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Virtual Computer Laboratory Learning System Integrated with Social Media and Video Conference

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ABSTRACT

The advancement of information and communication technology has driven innovation in various aspects of education, including computer laboratory learning. Traditional computer laboratories often face challenges in terms of time, cost, and accessibility. To address these challenges, this study developed a virtual computer laboratory learning system integrated with social media and video conferencing. This system is designed to provide flexible access, allowing students to learn and practice anytime and anywhere. The integration of social media aims to enhance interaction and collaboration between students and instructors, while video conferencing enables real-time learning sessions with direct interaction. The research methods used include system design, software development, and system testing. The results showed that the virtual computer laboratory learning system integrated with social media and video conferencing can facilitate learning and is expected to be an innovative solution in information technology education.

Introduction

The development of information and communication technology has had a significant impact on various aspects of life, including in the field of education. This advancement has opened up opportunities to develop more effective, efficient, and flexible learning methods (Setiawan, 2018). One of the important innovations in education is the development of a virtual computer laboratory learning system that is integrated with social media and video conferencing (Ridho, 2022).

Computer laboratories are a vital component in informatics engineering education. This facility provides students with the opportunity to understand and practice information and communication technology concepts directly. However, the use of conventional computer labs is often limited by time, space, and cost factors. These obstacles can hinder the learning process and reduce the effectiveness of education (Warman et al., 2023).

To overcome this problem, the development of virtual computer laboratories is a promising solution. Virtual labs allow access to computer software and resources online, so students can learn anytime and anywhere (Iskandar et al., 2023). Integration with social media aims to increase interaction and collaboration between students and teachers, as well as between students themselves. Social media provides a platform that allows information sharing, discussion, and cooperation in learning projects (Findyartini et al., 2020). In this study, video conferencing was used, namely Zoom.

Zoom Video Conference is a video-based communication platform used for meetings, webinars, and online collaboration. Founded by Eric Yuan in 2011, Zoom became very popular, especially during the COVID-19 pandemic (Yupita et al., 2021). The platform offers a variety of features such as screen sharing, virtual backgrounds, recording, and breakout rooms. Stable video and audio quality, as well as an easy-to-use interface, are the main advantages of Zoom (Rahman et al., 2021). However, the platform also faces challenges such as security and privacy issues, as well as the phenomenon of "Zoom fatigue" or fatigue due to excessive use of Zoom (Gani et al., 2023). Meanwhile, the use of video conferencing allows learning to be carried out in real time with direct interaction, even though physical distance separates students and teachers (Sari & Abidin, 2024). In this study, social media was used, namely Gmail.

Gmail is a web-based email service developed by Google. Launched in 2004, Gmail offers a variety of features that make email management easier and more efficient (Aisyah & Sari, 2021). Some of Gmail's key features include large free storage, integration with Google Drive for file storage, advanced search capabilities, and security features like spam filters and two-step verification. Gmail also supports integration with various other Google apps such as Google Calendar and Google Meet. This service is popular because of its simple interface, reliability, and strong security (Zurnali & Sujanto, 2021). This research aims to develop a virtual computer laboratory learning system that is integrated with social media and video conferences. This system is expected to improve the quality of learning in informatics engineering practicum by providing more flexible and interactive access (Afriani & Fitria, 2021). In this journal, basic concepts, development methods, implementation, and system testing will be discussed. This study is expected to make a positive contribution to the development of technology-based education, especially in the field of informatics engineering.

Method

The research methods used include needs analysis, system design, system implementation, and testing.

Needs Analysis

This needs analysis is the initial stage in creating a system to determine the necessary hardware and software. These needs are aligned with the needs of their users. Thus, the research intends to be able to form a learning information system that can be done remotely using video conferences.

Hardware Requirements Analysis

Table 1
Hardware needs analysis

Hardware
Core i5 or higher laptop
USB
Keyboard
Mouse

Software Needs Analysis

Table 2
Software needs analysis

Perangkat Lunak (Software)
Visual Code Studio
Php Myadmin
Xampp
Windows

System Design

System design modeling will be described through use case diagrams and system architecture.

a. Use case diagram

This system use case describes the features that exist in e-learning learning applications which are a representation of the functional and non-functional needs of the system.

