Development Module (Lab Report) As a Media of Learning in Vocational Education Viewed by Gender

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Abstract. Module as a media of learning and training, which especially the students studying in institutions offering education at undergraduate and associate levels can employ as a PLC (Programmable Logic Controller) controlled simulator of the logic gate, timer and counter. During industrial manufacturing processes, has been actualized through this work, for the purpose of training qualified technical personnel needed by companies, who are specialized in control and electro mechanics. It was found that, students are very happy learning to use the module so with very significant contributes to a large extent to the training process in favor of faculty members, who are to train personnel for the sector, and in favor of students, who should be able to acquire proper education. Working on the training tool allows students to acquire knowledge and practical skills and then make use of those skills for troubleshooting and control of machinery.

Keywords: learning media, PLC, vocational, education, training tool

1. Introduction
To achieve a stable economy requires great attention to the achievement of a competitive position in the world market and very important to look at how creative thinking can enrich the economic potential that education is about educating people to be ready to enter the world of work, creative skills and creative thinkers very be required. National education standards require suppression of creative course and a variety of creative ways of working, so that lecturers as educators play an important role in implementing the learning process in higher education, and develop the potential and creativity of the students, so that students can competition in the industry.

After observation and interviews on head of department about the problems that exist in laboratory control. Its need learning with modules (lab report) while the matter is obtained underprivileged students overcome troubleshooting on PLC program using CX-Programmer. It can be seen that the many industries that use PLC in the production process, controlling machines and electrical installations. From the above explanation can be presumed that in the learning process requires the learning media which efficient and targeted in order to improve students' ability to understand the PLC used in the industry.
2. Problem Statement
In education, there are two global issues that are very important in the learning process. Including the module (lab report) as a media of learning. By looking at the issue globally in the field of industrial control, so author discussions with the head of department mechatronic at State University of Trunojoyo Madura (UTM). From the discussion gained some problems that need to be overcome, the problem will be explained as follows, differences in male and female employees the ability to work in the field of industrial controllers.

3. Materials
This research uses several materials which are laptop/computer with software CX-Programmer v.9.3 and module (lab report) consists of two, first module about logic gate (load, or, and, not) and second module about timer and counter. Programming use CX-Programmer for PLC CP1E type.

4. Literature Review
According to Munadi (2013, p. 7) explains in his book that, the media is anything that can convey and deliver the message from the source in a planned manner so as to create a conducive learning environment in which the recipient can make the learning process efficient and effective. The media is a very important tool in the process of teaching and learning activities, while according Sardiman (2006, p. 3) media is a tool that convey or deliver messages of learning. Media can be defined by their technology, their symbol systems, and their processing capabilities. The most obvious characteristic of a medium is its technology, the mechanical and electronic aspects that determine its function and to some extent its shape and other physical features. These are the characteristics that are commonly used to classify a medium as a "television," a "radio," and so on. The cognitive effects of these characteristics, if any, are usually indirect. Characteristics such as size, shape, and weight makes it more likely that a student will learn with a book while on a bus but not a computer, though of course this is changing as computers get smaller, lighter, and cheaper (Kozma, 1991).

4.1 CP1E-N40DR-A System
The system configuration when using a CP1E N/NA N40DR-A type CPU Unit is shown at figure 1.

![Figure 1. Basic system (datasheet OMRON, 2016)](image-url)
### 4.2 CP1E-N40DR-A Specification

The following table gives the specifications that apply to the built-in I/O on a CP1E CPU Unit (Anonim, 2016).

| Item                  | Specification                                                                 |
|-----------------------|-------------------------------------------------------------------------------|
| Input type            | High-speed counter inputs or normal inputs                                    |
|                       | CIO 0.00 to CIO 0.01                                                         |
|                       | CIO 0.02 to CIO 0.07                                                         |
|                       | CIO 0.08 to CIO 0.11, CIO 1.00 to CIO 1.11 and CIO 2.00 to CIO 2.11           |
| Input bits            | CIO 0.00 to CIO 0.01                                                         |
|                       | CIO 0.02 to CIO 0.07                                                         |
|                       | CIO 0.08 to CIO 0.11, CIO 1.00 to CIO 1.11 and CIO 2.00 to CIO 2.11           |
| Input voltage         | 24 VDC, +10%, -15%                                                          |
| Applicable sensors    | 2-wire and 3-wire sensors                                                    |
| Input impedance       | 3.3 kΩ                                                                       |
|                       | 3.3 kΩ                                                                       |
|                       | 4.8 kΩ                                                                       |
| Input current         | 7.5 mA typical                                                                |
|                       | 7.5 mA typical                                                                |
|                       | 5 mA typical                                                                  |
| ON voltage/current    | 3 mA min at 17.0 VDC min                                                      |
|                       | 3 mA min at 17.0 VDC min                                                      |
|                       | 3 mA min at 17.0 VDC min                                                      |
| OFF voltage/current   | 1 mA max at 5.0 VDC max                                                       |
|                       | 1 mA max at 5.0 VDC max                                                       |
|                       | 1 mA max at 5.0 VDC max                                                       |
| ON response time *    | CPIE-N40DR-A CPU Unit                                                         |
|                       | 50µs max                                                                     |
|                       | 50µs max                                                                     |
|                       | 50µs max                                                                     |
|                       | 1 ms max                                                                     |
|                       | 1 ms max                                                                     |
|                       | 1 ms max                                                                     |
| OFF response time *   | CPIE-N40DR-A CPU Unit                                                         |
|                       | 50µs max                                                                     |
|                       | 50µs max                                                                     |
|                       | 1 ms max                                                                     |

