

MEDIA TEACHING DEVELOPMENT THROUGH INTERACTIVE WHITEBOARD BASED ON VIRTUAL LABORATORY IN VOCATIONAL EDUCATION

Sapto Haryoko¹, Hendra Jaya², Lu mu³, Mustamin⁴

^{1,2,3,4}Electronics Engineering Education, Faculty of Engineering, Makassar State University

¹saptoharyoko@yahoo.com, ²hendra070982@gmail.com, ³lumu_taris@yahoo.com, ,

⁴mustamin_tewa@yahoo.com

Abstract

Vocational School (SMK) is designed to prepare students or students who are ready to enter the world of work and be able to develop a professional attitude in the field of vocational, and must be able to provide the competencies or skills that can improve the quality of graduates to achieve success. In this study was developed through a practicum teaching media based interactive whiteboard with a virtual laboratory as a means of utilizing computer animation and 3-dimensional simulations along with the development of hardware -based touchscreen. This requires the development of a research model development Cennamo and Kalk. The design of the display design of Virtual Laboratory (LaVir) can be used to support activities in the laboratory practice. Activities that occur in the virtual lab consists of modifying the circuit, building a circuit, put the circuit, take measurements and subsequent component is an evaluation of a series that have been made. The next stage is how the virtual laboratory can be used by teachers and students of SMK through an interface that is touchscreen media. When teachers or students carry out practical activities on the interactive whiteboard cursor movement will be followed by a cursor that exist in the virtual laboratory. The results of the assessment of teaching practice through interactive media -based virtual lab whiteboard expert judgment obtained responses comprising the content aspect, practical design aspects, aspects of the display (Audio Visual), the virtual aspect, programming aspects, and aspects of electronics shows the overall mean score highly rated better.

Keywords: Media Teaching, Interactive Whiteboard , Virtual Laboratory

1. Introduction

The development of today's educational world is entering an era marked by incessant technological innovation, so it requires the adjustment of the education system in tune with the demands of the workplace. Vocational School (SMK) is designed to prepare students or students who are ready to enter the world of work and be able to develop a professional attitude in the field of vocational , and must be able to provide the competencies or skills that can improve the quality of graduates to achieve success [1].

Success in SMK size can not be separated from the name of the learning process and the lab . Some practical subjects

other than the need to know the basic concepts and theories supporting , also must perform experiments / experiments in the laboratory to understand a certain concept or the basic theories that have been studied in order to have a broader understanding level. To carry out a lab activities will require several factors, including laboratory space in accordance with the practice subjects, facilities equipment, and a complete practice materials .

Fact the field after the observation is found that there are many vocational equipment and materials that have very minimal practice, teaching media is still using conventional methods , there are even schools that do not have laboratory space,

so that the lab is not running optimally. Hope students are gaining the knowledge and experience of learning outcomes, while the teacher's expectations are practical learning process toward the achievement of cognitive changes, psychomotor , affective , and life skills enhancement students .

To overcome these problems, in this study will be developed as a means of teaching media animation and 3 dimensional simulations along with the development of hardware-based touchscreen. To develop this, we need a media research development [2].

Based on the description of the background , so in this study some of the problems can be formulated as follows: 1) how to develop media that can enhance critical thinking skills and life skills of vocational students; 2) how to design media that can enhance students' critical thinking skills.

2 . LAVIR Planning Methodology

This research is the development of research [3]. Software development models such as the medium of instruction for the virtual laboratory[4][5][6], carried out with the engineering approach where the stages are : analysis, design, implementation, and evaluation. Having produced a model of teaching media .

This study is a type of research and development. In accordance with the understanding that this research aims to produce a product. The products produced in this study is in the form of interactive media and instructional practices touchscreen devices are expected to address the practical activities carried out using conventional equipment .

The conceptual model is the embodiment of a multimedia and lab materials that make up the model LaVir (Figure1). The development of this LaVir consider a few things, namely: 1) audience . Users of this application are the teachers and students of SMK; 2) output equipment . Because the learning materials will be used by teachers and students independently, then the required format suitable for

interactive use, the touch-screen -based ; 3) image. Display with 3D images, such as backgrounds and illustrations that need to be made using 2D and 3D graphics software ; 4) audio. This application does not use a specific audio recording, but the recorded audio with the video as a whole ; 5) video . Video used in this application is a video showing the working principle of the working of a system or process that will be more easily understood and explained as compared to using a text ; 6) animation. 3D animation that shows the form in accordance with the scope of lab materials is practiced; 7) simulation. Practicum requires a process of selecting the components, assembling components, and perform testing of components through measurement tools . All processes that occur simulated in accordance with the real situation; 8) interactive tools. This application requires an interactive tool that is a button to switch to a specific view ; 9) virtual. Components and design rooms in the 3D shape is made equal to the real situation in terms of coloring, shape and perspective. So that would bring students into the atmosphere like a real laboratory practicum .

