Use of Information and Communication Technology in Virtual Laboratory Use Instructions

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A R T I C L E I N F O	A B S T R A C T
  	This project aims to enhance the Basic Telecommunications Engineering practicum by leveraging advancements in information and communication technology through digital transformation. The virtual lab addresses challenges such as limited equipment availability and obstacles preventing physical attendance, allowing practicums to be conducted remotely and on schedule. The virtual lab not only supports students in completing their practicum regardless of location and time constraints but also aims to improve the quality of education. Students must register with a username and password to access the Digital Transformation Practicum. Future developments include web-based practicum opportunities, further expanding online education for the course. Research indicates that, with a stable internet connection, virtual laboratory technology can be sustainably utilized to benefit students' learning experience.

INTRODUCTION

Is a method of transferring information from one location to another. One-way, two-way, and semi-two-way communication are three categories of long-distance communication included in the field of telecommunications. Information technology equipment is equipment used to collect data for both the present and the future. The information and communication industry is witnessing tremendous technological progress. One of the main factors for this success is the availability of advanced telecommunications systems courses, especially in the Department of Electrical and Computer Engineering. important in society because it is the most urgent aspect of life today, because we need to maintain relationships with everyone, even with those who are farthest away. As a result, communication becomes more effective. print or electronic media for communication.

Research Priorities and Urgency The goal of this project is to digitally transform an initial virtual laboratory prototype that can be accessed anytime and anywhere, increasing proficiency in laboratory practice and enabling students to continue practicing advanced information systems. Digital changes: Modules, responses, practicum processes, assignments, practicum tools and resources, as well as report generation are the many components that make up a virtual laboratory. Implementation guidelines and virtual laboratories for digital transformation were created for the Advanced Telecommunications Systems course. The aim of the virtual lab is to encourage student motivation in studying and understanding advanced telecommunications systems courses through interactive, dynamic and animated labs that are not boring. The aim of the results of this research is to create a system that can digitally change the initial prototype of the Advanced Telecommunication Systems Practicum. Providing theoretical support as an illustration of the meaning of communication and information. What is technology, namely various needs and facilities in the form of various things that function to facilitate the maintenance of human existence, information, especially news or news about something. who was notified; The practice of conveying information to others to enlighten, change attitudes, ideas, or behavior—either verbally or in writing—is called communication. Research Title: "USE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN INSTRUCTIONS FOR VIRTUAL LABORATORY USE "

THEORETICAL REVIEW

A website is an online collection of linked pages that can be viewed. Information and communication technology, which has progressed rapidly over time, is used to build websites. The worldwide network of connected computers called the internet makes it easy for electronic information to be shared quickly. It covers a variety of communication channels, including file transfers, email, and real-time computer or human-to-computer interactions. Websites take advantage of these technical developments to provide consumers with direct access to a variety of data and services. Websites may provide the materials, features and interactions necessary for contemporary communication and exchange of information over the internet. Internet visitors may find

various kinds of information on a website, ranging from important and important information to things that are pointless or useless. Commercial and free content may be included. A website is simply a collection of web pages with various types of media displayed on them, such as text, photos, animations and sound. These sites are networks of connected material and can be dynamic or static. They are connected via hyperlinks. This rapidly developing modern period has seen the evolution of computers enter its fifth generation. This generation ushers in a new era known as information and communication technology (ICT), namely the integration of computer technology and communication technology. The aim of this integration is to find solutions to problems more quickly and effectively. Not just one area, almost all people's lives are impacted by communication technology. On the other hand, a virtual laboratory can be described in two ways: either as a specific academic period devoted to practical laboratory work, or as a facility equipped for scientific experimentation, testing, and analysis, providing opportunities for observation and practice in the field. specific field of study.

A technique called "Learning Contracts," or "Learning Contracts," was created by lecturers to determine the different learning needs of their students and the activities they were willing to undertake to meet these needs (Hazmi et al., 2023).