In this system, it is described as 3 access rights, namely admin, lab officer (teacher), and also students.

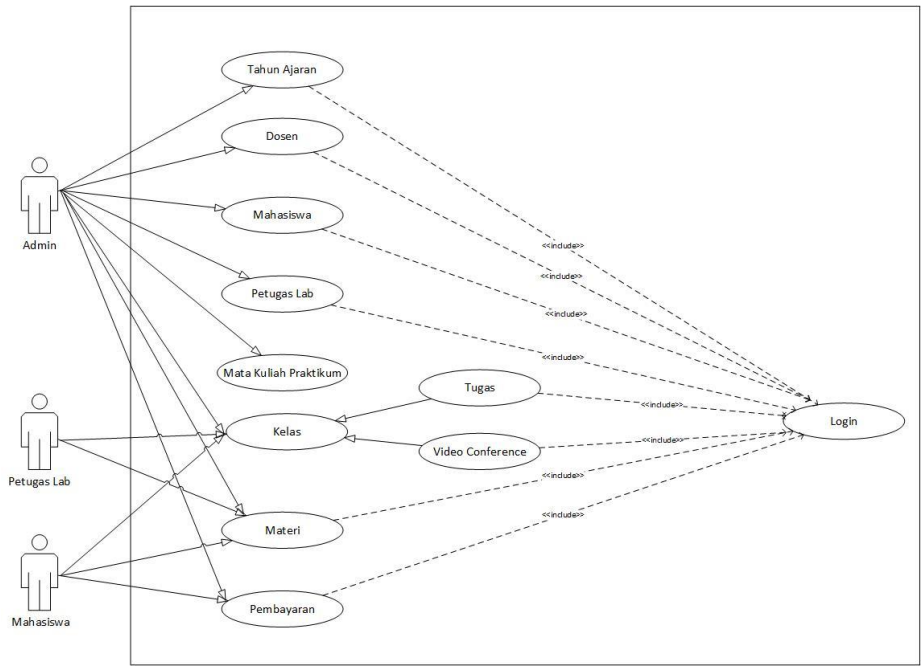

Figure 1. Use case overall diagram

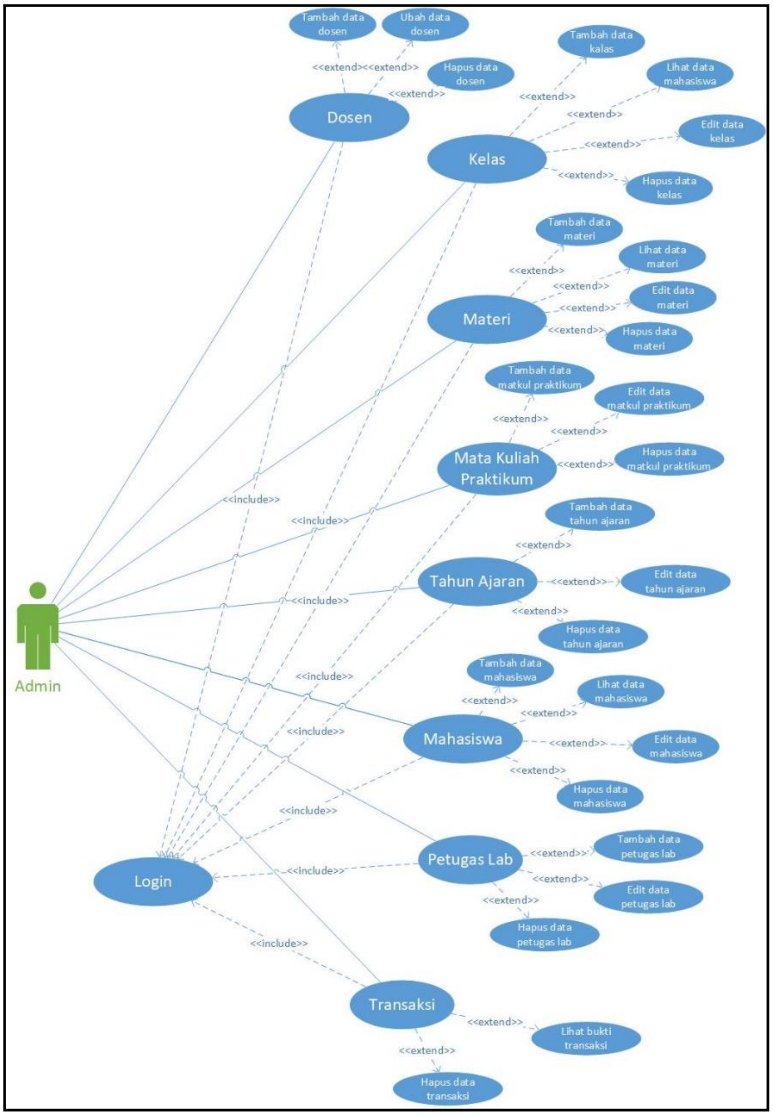

Figure 2. Use case diagram from admin

b. System Architecture

The system design is made to make it easier to implement the system. To find out the system architecture developed, an architectural design is designed. The system architecture in the learning information system starts from the user who accesses the system through a web browser (a network connection is required), then