

# PROCEEDINGS

Cloud computing is when the user use servers that are not stored in user's location, not owned by user, and not maintained by user, to provide the user with the programs that user use and to store and retrieve user's data. This is contrast to hosting and maintaining own server, loading and updating own software, and storing and backing up own data.

Today, the development of cloud computing is raised rapidly. There are many companies develop this model and a many kinds of cloud computing appeared. Such as Ubuntu one's Canonical Ltd and SkyDrive's Microsoft as cloud storage, Google apps and office web apps as cloud application, and windows azure as cloud operating system.

More important, it provide a lot of benefits for education. Nowadays, at first glance it sounds a little scary since it relies on someone other than ourselves and our own organization for services that are most likely critical to our operation. So why are schools increasingly turning to cloud computing as an alternative? Several reasons we have found why this to be the right solution for our educational system are: Saving money, Saving time, Anytime anywhere access, Reduced compatibility issues, Increased collaboration, Increased services offered, Foundation for new projects, Peace of mind, And many more.

For those in education sector, "the cloud" can seem like a nebulous and unattainable technology goal, used only by large enterprises and corporations. But the cloud has the power to drastically advance the goals of the educational system: to make it easier for institutions to empower their students to succeed while at the same time cutting costs and expanding accessibility.



<http://um.ac.id>

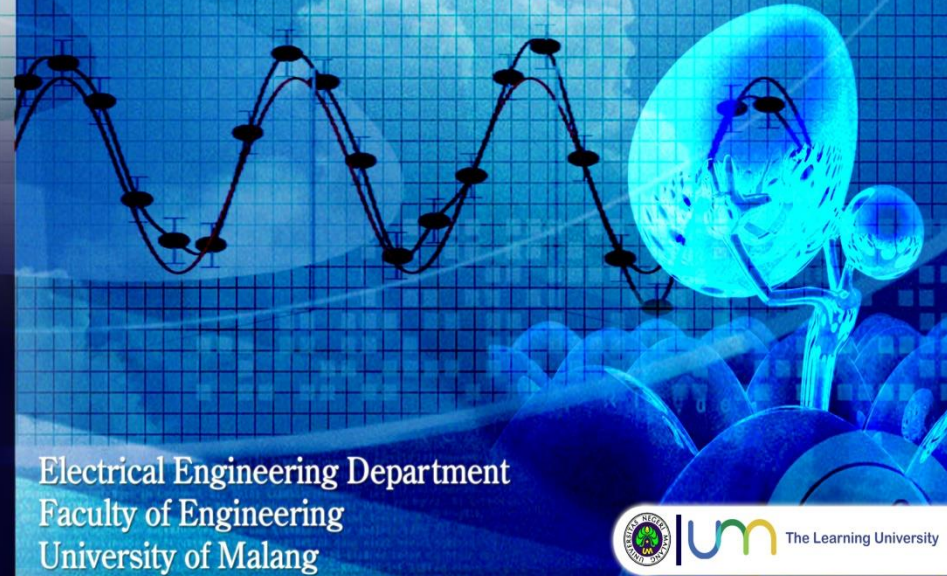


UM The Learning University  
PROCEEDINGS SEIE 2013  
International Seminar on Electrical, Informatics, and Its Education



# PROCEEDINGS

International Seminar on Electrical, Informatics, and Its Education



Electrical Engineering Department  
Faculty of Engineering  
University of Malang





# PROCEEDING

## INTERNATIONAL SEMINAR ON ELECTRICAL, INFORMATICS, AND ITS EDUCATION

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## PREFACE

International Seminar on Electrical, Informatics and Its Education 2013 (SEIE 2013) is a media for the dissemination of information and publication of researches from universities, researchers, teachers, and practitioners. SEIE will accommodate the dissemination of information and research on Electrical, Information Technology and Education of both.

SEIE 2013 is an international seminar organized by the Electrical Engineering Department, Faculty of Engineering, State University of Malang. This seminar is the third of SEIE first seminar which was held in 2009 and held every two years on a regular basis.

Article published, packed with international categories classified in two groups. The first group contains papers on the topic of electro and its application in education. The second group contains papers on the topic of informatics and its application in education.

The authors came from the local Indonesian and overseas including Japan, Libya, Taiwan and Vietnam. Any posts or articles that have been entered in a review by a competent reviewer.