Production of CD-ROM is a multimedia stage where the whole object is created. To develop a program of measures required LaVir design as shown in Figure 1.

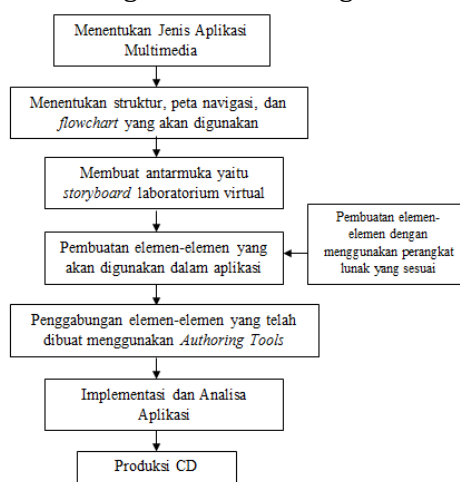


Fig.1
The design flow Touchscreen-based teaching media

Making an application based on storyboards, navigation structure, or flowchart derived from the design stage. At this stage of the design created storyboards that depict the look of each frame. Interactive because that will be made is not simple, it is necessary navigational structure that can be used to define links from one frame to another frame as well as the effects of virtual visualization depicting a similar situation with the real reality. After the creation of application-Virtual Lab, all lab materials stored on a CD-ROM to be duplicated. While the hardware needed for the manufacture of such measures in Figure 2 as follows

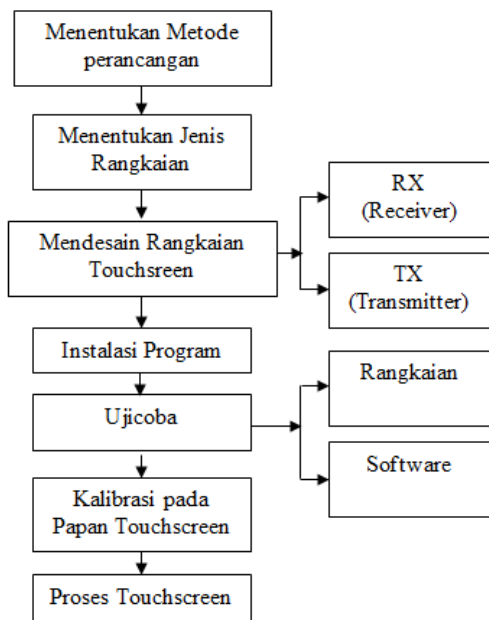


Fig. 2

Hardware Design groove LaVir Up to Produce process Touchsreen

In Figure 2 looks LaVir hardware design flow to generate the touchscreen. Starting from the design determines what method will be used further specify what type of circuit that will be used, in this case a series that is designed to function as a touch screen. The design is shown in Figure 3.

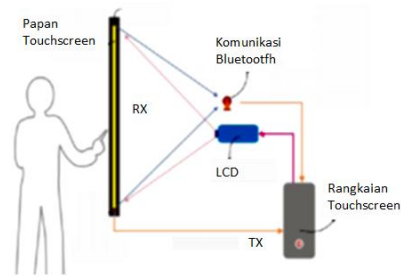


Fig.3

Design Media Teaching from Touchsreen

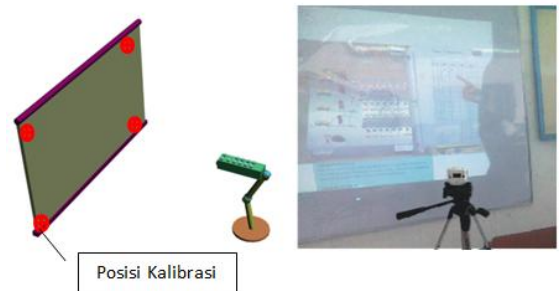


Fig. 4

Position for the calibration process

The series of touchscreen consists of 2 parts namely the transmitter (TX) and receiver sections (RX), the communication between them using Bluetooth communication. For the communication process between them using the installed software testing is then performed either software (software) or hardware (hardware) prior to calibration for the touchscreen.