the web browser requests the web server according to the user's wishes. The web server requests data from the application server to be displayed to the user. Data is retrieved from the database server. Once the data is obtained, then the user can view it through a web browser.

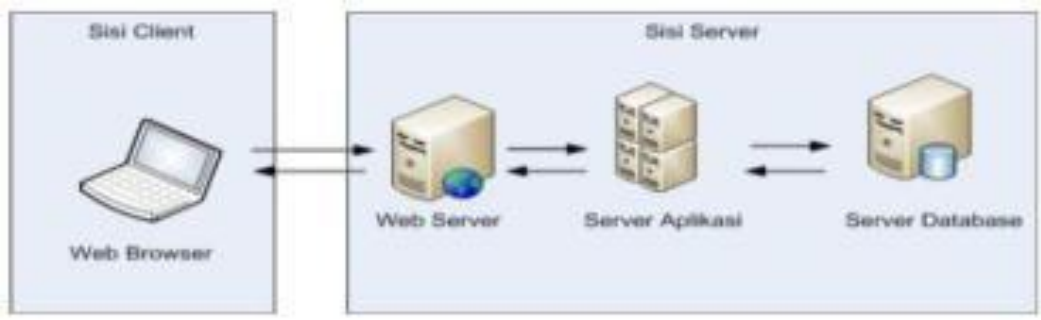

Figure 3 System architecture

System Trial

This system testing uses a black-box testing method that aims to find out if the software is working properly without paying attention to the program code in detail.

Results and Discussion

User Interfaces Display

a. Use of Social Media "Gmail"