The committees want to deliver big gratitude for your participation, and congratulation for author that the papers accepted and published SEIE 2013's proceeding. Criticis and suggestions are expected for the improvement this seminar. We hope this proceeding can be used as one of reference technology development in electrical and informatics engineering and its education.

Malang, October 5<sup>th</sup>, 2013  
Chairman,

Dr. Hakkun Elmunsyah, S.T., M.T.

**PREFACE FROM HEAD OF ELECTRICAL ENGINEERING  
DEPARTMENT ENGINEERING FACULTY  
STATE UNIVERSITY OF MALANG**

International Seminar on Electrical, Informatics, and Its Education (SEIE) 2013 held after the Engineering Faculty 48<sup>th</sup> Anniversary which simultaneously of State University of Malang 59<sup>th</sup> Anniversary. SEIE 2013 is held every other year by Electrical Engineering Department, Faculty of Engineering, State University of Malang. In 2009, it was called National Seminar Electrical, Informatics, and Its Education (SNEIE) 2009. For SEIE 2013 has already included an International area and has published to some neighborhood countries as Japan, Libya, Taiwan, Vietnam, etc.

The seminar packed with international categories classified in two groups. The first group contains papers on the topic of electro and its application in education. The second group contains papers on the topic of informatics and its application in education.

Hoping this seminar would be a place of researchers and practitioners to publicize and then disseminate the results of these researches that have taken place due to the progression of sciences and education throughout Electrical Engineering and Informatics Engineering.

Malang, October 5<sup>th</sup> 2013

Head of Electrical Engineering Department

Drs. Slamet Wibawanto, M.T.

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## Integrating Virtual Laboratory From Conventional Lab Into Vocational High School To Facilitate Practicum Activity

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### *Abstract*

**The success of workers in the electronic field is not only determined by the mastery of hard skills but also of soft skills. The soft skills can reach by using an Information Technology (IT) through multimedia. A New technology introduced based on virtual laboratory for training activity. Virtual laboratory usually combined visual and audio mode, and therefore need the active participation of the students to enhance the understanding of the learning materials. The software for building virtual laboratory is written by using Macromedia Flash MX, 3-D Max, where animation was used to raise the users' interest. The development of virtual laboratory was involved in development of instructional designing model (ID model). The development of the virtual laboratory will used the theory of constructive, cognitive and contextual for Student in Vocational Education by the cognitive domain in Bloom Taxonomy to strengthen cognitive skill.**

**Keywords: Virtual Laboratory, vocational high school, Practicum Activity**

### I. INTRODUCTION

During the 1960's and 1970's, teaching and learning tools were nothing but a piece of chalk and a blackboard, eraser, teachers and students who met each other face to face inside the classroom during class. In the 1980's, videotape programs were used as teaching aids. In the 1990's, one-way teaching by computer arrived. And finally today's advanced computer and information network technology has introduced radical innovative breakthroughs in our teaching and learning methods as well as in the learning environment. Students can listen to their teacher or trainers in distant classrooms through PC's and get a simultaneous view of their teachers and texts as well. They can ask questions and record the "class" for repeated viewing. Training organizations can conduct professional training directly via the computer network. These learning environments are not so different from a teacher-guided class with discussions and tests as well [1].

One of the concrete future strategic objectives of education and training systems in vocational high school is the improvement of the quality and the effectiveness of education and training systems in the workplace. This includes improving education and

training for teachers and trainers, developing skills for the students, ensuring access to ICT for everyone, increasing recruitment to scientific and technical studies, and making the best use of resources. The second strategic objective is facilitating the access of all to education and training systems. This objective includes open learning environment, making learning more attractive, and supporting active citizenship, equal opportunities and social cohesion.

### *Virtual Training Environment – An Ideal Training Place*

The Virtual Training Environment models the new training environment, which is a place that students can customize their study in their own pace. Providing up-to-date training material and personal study guide, it is an ideal study environment for the 'life-long' learners. The main goal of the Virtual Training Environment is to deliver the 'own-paced' material to the right person at any time. In the Virtual Training Environment, students can fully engage in the training process through an interactive, dynamic environment. The on-line material for each student is scheduled personally depending on his/her studying pace. Consequently, students will not waste their time learning irrelevant or already-known material, while other students may fail to understand the material. In addition, the Virtual Training Environment supports group-paced learning. The collaborative facility allows students to accomplish group projects and discussions.

