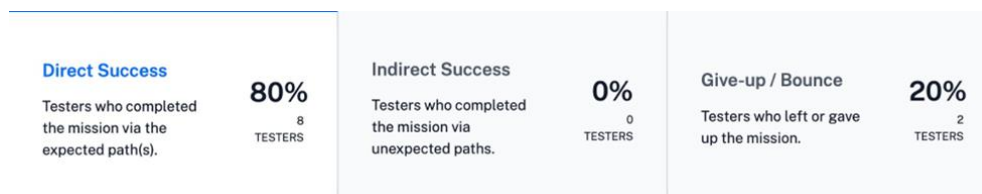
Picture 6

Usability testing (UT) results from design UI/UX design online class in virtual reality (VR) environment proves that design design Enough Good from results tests conducted using maze.

4. RESULTS AND DISCUSSION

User Specification Evaluation through Empathy Phase

In the empathy phase of the Design Thinking methodology, questionnaires and interviews were conducted with users to determine the requirements for VR-based online education. The recognized requirements are:

- **Increasing Learning Engagement**

Student engagement in online learning generally declines due to the lack of direct physical interaction. Virtual reality environments are expected to solve this problem by providing an immersive and authentic educational experience (Garcia & Lewis, 2020; Hansen, 2021).

- **Navigation and User Ease**

The results of the survey show that students need an intuitive interface, especially in the context of VR which is characterized by greater interaction complexity than conventional settings. This is important so that students can focus on the lecture material rather than facing technological difficulties. Chen and Wang (2022); Sunda Ariana (2023).

- **Collaboration and Interaction**

Virtual reality environments encourage increased social interactions between students and educators, creating a classroom climate similar to a physical environment (Smith & Johnson, 2020; Lee et al., 2021).

- **Problem Definition and Design Objectives**

The main concern emphasized is the creation of a VR interface that is user-friendly, engaging, and encourages social interaction in an educational context. The main goal is to increase engagement and simplify navigation while providing a collaborative platform for social interaction that mimics real learning situations (Li & Zhao, 2021; Sutabri, 2014).

Conceptualization and Progress of Design Solutions

The resulting design concepts include:

- **Physical Class Based Interface**

The interface simulates a classroom, using elements such as virtual whiteboards and interactive tables to offer a more familiar experience for students. This method facilitates rapid student adaptation (Ariana, 2023; Harris & Walker, 2020).

- **Gesture Interaction Capabilities**

In virtual reality, engagement can occur through hand gestures, such as raising a hand to ask a question or gesture. This feature increases student interest and participation in learning activities (Thompson, 2019).

- **Avatars for Collaborative Interactions**

Virtual avatars increase the realism of student interactions, thereby enhancing the immersive learning experience (Nguyen & Lee, 2021).4.2 Problem Definition and Design Objectives

The main concern emphasized is the creation of a VR interface that is user-friendly, engaging, and encourages social interaction in an educational environment. The main goal is to increase engagement and simplify navigation while providing a platform for collaboration and social interaction that mimics the real learning environment (Li & Zhao, 2021; Sutabri, 2014).

Prototype and Evaluation

After the prototype was developed, initial testing was conducted with small groups of students and educators. The results of the testing revealed many important findings:

- **Increasing Student Engagement**

Virtual reality settings increase engagement and stimulation in learning experiences, especially during simulation sessions and practical experiments (Davis, 2019).4.4

- **Prototype and Evaluation**

After the prototype was developed, initial testing was conducted with small groups of students and educators. The results of the testing revealed many important findings:

- **Navigation Facilitation**

Users felt that the real classroom-based interface facilitated their navigation and understanding of the functionality of current features (Sutabri, 2014).

- **Pragmatic Cooperative Engagement**

Avatars facilitate increased interaction between students and professors, fostering a learning environment similar to a traditional classroom (Lee et al., 2021).

5. CONCLUSION AND SUGGESTIONS

This study shows that the use of Design Thinking methodology in UI/UX design for Virtual Reality (VR) online courses can significantly improve student engagement and learning outcomes. This investigation leads to the following conclusions:

Increasing Engagement and Motivation

Virtual reality settings developed using Design Thinking methodology have shown increased student engagement through more active and immersive interactions. Realistic simulations and visual representations enhance the learning experience, thereby encouraging students to engage more actively in the educational process.

Facilitating Navigation with an Intuitive Interface

The interface design, inspired by the metaphor of a real classroom, effectively facilitates students' navigation in the VR environment. Students can focus on the subject matter without distractions due to the user-friendly interface and identifiable virtual reality technology components.

Enhancing Collaboration and Social Interaction

The use of avatar interaction and gesture features promotes genuine engagement and collaboration between students and educators, mirroring the social interactions typical of a traditional classroom environment. This offers a collaborative experience that is difficult to achieve in traditional online education.

Understanding the Importance of Design Thinking Methodology in Online Education

This study shows that the Design Thinking process is highly relevant to creating digital education solutions. Empathy, ideation, prototyping, and testing drive the creation of concepts that authentically focus on user needs.

This study presents several recommendations for further progress. To enhance the effectiveness of VR in education, it is recommended that the learning content in VR environments be varied and dynamic, including experimental simulations, exploration of three-dimensional environments, and problem-solving scenarios. This can enhance students' understanding of complex topics and increase their engagement. In addition, to increase flexibility in online education, it is important to consider integrating virtual reality with other educational platforms, such as Learning Management Systems (LMS). This connection will allow for a smooth transition between VR environments and conventional learning materials, thereby increasing students' access to a variety of teaching resources.

In addition, continuous evaluation and consistent user testing are essential to ensure that the interfaces created remain relevant and effective in meeting the needs of students. User feedback can serve as a benchmark for future feature enhancements and integration. Improving the visual integrity and realism of virtual reality will significantly enhance the educational experience for students. Visual enhancements and appropriate visual settings increase student comfort and reduce the likelihood of fatigue during learning sessions. These recommendations are expected to set a standard for developers in producing more effective and successful VR-based educational solutions.

VR-based interfaces are able to increase student engagement through more active interactions, intuitive navigation, and collaboration features that approach interactions in physical classrooms. Prototype testing shows that this design can meet student needs in

increasing engagement and learning comfort. It is hoped that this research can be a reference in developing an effective and efficient VR-based online learning platform.

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