MoREK: The learning media to improve students understanding about electrical circuit in informatics

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Abstract. The needs for labor in the world is already increasing especially in Indonesia. According to the World Bank, Indonesia is a country that ranks 9th in the world's largest economic growth. To meet that needs, Indonesia needs 55 million workers who are experts in the field of electricity. Therefore, it takes a lot of human resources and has been equipped with knowledge and expertise in the field of electricity. To be able to meet these needs, it takes a better method of learning to increase knowledge and expertise in the field of electricity since college, especially in the field of informatics. Prototype of Electrical Module (The MoREK) requires a Prototype method for the Practicum Module to be created as desired. This method is often used in the real world or it could be said Prototype method is part of the product that expresses the logic and physical external interface that is displayed. For data retrieval is used Pre-experimental method where students will be given pre-test and post-test. The Design of Electrical Module has a purpose to improve the students understanding of Electric Circuit Engineering Courses with the creation of The MoREK so that students are more competent to the course and can meet the needs of manpower or Human Resources (SDM) in the field of electricity. By using The Morek, the score of student learning outcomes increased by 7.8% and informatics students who conduct research in the field of electricity increased to 21%.

1. Introduction
The government has set a plan to build a power plant that can generate 35,000 MW in all parts of Indonesia so that it takes a skilled manpower in the field of electricity with a large number. If the development of electrical energy in a year to reach 5,000 MW then it takes about 20,000 workers consisting of 12,000 skilled workers, 5,000 middle-class workers. "The rest, 1,000-2,000 people are experienced experts [1].

STT-PLN should be a major pioneer in the provision of this workforce. Lesson materials or modules in the field of electricity should be updated immediately tailored to the needs of existing electricity. To produce competent graduated it is necessary lessons in accordance with the needs of the industrial world. When talking about electricity then what is pictured is majoring in Electrical Engineering whereas other majors such as Informatics Engineering can provide graduation to work in the field of electricity. This is because there are many tools connected with computer equipment even computer embedded system.

Based on this research, the researcher average the value of the subjects connected with the literature has decreased almost 80% of the value owned by the informatics students below the value of
50. And this affects the students who take the final project in the field of electricity in STT-PLN informatics majors. Based on the data of informatics students in 2015 who took research in the field of electricity only 6.08% of 205 students and on data informatics students in 2016 showed that students who take research in the field of electricity is only 6.06% of 132 students. This is really worried because STT-PLN should be a pioneer in the field of electricity. For that researchers tried to conduct research in this electrical field. How to make a module in the field of electricity field in the field of informatics (The MoREK) so that graduates will be competent in the field of electricity and will be used in the world of electricity field work so that Human Resources (HR) will be met. Currently, the study of electrical circuit is just a theory and practicum in the electro area but the students were less aware of the implementation of electrical circuits that are combined with the informatics area.

Preparation of practical modules are intended to facilitate students in capturing lessons that researchers teach. "Learning module can be used to improve student learning outcomes" [2]. So that students will be much more understand the subjects taught, will also be easy in carrying out electrical materials because they have learned both in practice and theory. Based on research conducted by Arif Budijanto et al., [3] pointed out that the learning module is an effective method for improving students' psychomotor in learning the course with practical approach". Besides, the researcher tries to develop electricity lesson in order to avoid saturation in electrical subjects.

2. Literature Review

In previous research [4], has successfully developed E-learning Assisted Virtual Laboratory For Practical Basic Physics II in Program Of Study Physical Education FKIP UNSRI which valid, practical and have a potential effect. The method used in this research is a Development Research that use Rowntree model comprising the steps of planning, development and evaluation. The evaluation used is Tesmer formative evaluation consisted of self-evaluation, expert review, a one-to-one, small group and a field test. Data collection techniques with walkthrough, questionnaires and tests. This research has resulted a valid e-learning assisted virtual laboratory with validation percentage score 91.67 %, of material aspect, 96.75 % of the media aspects and 77.78 % of instructional design aspects. E-learning Assisted Virtual Laboratory for Practical Basic Physics II developed practicality scores at stage one-to-one stage of 81.30 % and 81.50 % for small group are included in the category of very practical. The test results on the field test phase of 44 students who got an A by 31.82 %, the value of B was 34.09 % and the value of C by 34.09 %. Based on the research results, it can be concluded that Development E-learning Assisted Virtual Laboratory for Practical Basic Physics II has a valid, practical and have a potential effect.

Furthermore, in research [5], tells about teacher's difficulty in explaining the mathematical aspects and the way the phasor diagram depiction of this physical material is one of the causes is the lack of an attractive, flexible and easy-to-use medium to teach the material. Through this research, developed computer-based physics learning media subject of current and electric voltage back and forth for high school students / MA class XII by using Microsoft Excel 2007. Making of this instructional media refers to ADDIE development model that is Analysis, Design, Development, Implementation, and Evaluation. To determine the feasibility of the media, validation is made to several validators consisting of material experts, user experts, and media experts. This validation is in the form of a questionnaire with the criteria / indicators that have been determined. This program has met the eligibility criteria; media (design and program) equal to 78,92% or included in Good (B) category, material (suitability of curriculum subject program of physics subject and electric voltage back and forth SMA / MA class XII) equal to 72,22% or included in good category (B), and users (media and material) of 81.78% included in very good category (SB). From the results of validation analysis can be concluded that the program developed can be utilized and deserve to be used as a medium of physics learning the subject of current and electric voltage back and forth for SMA class XII.