The Virtual Training Environment not only transmits information to the students, but also provides forums for exchange. When group members participate and share their knowledge, their knowledge base increases and members continue to benefit [2]. This kind of real-time communication is not restricted to only peer interaction (student/student). It can also encourage active participation of students and the instructor in a shared task for understanding and applying the concepts and techniques that characterize a subject area [3].

### *Teaching Road Safety using computer applications*

A substantial amount of Road Safety teaching material consists of multimedia and hypermedia applications. What is easily ascertained is that almost



all of them focus on knowledge acquisition. Very few include some form of road simulation, even so, student's active participation is limited. In general, these applications present traffic situations with the use of static or animated graphics and ask student to make judgments about what to do next, if there is something wrong, what should have been done and so on. Even if this can be considered as a form of training in detecting dangerous situations, it does not train any of the crucial pedestrian skills.

Two research projects came to our attention that used computers for training specific skills [4]. The first one investigated the problem of distraction in children's attention and how audiovisual search strategies can be applied to help in partially solving this problem. The second research project examined how the pedestrian skills of safe place finding, roadside search, gap timing and perception of others' intentions can be improved [5]. Training in each of the above skills was a separate module of the application, with four training sessions in each one. All modules shared the same small town setting and a common cast of characters to emphasise the relationship between the skills. The activities in each training session were about making decisions on if, when or how the character that represented the child in the application should cross the street. When a decision was made, the character crossed the street and the computer demonstrated the consequences of that decision.

## II. METHODS

Virtual Laboratories to Support teaching, Learning, and practicum Activities The virtual environments, named virtual laboratories, vary from static Web pages with didactic videos and texts, to dynamic pages with sophisticated environments, collaborative authoring [6], videos on demand, virtual meetings, and many other features. These virtual laboratories may also allow remote access to measurement instruments, video cameras.

Virtual laboratory need an interesting grafik design to keep the student stay consistent to use the electronic learning, the diversity of models and structures for virtual laboratories is large and varies according to the nature of the project under investigation, the goals, and the technologies involved. The motivations for the implementation of virtual laboratories include, but are not restricted to [7]: a) The limitation on the resources and space in the real-world laboratories. This type of limitation may cause delay in the learning activities of the students, who may face the situation in which they have to compete or wait for the availability of a given resource, in addition to the fact that one's experiment may be interrupted before it is concluded, due to the need of sharing resources; b) The possibility of sharing usually expensive equipment; c) The stimulus for the collaboration of research or work in groups independently of their physical distance; d) The

existence of a learning environment outside the school, allowing the students to participate or develop their own projects together with other students in their spare time; e) The possibility of developing different parts of an experiment at different locations; f) The remote supervision and intervention in potentially dangerous experiments, thus helping to prevent accidents; g) The remote access and control of precision equipment; h) Facilitate the learning of a subject by allowing the distance experimentation with Engineering process, chemical reactions, biological mechanisms, physical simulations, or other subjects; h) Allow for the creation of virtual communities about a central subject, and thus result in the convergence of people with similar interests to the same virtual environment; i) Bring together resources and information related to a specific subject matter; j) Provide guidelines for the use, teaching, and learning of the subject, together with means for its assessment.

## III. RESULT

Virtual Laboratories to Support teaching, Learning, and practicum Activities The virtual environments, named virtual laboratories, vary from static Web pages with didactic videos and texts, to dynamic pages with sophisticated environments, collaborative authoring [6], videos on demand, virtual meetings, and many other features. These virtual laboratories may also allow remote access to measurement instruments, video cameras.

Virtual laboratory need an interesting graphics design to keep the student stay consistent to use the electronic learning, the figure 1 bellow shown a design of virtual laboratory in Digital Electronic.

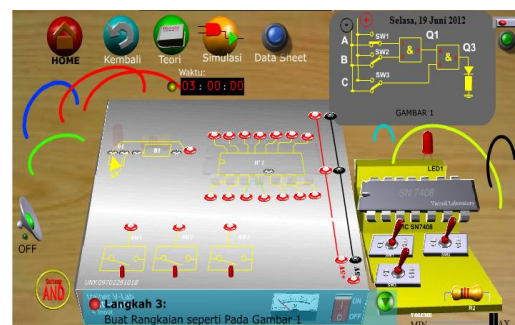


Fig. 1 virtual laboratory in Digital Electronic Media virtual laboratory using the model adopted by Robinson [8]. Products made using the main software macromedia flash, swift 3D, 3Ds Max and produce media Virtual Laboratory. Digital Electronics Lab-simulation presented by the number of lab materials were 13 trials (AND, OR, NOT, NAND, NOR, EX-OR and EX-NOR) to the experimental (Decoder and Encoder).

