Artikel Jurnal Internasional - Development Of Lab View in Microcontroller Subjects at Vocational School Internasional....

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Development of LabVIEW in Microcontroller Subjects at Vocational School Industrial Electronics Engineering Department

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Abstract: The purpose of this study was to determine the development of media LabVIEW microcontroller subjects. A virtual laboratory is one form of learning media. A virtual laboratory is defined as an interactive environment to create and conduct simulation experiments were designed with three-dimensional effects that will display the equipment looks like a lab using the actual equipment. One of the virtual laboratories that have been developed is LabVIEW. This software is used specifically for processing and visualisation of data in the areas of data acquisition, control and instrumentation and industrial automation. Subjects microcontroller is a compulsory subject for students of Electronics Engineering Industry. As with other subjects, some students still find it difficult to understand the material taught in the subjects of the microcontroller. It is caused by various factors including teachers teaching methods that are less use of media as a tool in the learning process. Seeing the results of student learning must not only see reference to the value of outcomes, however is more important than it is in the learning process of students in the form, the response of students to the lesson, interest in learning as well as the motivation of learners. Approaches using LabVIEW interactive media on the factors mentioned above individual learners can be made to improve the learning outcomes of students.

Key words: LabVIEW, microcontroller, virtual laboratory, student, reference, learners

INTRODUCTION

Education is a human need and an essential element in supporting the progress of a nation. Education is a symptom of the universe (universal phenomenon) and continues throughout the life of man wherever humans are where no human life there must be education (Siswoyo, 2012). Law No. 20 of 2003 on the national school system states that learning is a process of interaction of learners with teachers and educational resources in the learning environment. Along with the development of learning methods also developed both personal learning methods with the media or the process of learning itself. Collaboration between the two between learning with the use of technology will provide better results.

Around the middle of the 20th century the use of visual media comes with the use of audio tools, thus was born the audio-visual aids. Along with advances in science and technology, particularly in the field of education, the current use of tools or media become increasingly widespread learning and interactive, like the media simulation and virtualization using a computer. Instructional media are developed and widely used today is based instructional media such as Virtual Laboratory (V-Lab), the media is mainly used for subjects that require simulation and practicum.

A virtual laboratory is one form of learning media. A virtual laboratory is defined as an interactive environment to create and conduct simulation experiments were designed with three-dimensional effects that will display the equipment looks like a lab using the actual equipment. One of the virtual laboratories that have been developed is LabVIEW. This software is used correctly for processing and visualisation of data in the areas of data acquisition, control and instrumentation and industrial automation. This software was first developed by the company National Instrument (NI) in 1986. LabVIEW is an acronym for Laboratory Virtual Instrument Engineering Workbench. LabVIEW programming language that is more easily understood to be one of the advantages of LabVIEW compared to other programming languages.

LabVIEW is a software developed by national instrument for the system design. LabVIEW is used by engineers and scientists to create and operate a system of measurement and control through hardware integration. LabVIEW is a tool that is widely known in the industry and the world of education because it is useful in helping

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to resolve technical problems, increase productivity and foster innovation. LabVIEW applications are grouped into several categories: data acquisition and signal processing: LabVIEW measure any sensor on any bus, perform advanced analysis and signal processing, display data on interface designed by the user, storing data and generate reports, automatic test and validation systems: automate the validation tests or manufacture of the product, control instruments, analyze and display the test results with an interface that was designed by the user, teaching: interactive learning approaches and practical, combining algorithm design with real-world measurements. In the world of education, LabVIEW has been widely used for tasks of measurement and instrumentation, circuit design, control and mechatronics, embedded system design, RF and communications and processing of images and signals. The use of LabVIEW, LabVIEW able to demonstrate in his research research process of an object as well as to show an object in the form of 3D images. In the industrial world in general, the machines that produce a proper use of technical assistance to facilitate counting the number of products manufactured on a large-scale. This is because the calculation process automatically using some software like LabVIEW much easier for operators to acquire the data (Irfan, 2013). LabVIEW-based virtual instrumentation can be applied to the acquisition of the characteristic data such as application control and physics lab associated with the oscilloscope and signal generator (Sigiro *et al.*, 2013). Competence of graduates needed the industrial world is still on the acquisition of technical skills (technical skills) to put forward the tasks associated with computerisation and digital compared to the tasks that are manual (Arfandi, 2013).

