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DEVELOPMENT OF BASIC ELECTRONIC INSTRUCTIONAL MODULE AND TRAINER

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ABSTRACT: ***This*** *research was aimed to produce the module and trainer on mastering basic electronic competency of the students at Education of Electronic Engineering Faculty of Engineering State University of Medan. Developing and implementing the module and Trainer and given a posttest to the student. The research method used was Research and Development model by Borg & Gall (1983) which is known as R & D Cycle. To develop the instructional material of the module used Dick and Carey's model and Cruch Kilton criterion to plan and build the trainer. The data collecting instrument were field study, observation, interview and questionnaire as long as development activity and posttest to know the effect of the module by using objective tes. To know the effectiveness of the module and trainer to higher the instructional outcomes or mastering the competency done by differentiating outcomes between module group and control group. The differentiation analysis by using t-test to find out significance differences. The subject research was 5 lecturers, 40 students of first semester regular class at Education of Electronic Engineering. The research result of the development of the module consist of nine learning topics include student guidance, student practical activity, and the trainer which consist of electronic components that support practical activity which is integrate with the topics, lecturer guidance, and posttest and it's key answer. The mean score achievement by module group was 82.80, mean while the score achievement by control group was 74.74. The result of the t test was 4.63 and t table with df =73 on 95 % significance is 1.960. Because the t observed = 4.63>1,960 t table, so the module and trainer effective, and efficiency to higher the student out comes on basic electronic.*

KEYWORD: **Development, Module, Trainer**

INTRODUCTION

Various efforts had been made to improve the quality of teaching in education of electronic engineering engineer Faculty State University of Medan, such as increasing skills and learning methodology through the development and upgrading against teachers, but the results are still low. Many graduate students have not been able to meet the qualifications as required by educational institutions Vocational School. These symptoms indicate that learning in the education of electronic engineering has not been able to provide a learning experience on cognitive and psychomotor of students. Various strategies, methods, and models of learning have been found and have been socialized to the teachers, but the reality today is generally lecturers using the old methods focused on methods lectures, question and answer and discussion groups. The presentation of the course material is done in the classical style, lack of attention to the ability of the individual student, and less theoretical attention to the balance between knowledge and skills. In addition, the availability of engineering books in the library and funds for the procurement of

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equipment and materials is very limited practice. This condition is one of the causes of poor quality of graduate students.

Improvement of the quality of learning can be initiated from the lesson plan. Learning that begins with the design, the quality improvement efforts of learning. This means that the improvement of learning outcomes must be initiated from instructional design quality improvement. In the design and implementation of learning, a lot of variables that determine the quality of learning should be accepted as such by the professor, and then these variables work as a guide. The purpose of the eye subjects for instance, cannot be manipulated by the faculty as defined in the curriculum. Similarly, the characteristics of individuals and subjects, the limited resources of learning and practice equipment limitations.

LITERATURE/THEORETICAL UNDERPINNING

Dick Carey (2009) said that, the term instructional strategy is used generally to aspect cover the various aspect of choosing a delivery system, sequencing, and grouping claster of conten describing, describing learning component that will be included in the instruction, establishing, lesson structures, selecting media for delivering instruction. According to McKeachie's (2006), instructional strategy need to be able to set and use meaningful goals to help them learn and to help them generate and maintain their motivation for studying. Based on explained the expert of instructional disain above, concluded that instructional strategy and variable of instructional is very important.

The most important variable of all variables is a source of learning and practice equipment, as the source of learning and practice equipment can be manipulated in order to affect change in behavior of the various characteristics of different students. Important characteristics of learning resources include the availability of complete information relating to the knowledge to be mastered, while equipment practices include the availability of components and equipment to provide practice experience so that students have the knowledge and skills. In learning basic electronics needed a good understanding of the students of this course is the knowledge base that is used to understand how electronic circuits work, therefore the availability of the module as a source of theoretical knowledge and the trainer as a training tool should be considered as a factor that affects the results of learning students.