### Discussion

Model of virtual laboratory produce a subsequent lab activity in the so-called virtual laboratory activities as part of the virtual learning

environment and approach to human computer interactive. Activity Virtual Laboratory in this study using laboratory equipment such as measuring devices and components are visualized in 3-D design an interactive, computer-operated and can simulate the activity in laboratory

Digital Electronics through modifying the circuit logic (modify), the circuit (construct), enter a value component (inject), install the circuit (Installation), measuring components (measure), and subsequent is the evaluation (evaluation) of the series that have been made. Display Simulation Laboratory is designed as if the user is at the actual lab. A complete virtual lab activity diagram in laboratory simulations are presented in Figure 2.

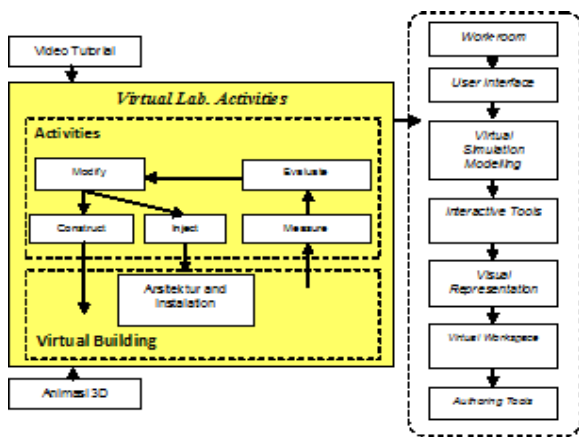


Figure 2. Lab Activity Diagram Virtual Laboratory

**Integration of Virtual Laboratory Methodology**

Virtual laboratory component is formed of several parts that support, it is necessary for the methodology of designing a virtual laboratory. Design approach / methodology enables the development of a virtual laboratory for all subjects without limitation or training courses. This involves the integration of architecture and organization held a virtual lab include: *work-room, user interface, virtual simulation modeling, interactive, authoring tools, visual representation, and virtual workspace.*

**a. Entrance The Room**

Laboratory and practical activities are an important component for engineering students especially students of SMK. Learning practices in vocational one of the principle is how to prove a theory. According to Banerji [10] which gives the main points that are very kompit engineering students in terms of knowledge transfer in the field no more is to find information. Besides engineering students' knowledge is dynamic. Students tend to do the construction and reconstruction of the meaning of something because they were familiar with the conceptual, analysis, and manipulation.

Currently the process to acquire the knowledge, skills, and abilities can be done outside

the classroom and the laboratory bench. Just as in the real lab to enter the lab room there are several steps that must be done are: 1) to enter the building, 2) to the laboratory space, and 3) open the door to the lab.

According to Dobrzanki [11] argues that some features in the workspace virtual appliances along with instructions for using it. This means that in building a virtual laboratory facilities should be given workspace / laboratory space. For it was made in the development of a display that shows as if the student enters a laboratory space as shown in Figure 3 and the students opened the door to the lab is shown in Figure 4.

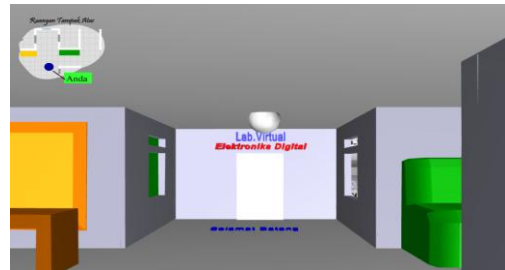


Figure 3 Entrance page one of the room (i)



Figure 4. One page Entrance the room (ii)

In Figure 4, to open the door of the room used 2 methods namely through the door handles and via *password*. Password used in this virtual lab is "vlab", keywords can be replaced by user desires / users.

**User interface**

The *user interface* is derived from the English language meaning of the user interface that serves as a mediator between users and computers. In the virtual laboratory *user interface* is very important because the presence of the *user interface* can easily happen interactivity and communication between users. User interface (*User Interface*) can receive information from the *user* (users) and provide information to the user (*users*) to help direct the flow of tracing the problem to find a solution.