Subjects microcontroller is a compulsory subject for students of Electronics Engineering Industry. As with other subjects, some students still find it difficult to understand the material taught in the subjects of the microcontroller. It is caused by various factors including teacher's teaching methods that are less use of media as a tool in the learning process.

LabVIEW: LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) is a software developed by National Instrument which has an extensive use both in industry, education and even everyday education. LabView is itself a software development environment that allow unifying the components for testing purposes, simulation, measurement or control applications.

LabVIEW is used to automate the testing and data collection. It is a graphical programming language in which the user can set the program to manipulate and store data. LabVIEW also helps technicians to be more easy to apply controller programmable logic system using the incorporation of a PC on their applications with the aid

of equipment HMI or SCADA. Engineers can program with the LabVIEW HMI and logic in the same area to minimise the manufacturing cost and time to maximise the learning and programming skills in the industrial world in general and the machines that produce a good use of technical assistance to facilitate counting the number of products manufactured on a large scale. This is because the calculation process automatically using some software like LabVIEW much easier for operators to acquire the data (Irfan, 2013).

Why LabVIEW?:
- Using the G programming language is a very intuitive with flowchart-like data flow programming model, so that, it is easier to learn and process data in reality shows
- It can support thousands of devices such as motors and so forth with the uniformity of programming models
- Have a code library that can support all the needs of signal processing, analysis, communication and others
- User interface that is unbelievably interactive and easy to use that it can accommodate the display tables, charts and others
- Support the development of high technology such as FPGA, multicore CPU and visualisation
- Can a computational model that allows simulating near reality

Advantages of using LabVIEW: Using LabVIEW means we can make the program as easy as we wanted even as complicated as we want. With the ability to support thousands of hardware will disperse the boundaries in the construction of a system. LabVIEW can easily connect other devices such as a microcontroller, arduino, IP camera and even computer networks. Additionally, national instruments has also developed highly compatible with the hardware such as NI LabVIEW MyRIO, NI CompactRIO and NI ELVIS that facilitate in making a system.

Simulation: Simulation is a technique mimics operation or processes that occur in a system with the aid of computer equipment and based on certain assumptions that the system can be studied scientifically. In the used computer simulations to study the numerical system where data collection to estimate the statistics to obtain the original characteristics of the system. Simulation is a useful tool to use, especially, if it is required to perform experiments that are difficult to do in practice. By doing simulation studies, it can be determined in a short time the right decision and at a cost that is not too big because everything is done by computer. Simulation approach begins with the development model of the real system.

The model should be able to show how the various components of the system interact to describe the behaviour of the system completely. Once the model is created, then the model is transformed into a computer program that allows for simulated (Yi *et al.*, 2005).

MATERIALS AND METHODS

This research is a kind of R&D, using ADDIE model of which is an acronym of the analysis, design, development, implementation and evaluation (assessment). In this study, using a micro controller learning using LabVIEW media in trial 2 cycles, each cycle consisting of the stages of planning, action, observation and reflection. In general, the overall phase of activity in cycle 1 and 2 performed until it is found that the media LabVIEW effective in improving learning outcomes micro controller learners.

RESULTS AND DISCUSSION

Media LabVIEW for topic microcontroller instructional media used to implement is arduino kit along with IDE arduino as a microcontroller interface. Learning by using LabVIEW media consists of 2 parts, namely the introduction of arduino as a microcontroller interface and programming using arduino and LabVIEW interaction in controlling LEDs. Figure 1 and 2 show integration between the microcontroller module with LabVIEW.