Display Design for Virtual Laboratory

Before the beginning of the product development process is a step that must be passed by a collection of material . Collection material can be done in parallel with the production phase . At this stage, the collection of materials such as animated videos that match the topics lab, for background audio, video and others needed for the next stage. If the material sought is not found , then it should make your own by using software that has been predetermined.

Researchers in producing software LaVir media using a combination of measures of development measures which have been proposed by Borg and Gall , to adopt instructional design instructional Dick and Carey, and multimedia development in the adoption of Lee &

Owens . In outline at developing measures undertaken by researchers in this development is to construct a flowchart , story board, CD packaging, and manufacturing series of touchscreen. Products made using the main software Macromedia Flash MX, Macromedia Flash prof. 8, swift 3D, 3Ds Max and then produced the initial product LaVir media. LaVir initial product developed with the material presented by 10 lab experiments .

The design of the menu display design model development and then used as the

basis of the Virtual Laboratory (LaVir) to generated a learning software that can be used in practice to support activities in the laboratory as shown in Figure 5.10. Activities that occur in the virtual lab consists of modifying the circuit , building a circuit , put the circuit , take measurements and subsequent component is an evaluation of a series that have been made .

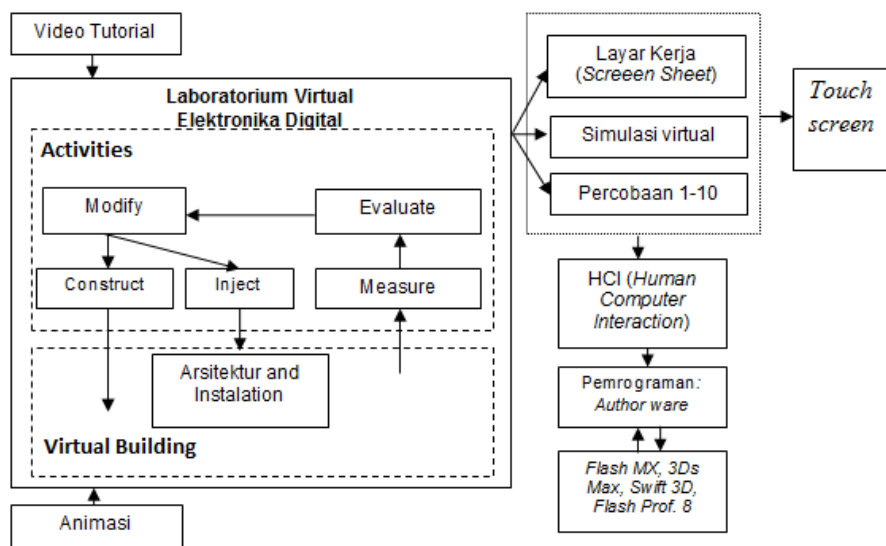


Fig.5 Activity Diagram in the Virtual Laboratory

Display Virtual Laboratory (LaVir)

Facilities and content developed in LaVir based storyboard and flowchart. For that to realize a virtual laboratory for the manufacture and animation programs are always based on the storyboard. The following will discuss about creating a virtual lab:

- a. Home, is the first open page-This Virtual Lab program. This page will direct the user to enter the main menu page as shown in Figure 6.



Fig. 6Home

- b. Main Menu page, a page that will display the entire form to be explored. This page consists of a few buttons by function buttons respectively. First, the

"clues" to see the Virtual Laboratory guidelines. Second, the "component" to go to form a short introduction to the components used in digital electronics. Third, the "tools and materials" to go on the form provides information on the tools and materials used in electronic circuits. Fourth, the "practice" to go to form a virtual laboratory practicum. Fifth, the "material" that goes inside the material matter relating to lab activities.



Fig. 7. Main Menu page

c. Practice page, a page that will bring students to carry out practical activities. Form in Figure 8 is made as if the user or student taking the components and put them interactively. This page consists of several frames which are merged to form the video display in the form of SWF files. Perspective display provides an atmosphere as if it were in the room. It aims to deliver virtual effects / virtual.