Next, in research [6], the use of network in embedded systems can be done with many kinds of mobile phones, bluetooth, modems, ethernet cards, wireless technology and so on. Using network in embedded system can help people to do remote controlling. On previous research, found that many
students have the ability to comprehend the basic concept of embedded systems. They could also make embedded system tools but without network integration. And for that, a development is needed for the embedded system module. The embedded system practicum module design needs a prototype method in order to achieve the desired goal. The prototype method is often used in the real world. Or even, a prototype method is a part of products that consist of logic expression or external physical interface. The embedded system practicum module is meant to increase student comprehension of embedded systems course, and also to encourage students to innovate on technology-based tools. It is also meant to help teachers to teach the embedded system concept on the course. The student comprehension is hoped to increase with the use of the practicum course.

Also, in research [7], Observations conducted by researchers showed that in SMK Negeri 2 Bojonegoro student learning is having a module but the module is not used in accordance with the potential students and less according to the standard module, so generally, this study aims to determine the potential of students in SMK Negeri 2 Bojonegoro, quality learning modules, and student learning outcomes. This research development, because in this study developed learning modules and devices. This learning module development refers to the development of 4D (Define, Design, Develop, and Disseminate). The study subjects were 32 students of class X TEI 1. The design of experiments used for data retrieval experimental research design One Group Pretest Posttest with the following results: 1) the results of formal reasoning ability tests concluded that the average student there is at the level of reasoning ability transition, 2) the validation of results result obtained 80.2% for the learning modules and 80% for items we can conclude for use, 3) the result an average value and standard deviation of posttest 64.62 then 12.05 to pretest with an average value of 58.56 and a standard deviation of 12.20. The difference between the results of the study revealed that a significant level of 5%, the value of $t_{\text{count}}$ 3.188 while the value of $t_{\text{table}}$ 2.04, so the value of $t_{\text{count}} > t_{\text{table}}$ and the probabilities obtained the P Value 0.003, P-Value <0.05 which can be categorized $H_1$ is accepted and $H_0$ is rejected, from the statement that the learning outcomes of students after using the learning modules increased compared with students before using the learning modules.

3. Research Method
The method used to develop the module is Prototyping Method so that the module generated can be according to user requirement. This method is often used in the real world or can be said Prototype method is part of a product that expresses the logic and physical external interface is displayed.
Figure 1. Prototype method

The population used is the students of Informatics Engineering who have taken the course of electrical circuit in the final semester. With a sample consisting of 2 classes of class A and class B consisting of 45 students class A as experimental class given treatment and 45 students of Class B is non-experiment and not given treatment. The design used in this research is pre-experimental design of static group compared.

Figure 2. Static group comparation

Class group that is given treatment by using The MoREK is a class of electric class A class Informatics engineering and class of electric class B class Informatics techniques are not given treatments. The technique that is being used for collecting data is by giving test sheets and questionnaires that are analyzed with Likert scale. With criterias such as “very helpful”, “helpful”, “enough”, “unhelpful”, “very unhelpful”.

| Percentages | Criteria     |
|-------------|--------------|
| 0%-20%      | Very Unhelpful|
| 21%-40%     | Unhelpful    |
| 41%-60%     | Enough       |

Table 1. Criteria of experiment
Based on the criteria percentages, the MoREK module on helping students in increasing their comprehension of embedded system course is said to be good if it has a percentage above 60 percent.

\[
\text{Percentage} \, (\%) = \frac{\text{Total Actual Score}}{\text{Total Ideal Score}} \times 100\%
\]

(1)

4. Result
Based on the results of the questionnaire calculations conducted on the arbitrariness of what do the student by using The MoREK module. This can be seen from the graph below. With the graph and the questionnaire concluded that students are helping by The MoREK. It is showed by the 75., 22% respondents that said they could understand, learn, and operate the given module.

Based on the results of tests conducted using pre-test and post-test it is seen that the class that provided the MoREK module, has a much better average value compared to that not given the MoREK module. In Class A when done post-test get value equal to 64.7 and after doing post-test get value 72.5.

![Figure 3. Aspect usability](image)

![Figure 4. Score of class A](image)
In Class B when done post-test get value equal to 57.4 and after done post-test get value 57.8.

![Score Class B](image)

**Figure 5.** Score of class B

This also affects the research generated by students in the field of electricity is visible in the following table.

![Sum of Thesis With Electricity Field of Study](image)

**Figure 6.** The number of research students in the field of electricity

5. **Conclusion**

By using the MoREK Module the value obtained by the students increased by 7.8% from the previous value. Student research covering the field of electricity also increased by 21% from the previous year.

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