By doing learning modules based trainer then learning will be more effective and efficient at Eventually that will improve learning outcomes. The same as Finch and Crunkilton (1985) concluded that module is complete tool in instructional to help student to improve learning achievement. Strategies applied in learning basic electronics for this is to write a lecturer in the college material jobsheet, then explain, if the electronic components and measuring instruments available faculty writing practice activities then assign students to take the components and tools, as well as arranging the components on the board track. After the students finished assembling a first electronic circuit lecturer examined before being given the power to prevent damage if there is an error. As long as students do practice faculty to supervise and provide assistance if there are students who need. Experience shows the experimental learning without giving a complete theoretical basis and without clear instructions as described above, causes the student knowledge

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is very limited, mostly just comes from what is written on jobsheet lecturer. The use of electronic components in a very wasteful practice because of limited experience and student carelessness, often causing a broken leg component when the component is installed to track board (bread board) and many components are lost when returned to the tool box and materials. Based on the above-mentioned gap, it is necessary to develop a learning module that is fitted so that the trainer be effective and efficient learning and ultimately student learning outcomes will increase.

METHODOLOGY

The research was conducted in the education of electronic engineering State University of Medan. The study population was all students of education of elektronic engineering. The subjects were students of Electronic engineering that follows the basic electronics course as much as 2 class.This research method development research method, the research and development process cycle "The R & D cycle" Borg and Gall (1983). In accordance with the R & D approach is used, then the execution of this study to follow these steps: a preliminary survey, the planning module, a test module, module validation, socialization and dissemination. Results are expected in the first stage of the preliminary activities are: (a) find learning needs in an effort to improve the learning outcomes of basic electronics, (b) find a basic electronics learning procedure that should dilakukaan, (c) know the real basic electronics learning conditions in the classroom, (d) find the form of modules and the right trainer as an effort to improve the learning outcomes of basic electronics, (e) find the appropriate evaluation tools. In the second stage, conducted trials through field trials (expert reviews, test), dissemenasi and implementation. In the implementation of field trials, using the pretest-posttest design experiment with design.

Data analysis techniques used are: (1) descriptive data analysis to illustrate the effectiveness of the trainer module is used, (2) to determine differences in the effectiveness of the learning modules and trainer with students studying with jobsheet and measuring devices. Implementation of research activities are described as follows:

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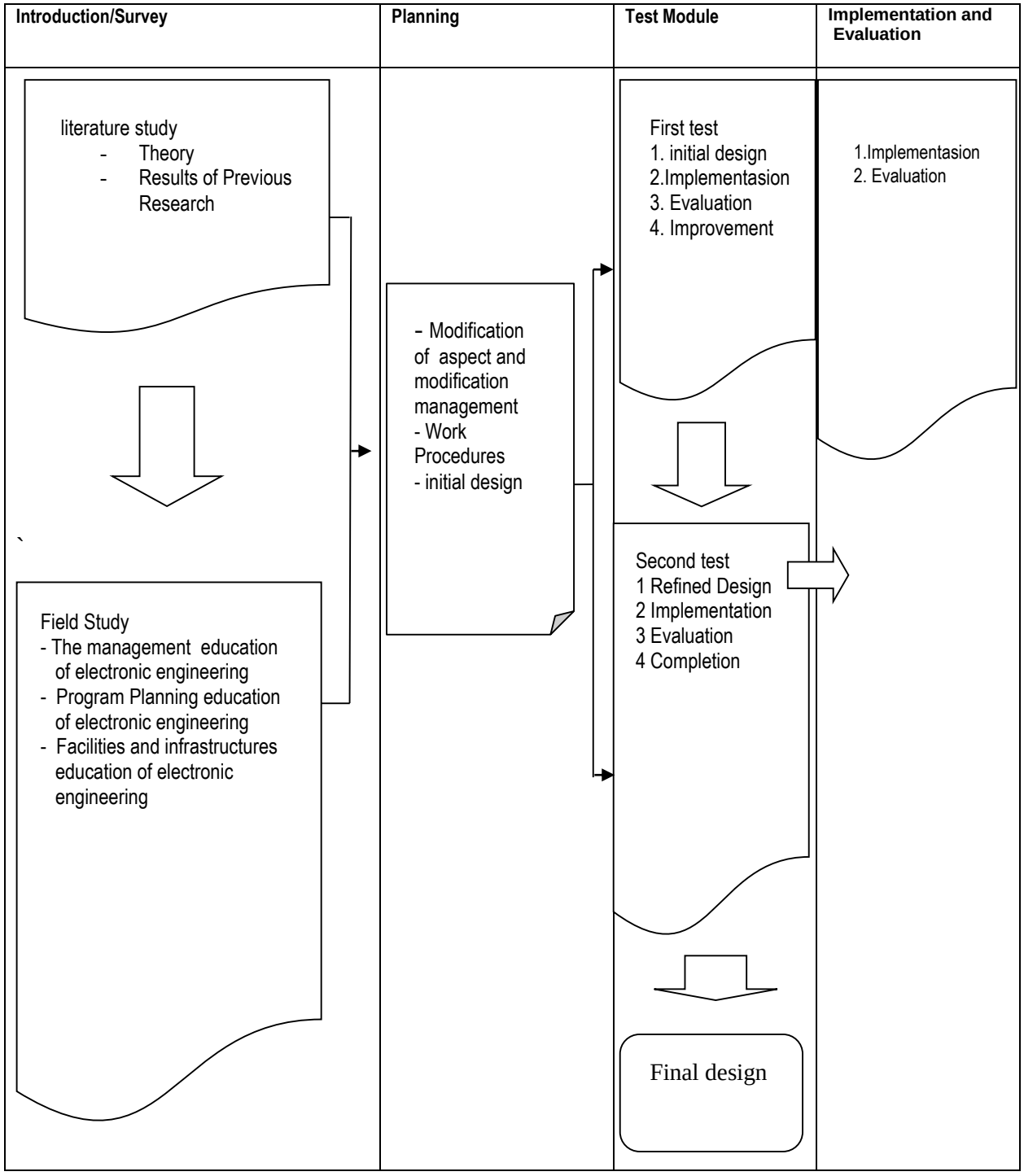