Fig.8 Practice Page

d. Component Guidelines page, contains the steps that must be done before the start of practice activities. Page instructions shown in Figure 9.

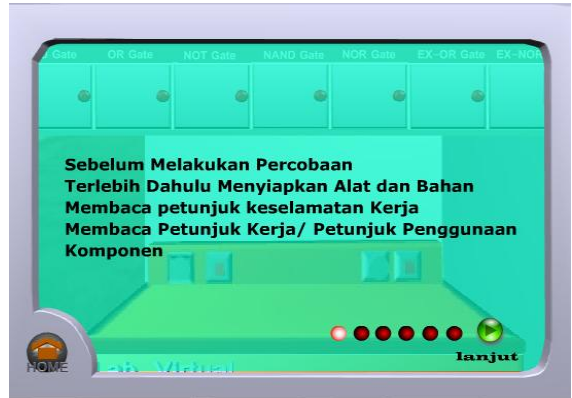


Fig 9.Component Guidelines page

e. Exercise and test pages, contains the exercises and tests given at the end of the experiment as shown in Figure 10. Given test consists of two tests in the form of the essay and a multiple choice test.



Fig 10.Exercise and test pages

f. Workscreen page, a portion of the practice page. On this page students can assemble the circuit as shown in the upper right of the screen.

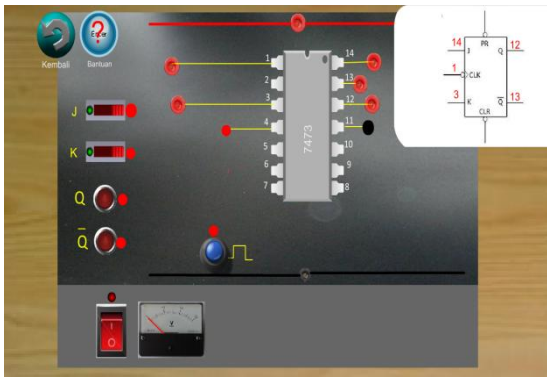


Fig 11. Workscreen page

In the above picture students can draw (Drag) red dot where it wants and put it (Drop) to the corresponding point on the circuit like. When the draw point it will be followed by a line to illustrate the real-world "establish the connection / jumper cables".

Programming Virtual Laboratory

To make interactive programs the need for programming activities in Macromedia Flash action script known. Macromedia Flash application program developed for more interactive learning-based user interface as a means of communication between humans and computers (Human Computer Interaction), because the program is to provide tools that can be developed by the developer.

Page-screen menus work in Figure 5.16 is designed with interactive pattern where the user is given the freedom to manipulate the circuit, doing trial and error, look at the output and execution (running the program).

```

on (release) {
    //menghasilkan variable i=1, i=2, i=3, i=4, i=5
    for (i=1; i<4; i++) {
        //jawaban_user+i dikosongkan
        if(_root["jawaban_user1"] == "terhubung"){
            if(_root["jawaban_user2"] == "terhubung"){
                if(_root["jawaban_user3"] == "terhubung"){
                    //tanda+i pindah ke frame 1
                    gotoAndPlay(2);
                }
            }
        }
    }
}
on(release)
{
    _root.snd.stop();
}

```

Fig 12.

Salah satu Action Sript pada menu simulasi
4. Interface Design

After designing software that LaVir, next is how the virtual laboratory can be used by teachers and students of SMK through an interface that is touchscreen media. Interface in the form of hardware (Hardware) LaVir consists of several components, namely: 1) touchscreen receiver section referred to as the RX-TCS; 2) touchscreen transmitter section known as TX-TCS.

