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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. Virtual laboratory is one form of learning media. 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 actual equipment. One of the virtual laboratory that has been developed is LabVIEW. This software is used specifically for processing and visualization 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 in an effort to improve the learning outcomes of students.*

***Keywords:*** *LabView, Microcontroller, Virtual Laboratory*

## I. INTRODUCTION

Education is a human need and a very important 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 [1]. Law No.20 of 2003 on the national education system states that learning is a process of

interaction of learners with teachers and learning 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.

Virtual laboratory is one form of learning media. 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 actual equipment. One of the virtual laboratory that has been developed is LabVIEW. This software is used specifically for processing and visualization 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 effective in helping to resolve technical problems, increase productivity and foster innovation [2]. LabView

applications are grouped into several categories: 1) 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; 2) 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; 3) 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, rangakaian 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 work process of an object, as well as to show an object in the form of 3D images [3]. In the industrial world in general an the machines that produce a good use of technology assistance to facilitate counting the number of goods produced on a large scale. This is because the calculation process automatically using some software like LabView much easier for operators to acquire the data [4]. LabVIEW-based virtual instrumentation can be applied to the acquisition of the common data such as application control, and physics lab associated with the oscilloscope and signal generator [5]. Competence of graduates needed the industrial world is still on the acquisition of technical skills to put forward the tasks associated with computerization and digital compared to the tasks that are manual [6].

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.

#### A. Lab View

Labview (Laboratory Virtual Instrumentation Engineering Workbench) is a software developed by National Instrument which has a very wide use both in industry, education and even everyday education. LabView is itself a Software Development Environment that allows unify the components for testing purposes, simulation, measurement or control applications.

LabVIEW is used to automate the testing and data collection. It is basically 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 controlller programmable logic system by means of the incorporation of a PC on their applications with the help of equipment HMI or SCADA. Engineers can program with the LabVIEW HMI and logic in the same area so as to minimize the manufacturing cost and time to maximize the learning and skills permrograman. In the

industrial world in general an the machines that produce a good use of technology assistance to facilitate counting the number of goods produced on a large scale. This is because the calculation process automatically using some software like LabView much easier for operators to acquire the data [4].

#### B. Why LabView?

- Using the G Programming Language is very intuitif denganflowchart-like dataflow programming model so that it is easier to learn and process data in real 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, MulticoreCPU and visualization.
- Can a computational model that allows simulating near reality.

#### C. 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 disambungkan other devices such as 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.

#### D. Simulation

Simulation is a technique mimics operasioperasi 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 [7]. 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 good 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 in the system interact to completely describe the behavior of the system. Once the model is created then the model

is transformed into a computer program that allows for simulated.

## II. RESEARCH METHODS

This research is a kind of R & D [8], using ADDIE model of which is an acronym of the analysis, design, development, implementation, and evaluation [9]. In this study using a microcontroller learning using LabVIEW media in trial two (2) cycles, each cycle consisting of the stages of planning, action, observation and reflection. In general, the overall phase of activity in cycle I and II performed until it is found that the media LabVIEW effective in improving learning outcomes microcontroller learners.

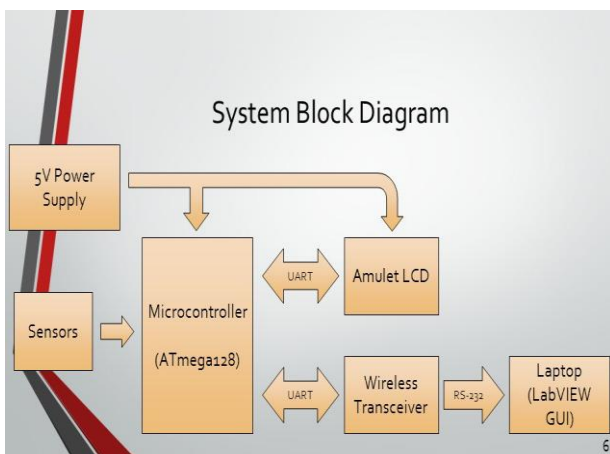


Fig 1. System Block Diagram Sensors Microcontroller integrate with LabView [10]

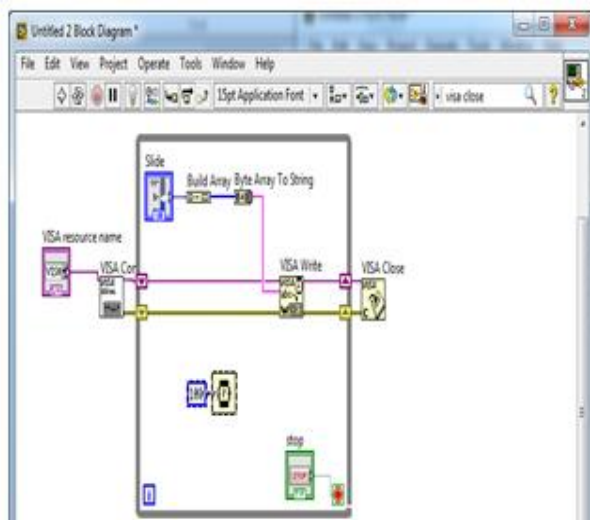


Fig 2. Block diagram of media LabVIEW

## III. RESEARCH RESULT

Media Lab View 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 (two) parts, namely the introduction of Arduino as a microcontroller interface and programming using Arduino and LabVIEW interaction in controlling LEDs. Figure 1 show integration between the microcontroller module with Labview.