A form of strategy in the cooperative learning method called a "learning contract", or "learning contract", is created by lecturers to identify the various learning needs of their students and the activities they want to carry out to meet these needs. This learning contract approach is considered the most reliable The relationship between learning contrast and student discipline in class VIII physical education learning at SMP Negeri 1 Purwasari is the title of research conducted by Wati et al. in 2021. The research results show that the application of the Learning Contract approach (learning contract) has a good impact on the learning objectives of Indonesian history in Class X IPS SMAN.

Lareh Sago Halaban, which encourages student participation in class to increase the significance of the educational process.

Hazmi et al.'s research, "The Influence of Contrast Learning Methods on Indonesian History," published in 2023 Learning Objectives for Teaching in a Self-created Contrast Class will be more profound and long-lasting than following the teacher's instructions. But it is important to ensure there is a clear consensus on what and how these matters will be investigated.

There are a wide variety of models and structures available for virtual laboratories, which change depending on the goals, technology, and type of project being studied. Reasons for using virtual laboratories include, but are not limited to:

A. Limited space and resources in the actual laboratory. Due to competing resource needs, students may face situations where they have to wait for the availability of certain resources, which can delay their learning activities. Additionally, the need for shared resources can cause experiments to stall before completion.
B. Sharing equipment is usually not a cheap option.

C. Incentives for joint or separate research, geographically dispersed groups.
D. The availability of an after-school learning environment where students can collaborate with each other on projects or take part in them.
E. Potential to create a variety of experiments in a variety of settings.
F. Remote intervention and monitoring in risky experiments to help prevent accidents.

METHODOLOGY

Data collection, literature evaluation, data analysis, system planning and design, system validation, virtual laboratory system design, system testing and improvement, and application use are some of the stages of this research project. The following is an explanation of the research steps:

1. Data Acquisition. Obtaining data is the initial stage in this investigation.
2. Literature analysis: To learn more about the use of Virtual Lab technology to implement digital transformation, a literature analysis was conducted.
3. In the Advanced Telecommunication Systems Practicum, using web-based virtual lab technology to determine the parameters of the digital transformation system.
4. Created the first digital transformation prototype utilizing Virtual Lab web-based technology.
5. Using the basic Telecommunications Engineering Practical Virtual Lab System, the results of the first digital transformation prototype were evaluated for software implementation.
6. Using Virtual Lab technology, Implementation Research was carried out by collecting literature related to digital transformation.
7. Users of the Practical Digital Transformation Implementation Guide to Basic Telecommunications Techniques are given a questionnaire.

Planning, implementation, observation, and reflection form the Kenmis and Taggart model that is the subject of this kind of study. The odd semester of the 2023–2024 academic year or July–November 2023 is when this research was conducted.

Planning, implementation, observation, and reflection form the Kenmis and Taggart model that is the subject of this kind of study. The odd semester of the 2023–2024 academic year or July–November 2023 is when this research was conducted. Students enrolled in the Class B Basic Telecommunication Engineering course were used as research subjects. Twenty students returned and completed the survey. "The Urgency of Implementing Digital Transformation Guidelines in Basic Telecommunication Engineering Practicum" is the title of research carried out in the electronics and telecommunications engineering laboratory, engineering faculty, Gorontalo State University in the electrical and computer engineering department.

Through the use of virtual lab technology, users in this research completed a basic practicum in Telecommunications Engineering at http://labtte.ft.ung.ac.id/virtual/laboratory/2. The results of using the

application guide during the digital transformation practicum using students' virtual labs were then observed as a data collection approach. Following improvements through assistance from laboratory assistants to prepare offline practicum reports every week for one experiment with eight modules, student results data using the application guide was then analyzed in tabular form to see the improvement in independent practice skills using the application guide assisted by virtual laboratory technology.