In the virtual laboratory that developed interactive and include aspects of process control by considering the design of the aspects of ergonomics and psychology. *Workscreen* page provides ways: 1) input, allowing the user to manipulate the system, 2) output, allowing the system to show the effects of manipulation of the user (Figure 1).

In Figure 1 is shown a display of work (*workscreen*) which allows the user to be able to perform manipulation process by installing the components and cabling in accordance with series of

images located on the right side of the page. In doing the installation of the component user to first take the appropriate cables and components, if it does not match then the components will be returned to its original place. Furthermore, after all cables and components are properly installed last step is to press the red power switch is located on the trainer. If the circuit is strung correctly, then the switch will turn "ON" as dipelihatkan in Figure 5 and if it does not mean they are wrong or the installation of components that need to be forgotten for re-review.

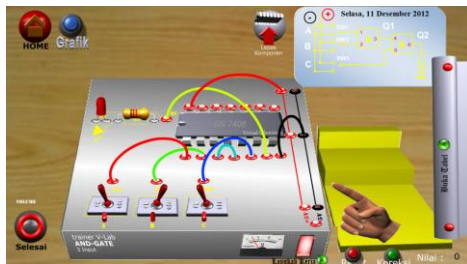


Figure 5. One form of user interface in a virtual laboratory

Figure 6 shows that the trainer was able to run the lights marked a trainer and appointment voltmeter with 5 Volt designation value (Figure 6).

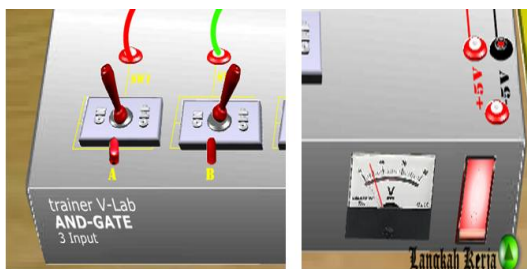


Figure 6. Input and output indicators of the user interface

**Virtual Simulation Modelling**

Representation in the virtual laboratory is designed in the form of 3-dimensional. All data is displayed in the form of 3-dimensional like the look of the actual (Figure 7). 3D view should have the ability to interpret broadly the Virtual world and be able to reflect the characteristics of the real world. One application of real-world application is shown in Figure 8.

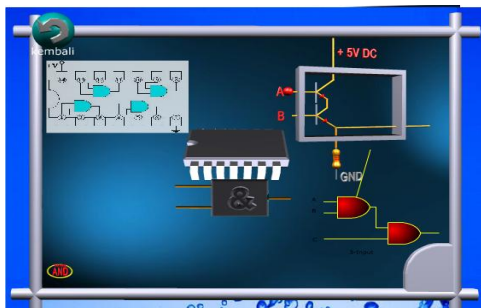


Figure 7 Page one theory that gives 3-D simulation model for virtual

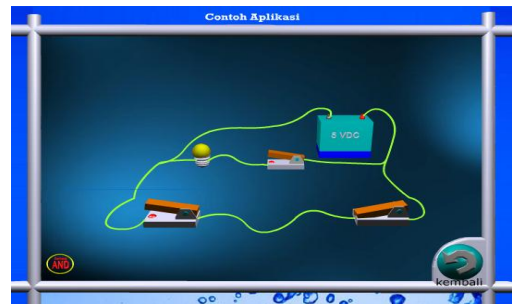


Figure 8 Page one theory that gives 3-D simulation applications in virtual

**Interactive Tools**

In the virtual laboratory that developed designed a page that incorporates a variety of applications and Audio Visual Media thereto, and interactively controlled by a control application to provide user convenience in process or the information needed in a row or randomly through an interactive navigation system logic. In this interactive virtual laboratory *tools* can be found on pages simulations as shown Figure 9.