This research was conducted in the Class 12 SMK electronics industry 9 Makassar (Fig. 3). The initial stage in this study researchers are collecting the documents comprising state data learners SMKN 9

Makassar Department of Electronics Industry (ELIND) 2015/2016 academic year. Furthermore, researchers conducted interviews with teachers microcontroller ELIND class 12 (Imran) on December 20, 2015 (Fig. 4). This interview aims to determine the circumstances of learners and the learning process on the material microcontroller programming interface and microcontroller in class 12 and determine the effectiveness of learning the material microcontroller interface and programming micro controller (Fig. 5).

Seeing the problem, researchers conducted a study to address the issue of low effectiveness of these learners. Researchers use 2 cycles in this study in addition to interviews researchers also provide pre- and post-test on the students and make observations activities learners and distribute a questionnaire to measure the response (motivation) of learners. Data from the test (pre- and post-test) is presented in the block diagram as shown in Fig. 6.
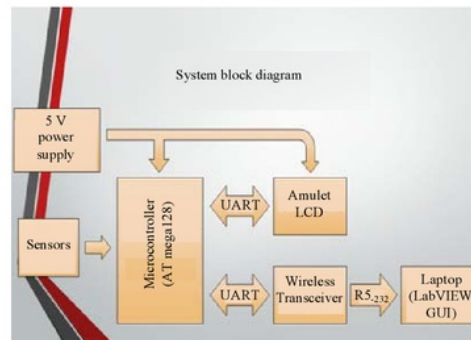

Fig. 1: System block diagram sensors microcontroller integrate with LabVIEW (Gutschlag, 2015)
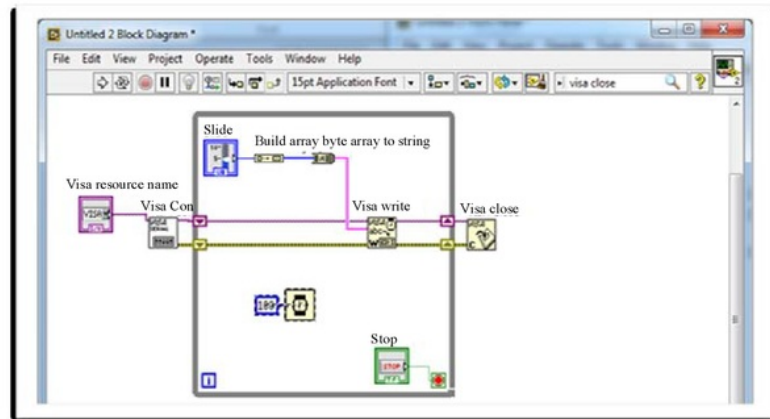

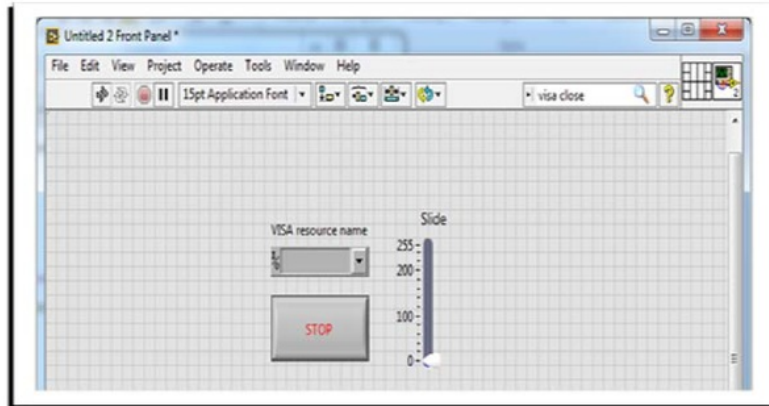Fig. 2: Block diagram of media LabVIEW

Fig. 3: Front panel of media LabVIEW

Fig. 4: Kit arduino as an interface of microcontroller

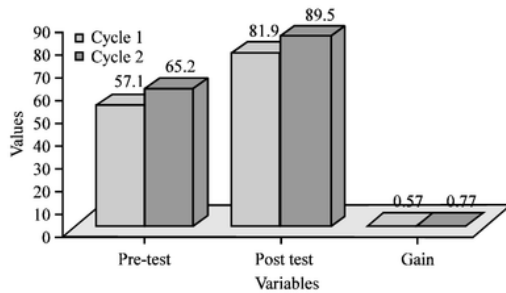Fig. 5: IDE arduino to write the program script