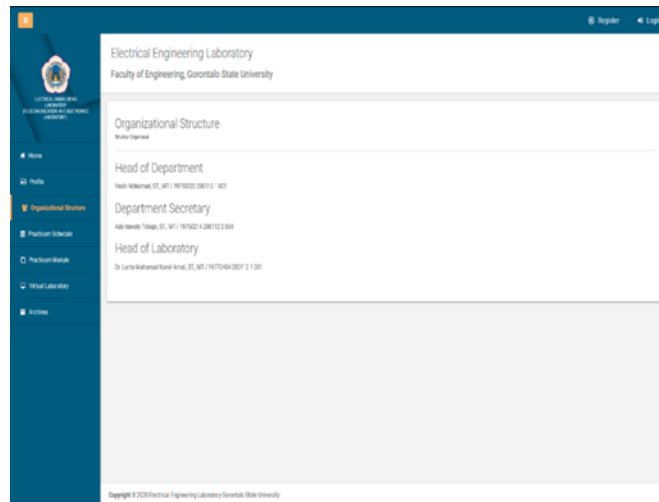The final step is carried out remotely using the internet at labtte.ft.ung.ac.id.
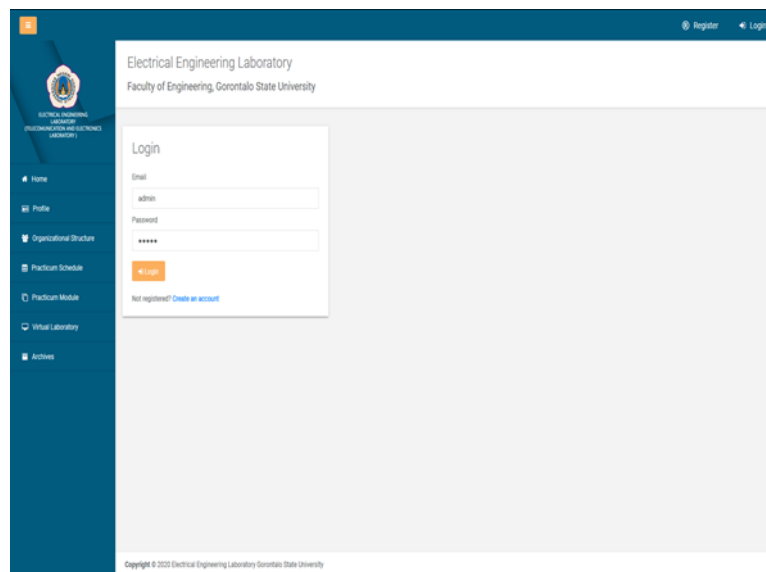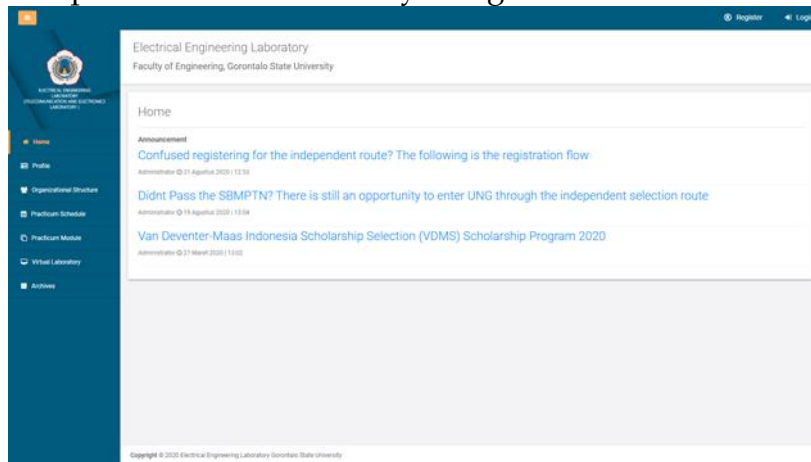
Figure 1: Information/Home Page
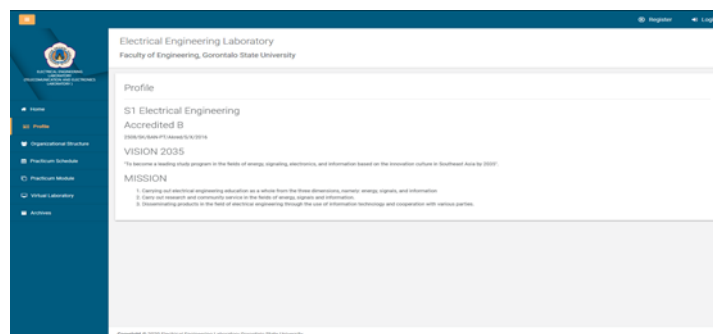
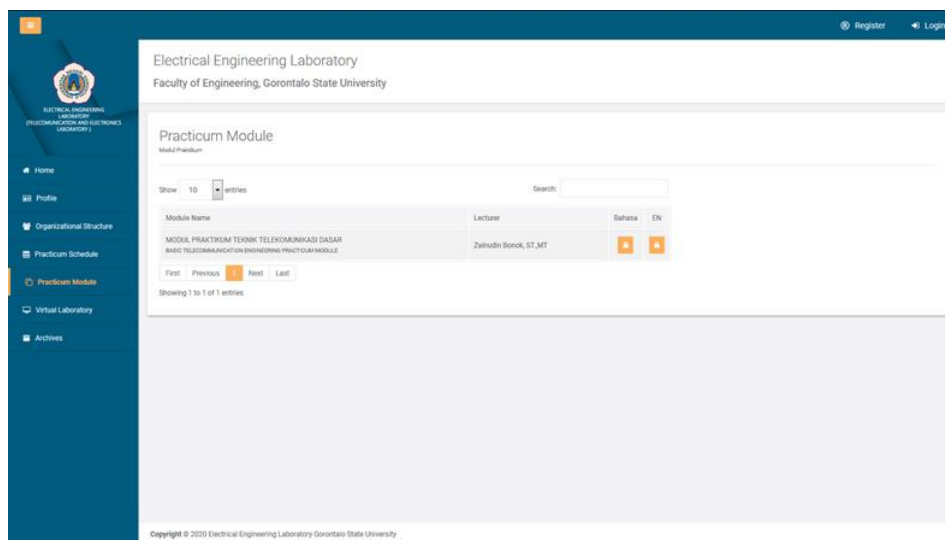**The profile page is shown in Figure 2.**