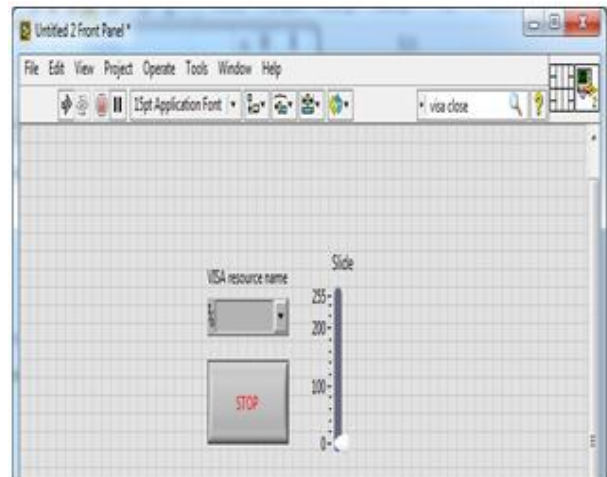


Fig 3. Front Panel of media LabVIEW



Fig 4. Kit Arduino as an Interface of Microcontroller [11]

This research was conducted in the Class XII SMK Electronics Industry 9 Makassar. The initial stage in this study researchers collecting the documents comprising state data learners SMKN 9 Makassar Department of Electronics Industry (ELIND academic year. Furthermore, researchers conducted interviews with teachers Microcontroller ELIND class XII. This interview aims to determine the circumstances of learners and the learning process on the material Microcontroller Programming Interface and Mikrokontroler in class XII and determine the effectiveness of learning the material Microcontroller Interface and Programming microcontroller.





Fig 5. IDE Arduino to write the program script

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

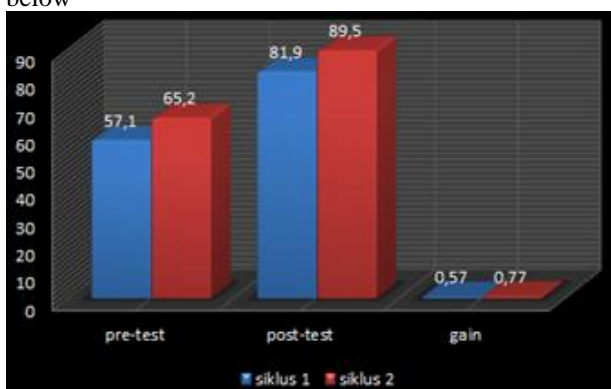


Fig 6. Block diagram of test scores

The data in the block diagram above shows that in the pre-test and post-test were performed during two cycles has been increased. Their gain of 0.57 and 0.77 in each cycle becomes indicators showed significant increases. In addition there is also a block diagram form of test data (pre-test and post-test). In the diagram presented the acquisition of each learner for 2 cycles, and gain achievements of the pre test and post test per individual learners. In addition, the following test result data presented observational data on the activities of learners.

Observations on the activity carried out by the observer learners assisted by subject teachers microcontroller. Things were observed concerning the activities of learners 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 in every meeting. The following presentation scoring average activity observation of learners in each meeting, while more detailed scores for each aspect of learners assessed per meeting are presented on the attachment diagram,

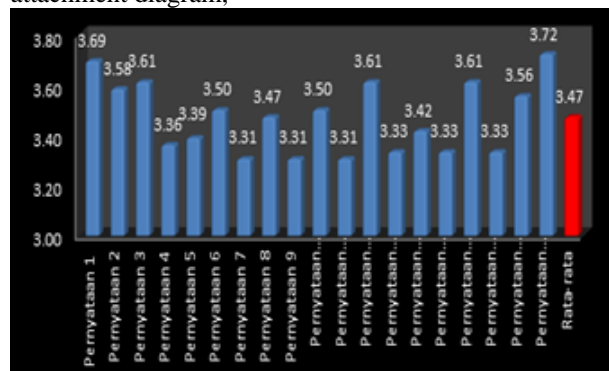


Fig 7. Blok diagram student motivation

In the Figure 7 can be seen scoring 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 very good 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. A complete learners increased activity can be seen in the following graph

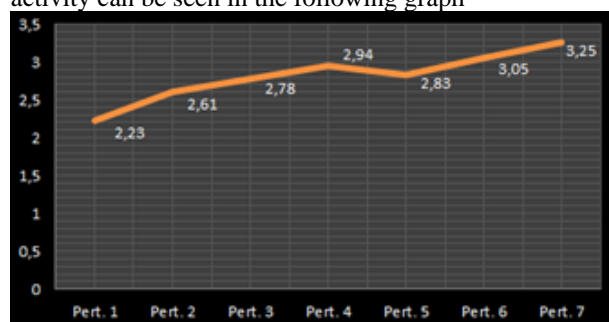


Fig 8. Graph Activities Students

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. Furthermore, from meeting to meeting 4 5 decreased to 2.83 later continued to increase up to seven meetings to 3.25. Overall from the chart above that obtained the final score is the average score of 7 encounter with 2.81. This means that the activity of students during the learning takes place using LabVIEW learning media can be considered good.

#### IV. CONCLUSION

One of the virtual laboratory that has been developed is LabVIEW. This software is used specifically for processing and visualization 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 in an effort 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 learning microcontroller 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 students' response to LabVIEW that are in the very good category; Application of LabVIEW media for two cycles in order to improve student learning outcomes microcontroller is done through a combination of lectures, explanations of materials by teachers using LabVIEW media, as well as lab work in groups by students.

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