Fig. 6: Block diagram of test scores

Fig. 7: Blok diagram student motivation

The data in the block diagram above shows that in the pre- and post-test were performed during two cycles has been increased. Their gain of 0.57 and 0.77 in each period becomes indicators showed significant increases. Also, there is also a block diagram form of test data (pre- and post-test). In the chart presented the acquisition of each learner for two cycles and gain achievements of the pre and post test per individual students. Also, the following test result data presented observational data on the activities of students.

Observations on the activity carried out by the observer learners assisted by subject teachers microcontroller. Things were observed concerning the activities of students during learning activities take place, then fill in the observation sheet. In every meeting of observation by providing scoring on every aspect of the above. Of the 37 students selected 20 students that will be observed at every meeting. The following presentation is scoring average activity observation of learners in each session while more detailed scores for each aspect of students assessed per meeting are presented on the attached diagram.

In the Fig. 7 can be seen scoring an average of 36 students for each statement into aspects of evaluation. Average for all aspects assessed was 4.47 which means that are in the excellent category or in this case the learners are motivated by learning using LabVIEW media. In any action, investigators accompanied by a teacher and an observer. Complete learners increased activity can be seen in the following graph.

The observation of the activity of students in the first meeting obtained at 2.23 and then increase to the fourth meeting to 2.94 with an average increase of 0.24 in every meeting (Fig. 8) Furthermore, from meeting to meeting, 45 decreased to 2.83 later continued to grow up to seven meetings to 3.25. Overall from the chart above that obtained the final score is the average
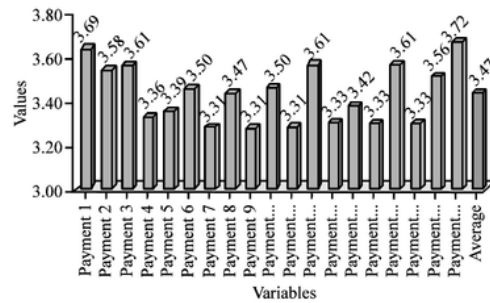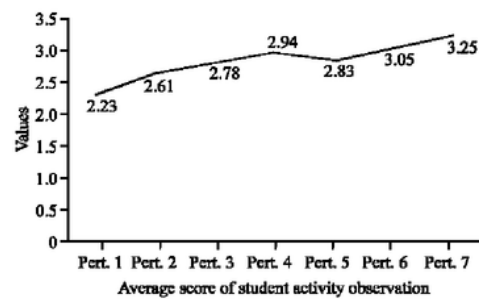

Fig. 8: Graph activities students

rating of 7 encounters with 2.81. This means that the activity of students during the learning takes place using LabVIEW learning media can be considered good.

CONCLUSION

One of the virtual laboratories that have been developed is LabVIEW. This software is used specifically for processing and visualisation of data in the areas of data acquisition, control and instrumentation and industrial automation. Subjects microcontroller is a compulsory subject for students of Electronics Engineering Industry. As with other subjects, some students still find it difficult to understand the material taught in the subjects of the microcontroller. It is caused by various factors including teachers teaching methods that are less use of media as a tool in the learning process. Seeing the results of student learning must not only see reference to the value of outcomes, however is more important than it is in the learning process of students in the form, the response of students to the lesson, interest in learning as well as the motivation of learners. Approaches using LabVIEW interactive media on the factors mentioned above individual learners can be done to improve the learning outcomes of

students. Based on data analysis and description of the previous chapter from this study we can conclude that; activities of students during the micro learning controller using LabVIEW media well in the first cycle and the second cycle of action research is considered good while the motivation and learning to use the student's response to LabVIEW that are in the excellent category. Application of LabVIEW media for two cycles to improve student learning outcomes microcontroller is made through a combination of lectures, explanations of materials by teachers using LabVIEW media as well as lab research in groups by students.

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