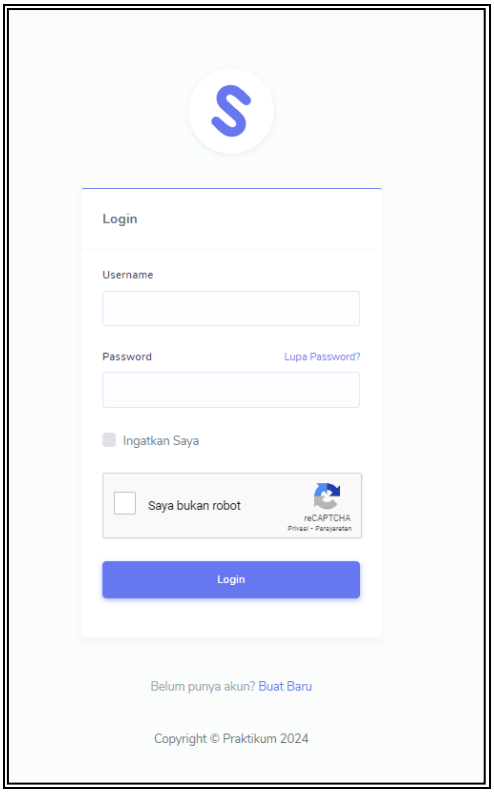

Figure 4 Login Page

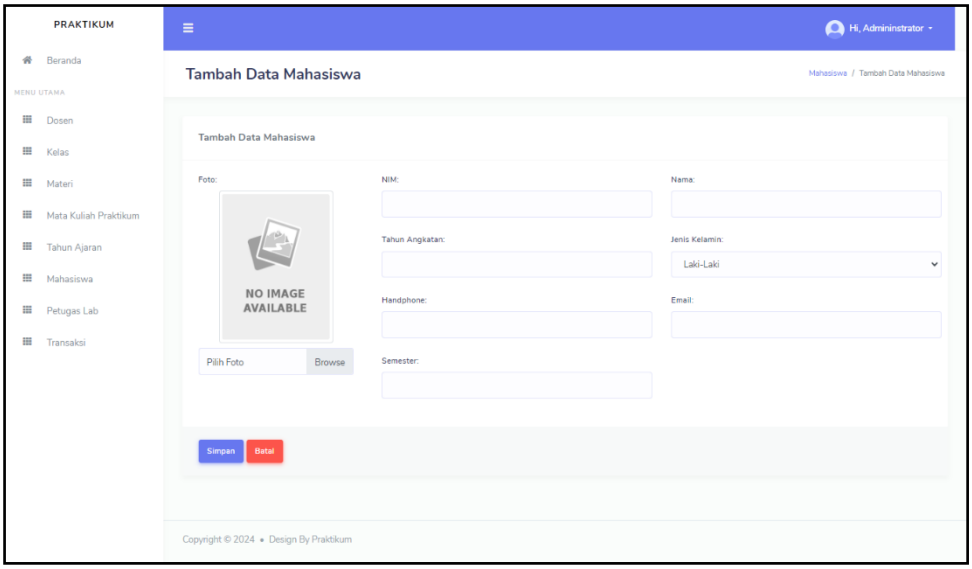

Figure 5 Page of the New Student Add Form

Figure 6 Students receive usernames and passwords.

b. Use of Video Conference "Zoom"