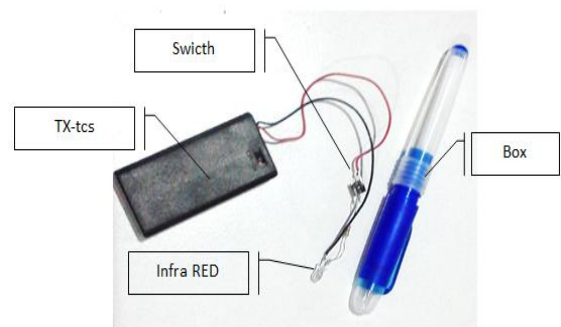


Fig 13. Transmitter TX-tcs

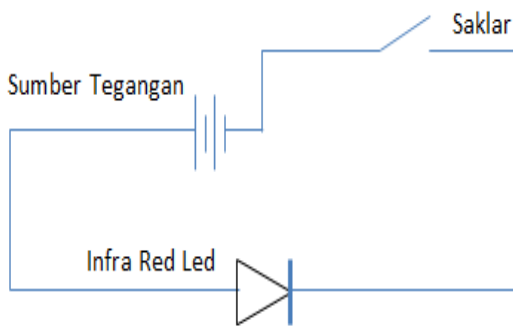


Fig 14.
Diagram Schematic of TX-tcs

The standards to be achieved in this design are: 1) when the TX-TCS serves emit infrared signals when measured or give off light when viewed on a mobile phone camera; 2) Monitor, wide projection screen (LCD), or whiteboard can be touched and controlled like a touch screen using a TX-TCS; 3) once the LED lights will light up captured by TX-TCS as a single click, double click two times the mean, the next flare will continue to be perceived as click and drag (click and drag)

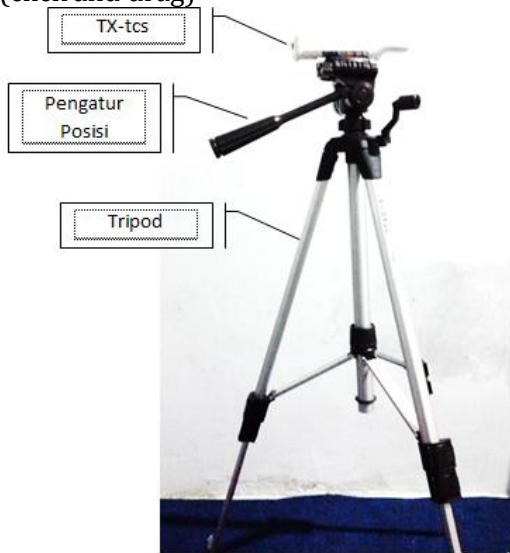


Fig 15. Transmitter Touchscreen (TX-tcs)

Touchscreen transmitter (TX-TCS) will emit a signal via Bluetooth to the communication process between the RX-TCS and computer. When teachers or students carry out practical activities on board touchscreen

cursor movement will be followed by a cursor on the laptop. The following will be shown in the parts of the touchscreen transmitter (TX-TCS)

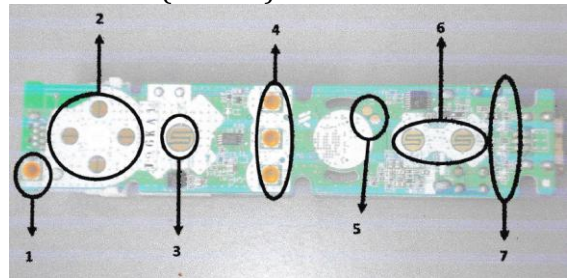
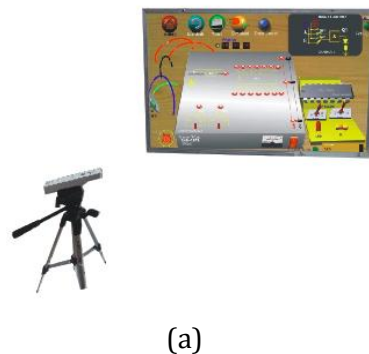


Fig 16. Layout TX-tcs

Specification consists of a number of components: 1) the power button connector; 2) connector direction buttons; 3) A key connector; 4) the volume button connector; 5) speaker connectors; 6) key connectors 1 and 2; 7) LED. Touchscreen is designed in this study using the wii remote application technologies are developed. The main feature of this series is the infra red receiver pixart camera that serves to capture the motion of the waves generated by infrared rays Led, other features are integrated with bluetooth connector series TX-TCS. Motion carried by the RX-TCS captured by the camera is then translated into the form of coordinates via software applications that are built into the computer, so the movements performed by the RX-TCS followed by the mouse pointer movement on the computer screen.