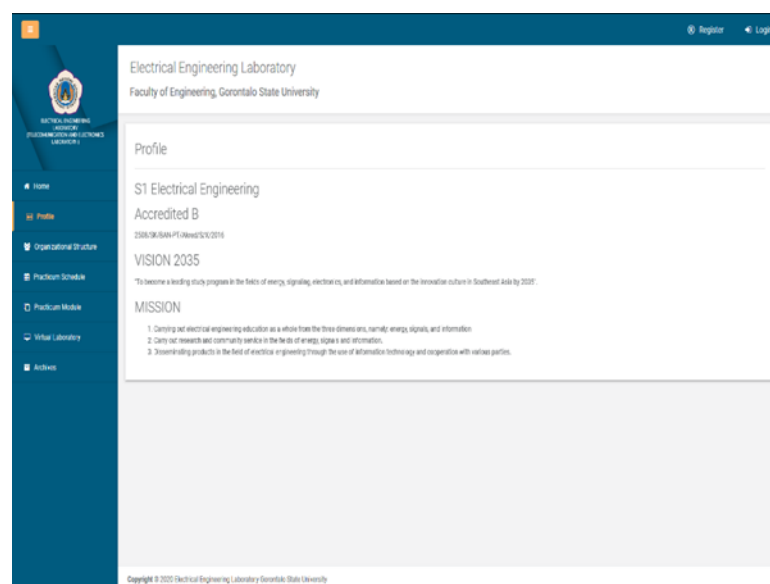**Figure 3: Login Menu Page**

Figure 4: Registration page

Furthermore, for Categorization of Software Processes A procedure definition is a part of a program that, when called, executes a particular program and then returns to the caller. Any PHP application starts with a form, which is basically a window. There are several event handlers on the form. An event is a program or event that is triggered by an event.