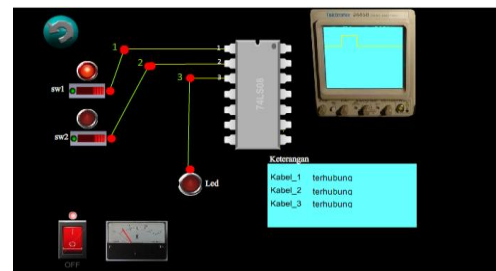


Figure 9 Simulated one page

*Interactive Tools* developed using a hyphen that connects the legs of components. Connecting lines on this page serves as a connecting cable. *Interactive Tools* in the virtual lab is very bermanfaat to describe the characteristics of components and measuring instruments. Measuring instruments such as oscilloscopes designed using programming languages *Authoring Tools* component that may resemble reality. Although the zoom that is 3-D but the same characteristics with real equipment. In Figure 9 appear to look the LEDs on the switch SW1 "on". The next signal is displayed by the oscilloscope output circuit adapted to the character of "AND". Before making application gauge karakteristik first need to know the components to be measured. In Figure 63 oscilloscope is used to measure the components of "Clock". On this page the user can shift the oscilloscope probe and put it anywhere. Oscilloscope display will change based on the measurement point.



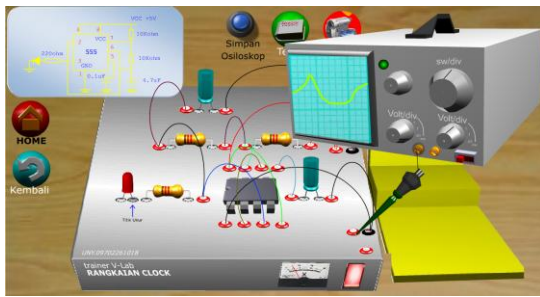


Figure 10. *Interactive Tools* through Oscilloscope

Other pages are developed based on the principles of *Interactive Tools* is *workscreen* page when completing the truth table. Truth table is filled by lab results. To make corrections to the truth table can use the "correction". After pressing the "correction" will be shown assessment scores. If the truth table stuffing one, then the program will execute and display the results in the form of a cross corrections and check mark on the right side of truth table as shown in Figure 11.

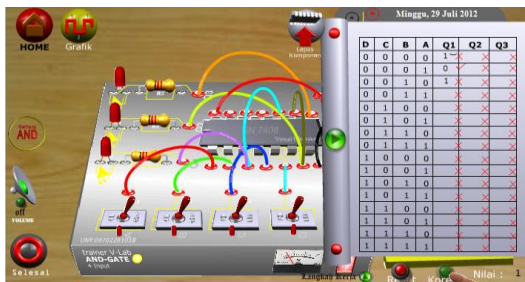


Figure 11. *Workscreen* one page with a table view of truth

### Visual Representation

Basically visual representations are intimately associated with visual communication. Visual communication is the study and develop a visual language (semantic, syntactic, and pragmatic) for information and communication purposes. Process and a visual message from the messenger of information products, services or ideas to target (public), are communicative, persuasive through if sign (semiotics), though the way (rhetorika), though the taste (aesthetics) are creative and innovative (new, original, smooth and supple).

Virtual laboratory that developed many refer to elements of visualization are: 1) support the teaching materials and practical design, so readily accepted by the students. At any given frame will display with the message disampaikan in depth; 2) every form shown adjusted to the things that are favored by the target associated with visual (icons, pictures and other visual elements); 3) Messaging (verbal) that of the conventional lab converted to Visual message, taking into account the visual message signs are understandable, easy, easy and comfortable viewing / reading; 4) with emphasis on the relevant image for each item of discussion theory.

Visualization of virtual laboratory *form* in Figure 12 and Figure 13 are presented through the design of graphic design elements (objects, colors, fonts and *layout*) are made so that students feel at home and not feel bored, uncomplicated clarity of the message that is received and remembered easily, using a visual language harmonious, intact and matching that teaching materials is perceived as a whole (comprehensive).