#### 4.3 CP1E-N40DR-A I/O Wiring Diagram

CP1E-N40DR-A have been input 24 points and output 16 points wiring diagram following (Anonim, 2010).

![Wiring Diagram](https://example.com/wiring_diagram.png)

**Figure 2.** Wiring diagram (datasheet OMRON, 2010)
4.4 Learning Outcomes

Learning outcomes is an important thing in the process of teaching and learning. In the process requires an important role between teachers and students that aims for the achieve certain specifications. As an explanation of Purwanto (2009, p. 44) that the study results can be explained by understanding the two words that make it up, namely the "results" and "learning". Definition of results (product) refers to an acquisition as a result of doing an activity or process that result in changes in the functional input. Purwanto (2010, p. 72) explains that the study results can also be used for the calculate Cost Ratio Results. The ratio of cost results is used for the determine the level of efficiency of the training program or training cost efficiency, that is by comparing the average value of the learning outcomes of participants by the number of costs per person during the training. The average value of the intended learning outcomes can use the value of the average increase in the capacity or the average value of the final test (final test).

5. Researchs Method

To make learning media his use research and development (R&D) method. Step by step from use research and development (R&D) method can be looking at figure 1 (Sugiyono, 2010, p. 409).

![Figure 3. Step by step research and development for PLC training tool and module (lab report)](image)

5.1 Potential and Problems

From the discussion gained some problems that need to be overcome, the problem will be explained as follows, differences in male and female employees the ability to work in the field of industrial controllers.

5.2 Data Collection

Necessary data collection phase of collecting information which is used as a learning media material plan that is expected to resolve the problem. Collecting data in this study a questionnaire response for students, media validation, student results cognitive, psychomotor, and affective.

5.3 Product Design

The created module (lab report) consists of two, first module about logic gate (load, or, and, not) and second module about timer and counter. Author is making design of module (lab report) following.
5.4 Data Validation
Validation is a process to assess the quality of the products, the products assessed were learning media. Validation is done by two expert lecturers from the department of mechatronic at UTM.

5.5 Revision of Design
Of the product validation process has been done will give an explanation of the weakness of learning media created. The weakness was further revised to make improvements to media of learning.

5.6 Trial Utilize
The trial media of learning done if revised. The trials module (lab report) implemented in department of mechatronic at UTM. Cognitive learning achievement of students is done by giving the student achievement test. Psychomotor learning achievement is done by giving students of test performance. Affective learning achievement performed by observing students.

5.7 Revision of Product
After testing the product in the department of electrical engineering, if there are weaknesses or deficiencies in the media, then the product will be revised to fix.

5.8 Analysis and Reporting
The completed media of learning tested and validated by experts of media, then performed analysis. The analysis is used to analyze the results of the validation and the questionnaire responses from students. Reporting the results of learning media are documented on CD and publish the results of research through international journals.

6. Result and Analysis
65 students were given a questionnaire produces the following data.
Figure 5. Male student questionnaire

Figure 5 explains that 41 male students are given a questionnaire about satisfaction with the use of module (lab report) with the scale, is not happy, quite happy, happy, and very happy. The PLC training tool hardware cannot be made because there is no material in UTHM so the author just makes the hardware design following.

Figure 6. Female student questionnaire

Figure 6 explains that 24 female students are given a questionnaire about satisfaction with the use of module (lab report) with the scale, is not happy, quite happy, happy, and very happy. The PLC
training tool hardware cannot be made because there is no material in UTHM so the author just makes the hardware design following.

Can be analyzed descriptively that after the author interviewed the students which use module (lab report) as a media of learning, the student response was very happy.

7. Conclusion

Students are very happy learning to use the module so with very significant contributes to a large extent to the training process in favor of faculty members, who are to train personnel for the sector, and in favor of students, who should be able to acquire proper education. Working on the training tool allows students to acquire knowledge and practical skills and then make use of those skills for troubleshooting and control of machinery.

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