It looks like you've provided a thorough synopsis of a study and its conclusions about implementing a virtual lab system for Basic

telecommunications engineering course. Based on the data you provided, here is an organized summary:

Research Overview

The aim of this research is to increase direct learning opportunities in the field of Basic Telecommunication Engineering by utilizing virtual laboratory technology to facilitate digital transformation.

Method:

1. Data collection: Literature studies and observations were carried out in the first stage.
2. Literature Study: Extensive analysis with the goal of understanding virtual lab technology best practices.
3. Prototype Development and Testing: Create and assess web-based virtual laboratory prototypes.
4. Implementation Research: Continuous improvement of digital transformation techniques.
5. Questionnaire Survey: Collect student input to measure how well the virtual laboratory system is working.
6. Key Results:
7. System Development: Using a specific web address, a working virtual lab system was created.
8. Features: Home/Announcements/Information Page, Profile Page, Registration Page, and Login Page are among the menu forms.
9. Enhanced Learning: Online lab resources, scheduling, and practicum modules make distance learning more effective.
10. Impact of Virtual Labs: During the COVID-19 epidemic, the need to maintain education has been greatly emphasized.
11. Competency Improvement: Through theoretical and practical learning, student competency in the field of telecommunications engineering is improved.

RESULTS AND DISCUSSION

The problem formulation and virtual Lab system design and implementation are based on the previous chapter. The design and implementation of this virtual Lab system produces an application program which consists of several main menu forms including Home/Announcement/Information Page form, Detailed Information, Profile, Organizational Structure, Practicum Schedule, Practicum Module, Virtual Laboratory Material. , virtual lab, archive, registration, and login page. The web

browser http://labtte.ft.ung.ac.id /virtual/laboratory/2 will appear after the login page for this machine. and the home page will appear. Select one of the menu options, specifically:

Students who want to use this application must register first on the registration form in the application. Teachers and lecturers can gain application access by contacting the administrator or operator.

1. *Application and Guide Page*

Practical course modules on this website are installed by the relevant lecturer or instructor in line with effective courses; Students can download the file, but must log in first to the application.

Student Learning Guide Using the Virtual Electrical Engineering Laboratory Application at http://labtte.ft.ung.ac.id
This program, called the Electrical Engineering Virtual Laboratory, can help students in studying online laboratory courses. It contains downloadable course materials, as well as virtual laboratory elements that students can utilize in lieu of face-to-face instruction. There are three (three) levels of access in this application: Administrator, Lecturer, and Student.

Students who want to use this application must register first on the Registration form contained in the application. Teachers and lecturers can gain application access by contacting the administrator or operator. Application Page Explanation

CONCLUSIONS AND RECOMMENDATIONS

Conclusions that can be drawn from the discussion of research findings are as follows:

1. Accessibility and Quality: By enabling anytime access to educational resources, virtual laboratory systems greatly improve the standards of teaching.
2. Pandemic Resilience: Demonstrates how useful virtual laboratories can be in maintaining learning in the face of emergencies such as pandemics.
3. Competency Development: Students gain theoretical knowledge and practical skills necessary for real-world applications.
4. Longitudinal Implementation: The efficacy and flexibility of this system is evident from its successful integration over several academic years.

FURTHER STUDY

Suggestions: Future Development: Based on user feedback, the virtual lab system will be further refined.
ADDITIONAL STUDY EXPANSION: Prospects for wider use in other fields or academic institutions are being evaluated.
Technology Infrastructure: To enable distance learning efforts, internet infrastructure is being upgraded.

ACKNOWLEDGMENT

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