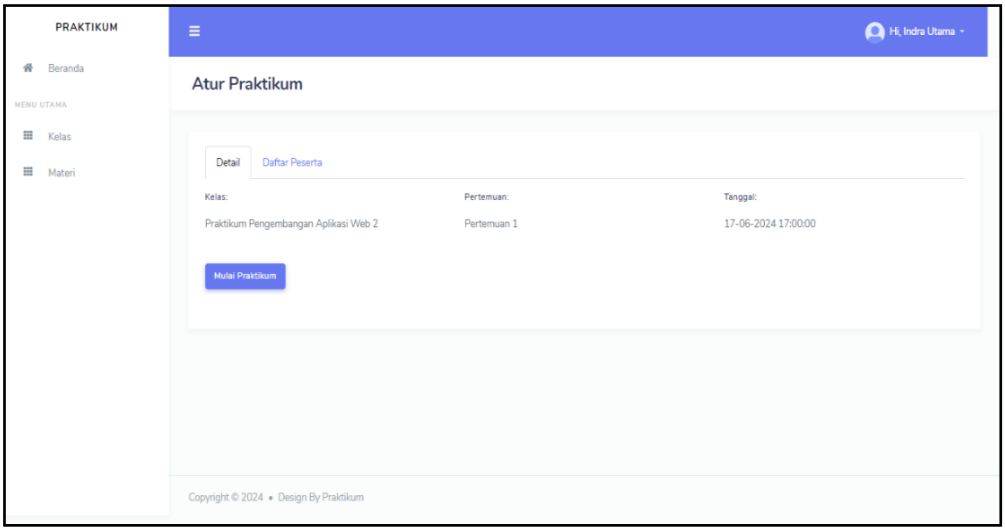

Figure 7 Page Lab Officer (Teacher) starting/opening zoom

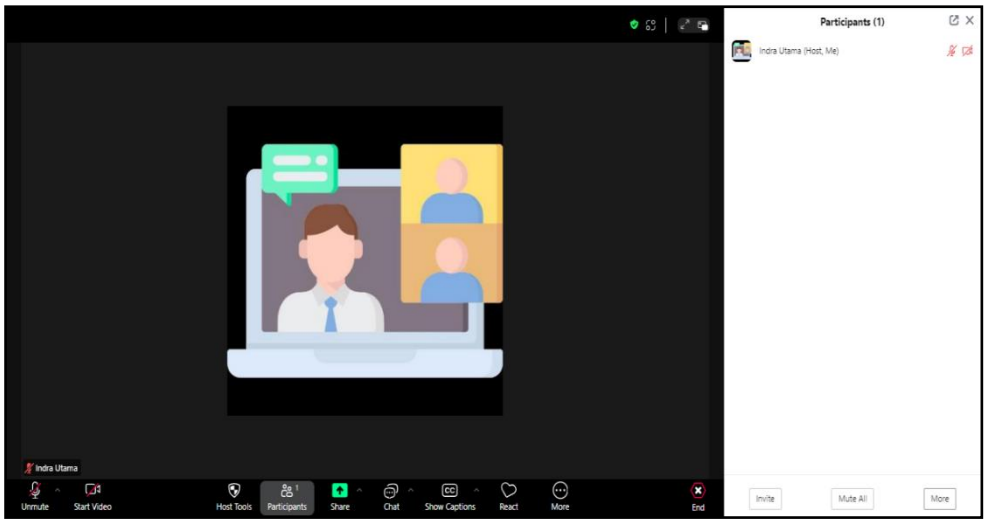

Figure 8 Lab Officer (teacher) successfully initiating/opening Zoom.