Figure 12. One page of instructions and safety with a visual representation

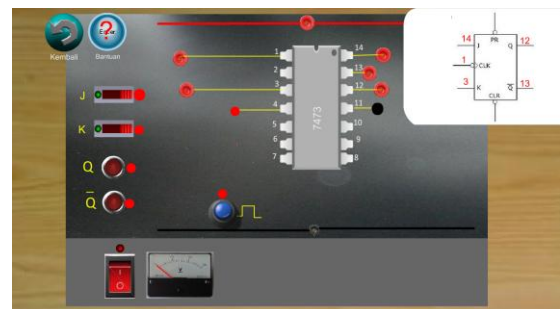


Figure 13. One page of instructions and safety with a visual representation

### Virtual Workspace

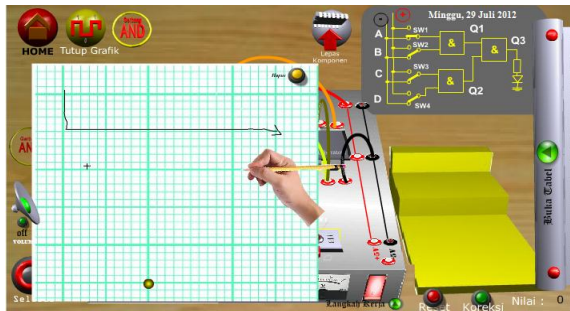
Practicum in "*Hands-on*" developed by education experts and science that provides the opportunity for students to undertake an investigation into a series. Process for student practicum will give you the skills of observation, prediction, deductive reasoning, conceptual modeling, theory building, and testing hypotheses in solving a challenging series.

Using virtual manipulation as shown in Figure 14, students can take control, modify, and perform experiments with electrical systems to safely and accurately visualize an abstract concept and concrete.



Picture 14. *Workscreen* pages in a virtual laboratory

In Figure 14 the students can see the demonstration and instruction given through the "Help" on how to use the tools of the *workscreen* this page. On this page students can also perform an interactive graphical representation as shown in Figure 15.



Picture 15. *Workscreen* one page with graphic images facility

**Authoring Tools**

A lot of software that can be used to design multimedia. For an interactive virtual laboratory is used Macromedia Flash (version Mx, and Prof. 8). For graphics processing using Adobe Photoshop CS3, sound processing using Cool Edit Pro and wave pad, processing animation using Swismax, Macromedia Flash and 3-D graphics processing using 3Ds-Max and processing of 3-D animation using Swift 3D Ver. 2.

**Practicality Virtual Laboratory Use In Teaching**

Further lectures with Virtual Laboratory research has practically qualified through assessment indicators as presented in Table 1, the obtained average overall score of 4.9 in the category of aspect is very good. Indicators are expressed practicality four assessment indicators are translated as follows: First, students can carry out and complete the practicum objectively according grooves and procedures in Virtual Laboratory obtained mean score 4.8 or are in a very good category. It is very practical when compared to conventional laboratory practicum on the equipment in practice by 4-5 students so that settlement is not running lab objectively because only one working and the other is just watching, as well as conventional laboratory only intelligent students who are could do with a good practice. Second, the teacher can immediately make an assessment and scoring of the student lab results stored in the data base Virtual Laboratory program earned an average score of 5 or excellent category. By contrast, in a conventional laboratory teachers should observe carefully the students one by one passage of the lab work done by students. Third, Virtual Laboratory stored in the computer can be directly accessed by the students to do lab work obtained the mean score of 5 with the category very well. All that is required in Virtual Laboratory has been provided, including equipment and materials, gauges, and data sheet book average score of 4.8 obtained with the category very well.

Table 1  
Practicality assessment in teaching through Virtual Laboratory

COMPONENTS	Mean Score	Category
<b>Practicality Indicator</b>		
1. Students can carry out and complete the practicum objectively according grooves and procedures in Virtual Laboratory	4.8	Very Good
2. Teachers can immediately make an assessment and scoring of the student lab results stored in the data base program Virtual Laboratory	5	Very Good
3. Virtual Laboratory stored in the computer can be directly accessed by the students to perform lab	5	Very Good
4. All that is required in Virtual Laboratory has been provided, including equipment and materials, gauges, and data sheet book	4.8	Very Good
<b>Overall Mean Score</b>	<b>4.9</b>	<b>Very Good</b>

**IV. CONCLUSION**

The integration of ICT in this virtual training environment for electronic services course, the student demand and interest in increasing the quality of education through ICT. Virtual Training Environment addresses the strategic objectives mentioned above: improving the quality and effectiveness of education and training systems in vocational high school by developing skills for the knowledge society, ensuring access to ICT for everyone, increasing recruitment to scientific and technical studies, and making the best use of resources. Facilitating the access of all to education and training systems by providing open learning environment, making learning more attractive, and supporting active citizenship, equal opportunities and social cohesion is the other strategic objective that can be achieved through this virtual training environment.

Characteristics virtual laboratory that is used in teaching is to be applied, communicative, interactive, able to develop critical thinking skills than just the ability observation alone. Assessment of learning outcomes through virtual laboratory practicum Digital Electronics in vocational criteria are very practical, all can be achieved through the use of virtual laboratory.



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