Position TX-TCS should be right in front of the touchscreen display that can be read coordinates, or can be placed next to the screen with menyerong position to the right or to the left as shown in the Figure below



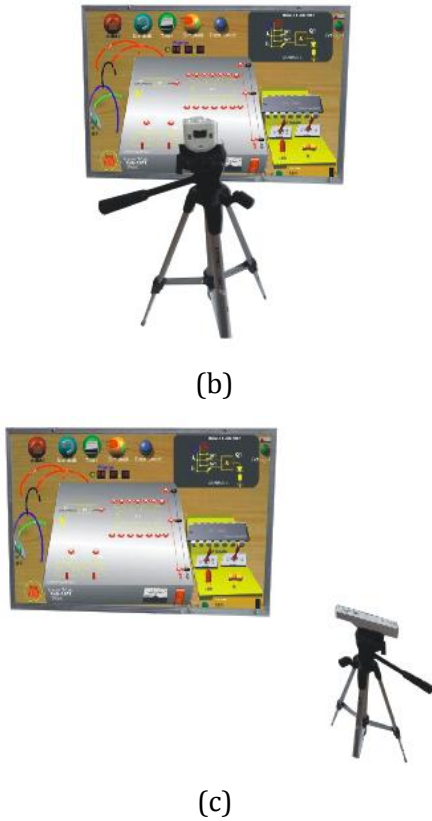


Fig 17. Position of TX-tcs

a) oblique to the left; b) right in front of the touchscreen display; c) oblique to the right



Fig 18. Product Testing

From the results of product testing conducted found that Black Box testing test results as presented in Table 1 below

Tabel 1 Product Testing Results

NO	DESCRIPTION	EXPLANATION
1.	Bluetooth connectivity	[Success]
2.	Touchscreen calibration Board	[Success]
3.	Drag process	[Success]
4.	Drop process	[Success]
5.	Suitability movement of the cursor	[Success]
6.	The accuracy of placement	[Success]
7.	Response RX-TCS	[Success]
8.	TX-TCS circuit works fine	[Success]
9.	This series of RX-TCS function properly	[Success]

CONCLUSION

Conclusions obtained in this study are: 1) The steps used in developing a virtual laboratory (LaVir) is through the analysis of the needs that exist in vocational lab, virtual lab development be done with attention to methodological aspects in the making of virtual -based learning to the writing program which then results of the prototype was tested through test expert (expert judgment) : media expert , the expert material , and electronics experts . The products produced in this study is a virtual laboratory software (Lavir) for subjects Digital Electronics , CD - Interactive LaVir, CD - Tutorial, guide books LaVir, Instructional materials, textbooks, draft patents, scientific articles and presented at national seminar and internationally, as well as draft articles for national journals and international journals; 2) Development of a virtual laboratory is done through the touchscreen-based architecture and organizations that exist in a virtual laboratory which include studio rooms, user interface, virtual simulation modeling, interactive tools, visual representation, virtual workspace, and authoring tools . 3)

aspects of programming and electronics aspects showed a mean overall score with a very good assessment .

ACKNOWLEDGMENT

Gratitude to the Higher Education which has provided the opportunity to continue the study until the 2nd stage.

REFERENCES

- [1] Tasma Sucita. 2009. Pengembangan Model Pembelajaran Praktikum Berbasis Software Komputer. Jurusan Pendidikan Teknik Elektro – Universitas Pendidikan Indonesia
- [2] Gagne, R. M. & Briggs L.J. (1974). Principle of Instructional Design. New york: Holt, Rinehart & Winston.
- [3] Gall, D. Meredith., Borg., Walter R.(2003). Education Research : an Introduction. (7th Edition).Allyn and Bacon.
- [4] Hendra J. (2010). Laboratorium Virtual Mata Kuliah Praktikum Elektronika Digital.Jurusan Pendidikan Teknik Elektronika Fakultas Teknik Universitas Negeri Makassar.JETC Jurnal Elektronika Telekomunikasi & Computer. ISSN: 1829-7021. Vol.4 No.2 Juni 2010.Hal.699-710.
- [5] Sapto Haryoko & Hendra J, & 2010.Pengembangan Laboratorium Virtual di SMK Untuk Meningkatkan Kompetensi Siswa Pada Mata Pelajaran Produktif.Proceeding Seminar Nasional FT UNESA. ISBN: 978-979-028-359-9. Hal.231-240
- [6] Nurrosat, Muchamad azwar. (2009). Penerapan Joomla Dan Moodle Pada Sistem Virtual Laboratorium Online PSD III Teknik Elektro.Laporan tugas akhir.Program studi DIPLOMA III Teknik Elektro Fakultas Teknik. Universitas Diponegoro, Semarang.