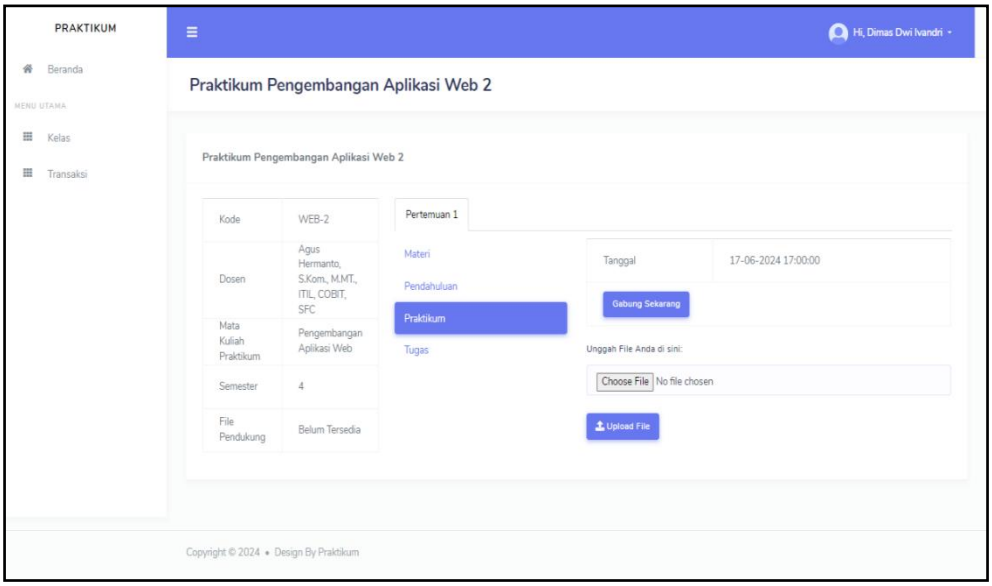

Figure 9 Student Pages to Join Zoom

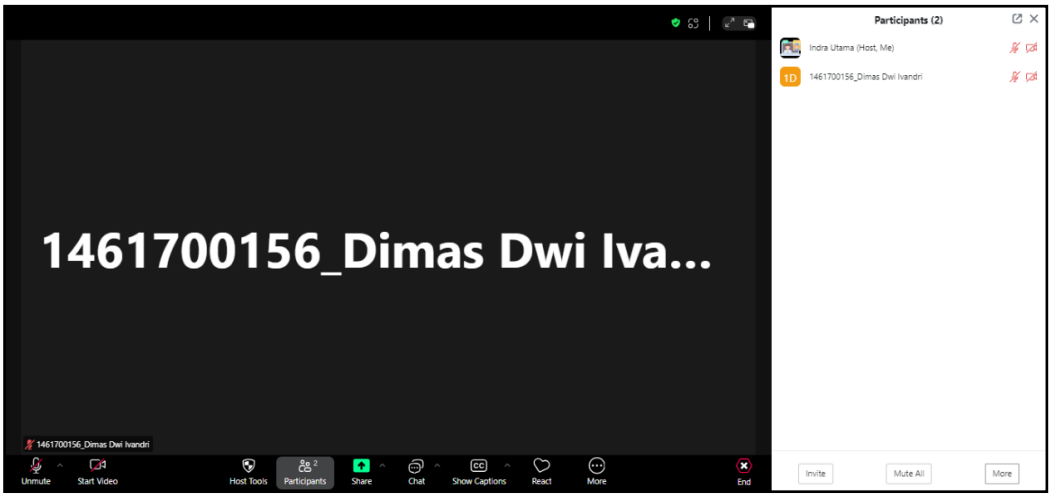

Figure 10 Page Students Successfully Join Zoom

Figure 11 Page Students Fail to Join Zoom Because Teachers Have Not Started Zoom

System Testing

The following are the details of testing the learning system using the black-box method, where the test is carried out at the end of the design so that the system can run well.

Table 3
Tabel Testing Black Box

Testing	Input	Hope	Observation	Test Results
Login	Log in to enter your username and password	Username and password fields are available, then select the login button	The app displays a dashboard page	[v] Success [ ] Failed

	If username and password are not entered then select the login button	Unable to access the system and the system displays an error message	The app displays the messages "Enter your username" and "Enter your password"	[v] Success [ ] Failed
Add Student Data	Select the "Add New" button icon.	Displays the add items page, fills in all the available fields, enters an active student email, then saves	The application displays a "success" message and students immediately receive a username and password that have been generated by the system.	[v] Success [ ] Failed
Start Video Conference	Lab Officer (Teacher) click the button icon "start practicum"	Display the Zoom page as a video conference	The app displays a Zoom page	[v] Success [ ] Failed
	Students click the "join now" button with the condition that the teacher has joined first.	Display the Zoom page and successfully conduct the video conference	Displaying a Zoom page	[v] Success [ ] Failed
	Students click the "join now" button with the condition that the teacher has not started the practicum.	Displays a page waiting for the host to start or cannot log in on the Zoom page	Menampilkan halaman "waiting for the host to start the meeting"	[v] Success [ ] Failed

Conclusion

The results of the evaluation show that students can access the virtual laboratory anytime and anywhere so learning flexibility increases. Social media integration allows for more dynamic and collaborative interactions, while video conferencing features allow

for real-time learning with in-person interactions, even if done remotely. Overall, the virtual computer laboratory learning system developed in this study provides a more interactive and engaging learning experience for students. It is hoped that this system can be an innovative solution in informatics engineering practicum, helping educational institutions optimize resources and improving the quality of learning.

The research also opens up opportunities for further development, such as integration with the latest technology, improved security features, and a more in-depth evaluation of the long-term impact of the use of this system on student learning outcomes. Thus, this system not only provides immediate benefits in the context of today's learning but also has the potential to be a model for future educational innovations.

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