Figure 1. The R & D cycle Borg and Gall

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RESULTS/FINDINGS

Based on the observation of the preliminary study to the school where the study obtained information that there is no instructional module used in basic electronics, and the practical activities carried out without using of work sheets and using separated components. Learning materials are given by lecturer with assigning a student writing a paper, and then be presented in class and the lecturer closed by giving an explanation to establish the core of subject. Based on the results of a questionnaire given to the lecturer and students of all respondents including 5 professors and 32 students, the overall agree if the subject matter is given in the form of modules, and is equipped with a trainer**.** Through literature review compiled description of the subject matter is based on the formulation of competencies and the outlines of subject matter, and eventually produced the module containing the nine subject matter, material description, the experience of doing the practice and training, along with guidance to students and lecturer in the use of the module. To provide practical experience of doing the necessary components recorded, the next planned layout of components and eventually built a trainer. Based on the opinion of hali educational technology content module structure can provide a learning experience to achieve competency in the use of color pictures Description facilitate understanding of student materials, theory with practice and learning activities that are facilitating the achievement of competence, and the phrase used in the module is easy to understand. Based on the opinion of the field study module already contains description of material that can achieve competence, it tracks and clear, which is already suitable practice to support the achievement of competencies, components and source voltage available to the trainer is ideal for achieving psychomotor competency, components that are in trainer is complete in accordance with the subject matter, and the question of the training provided is suitable for students to measure student mastery of the material. According to the opinion of the module students are able to induce a desire to learn because it has appeal and the time used to understand the material is lower than if assigned to writing a paper. According to the results of observations in the form of trainer preparation component is to improve the efficiency kompoen practice because there is no activity for a lost or damaged components.

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The experiment results of a pilot who started one-on-one, in which the subject of 1 to 5 is being piloted to the intelligence of the students are, the better students intelligence and one student that very good. During the testing of students in observation and after completion of the interview and was given a questionnaire to solicit information for the purposes of revision and trainer module if necessary. Revisions made if based on observations, interviews and questionnaires required before forwarded to the small class test. In a small class test modules and tariner subject 1 through 5 dengann tested to 5 students. During the testing of students in observation and after completion of the interview and was given a questionnaire to solicit information for the purposes of revision modules and trainer if needed revision made if based on observation, interview and questionnaire required before forwarded to the small class of large trials. In the pilot module besarl grade and subject tariner 1 to 5 tested to 40 students. During the testing of students in observation and after completion of the interview and was given a questionnaire to solicit information for the purposes of revision and trainer module if necessary.

The experiment was conducted to determine: whether student can use module and trainers individually, whether there are sentences that have not been understood in the description of the material and student practice guidelines, whether the module and trainer has appeal and efficiency, and whether the lecturer implements modules use according to the instructions. If any difficulties arise, lack of clarity in descriptions and instructions so It will be revised and finally generated good trainer and good module. Based on observations, questionnaires and interviews, students and trainer acknowledges that the module can be used with easily, the description of the material easy to understand, experience on doing practice help to understand the subject matter, module and trainer has an appeal, according to the description about the training materials, and instructions in module easy to understand. The procedures for implementation are described as figure 2 below

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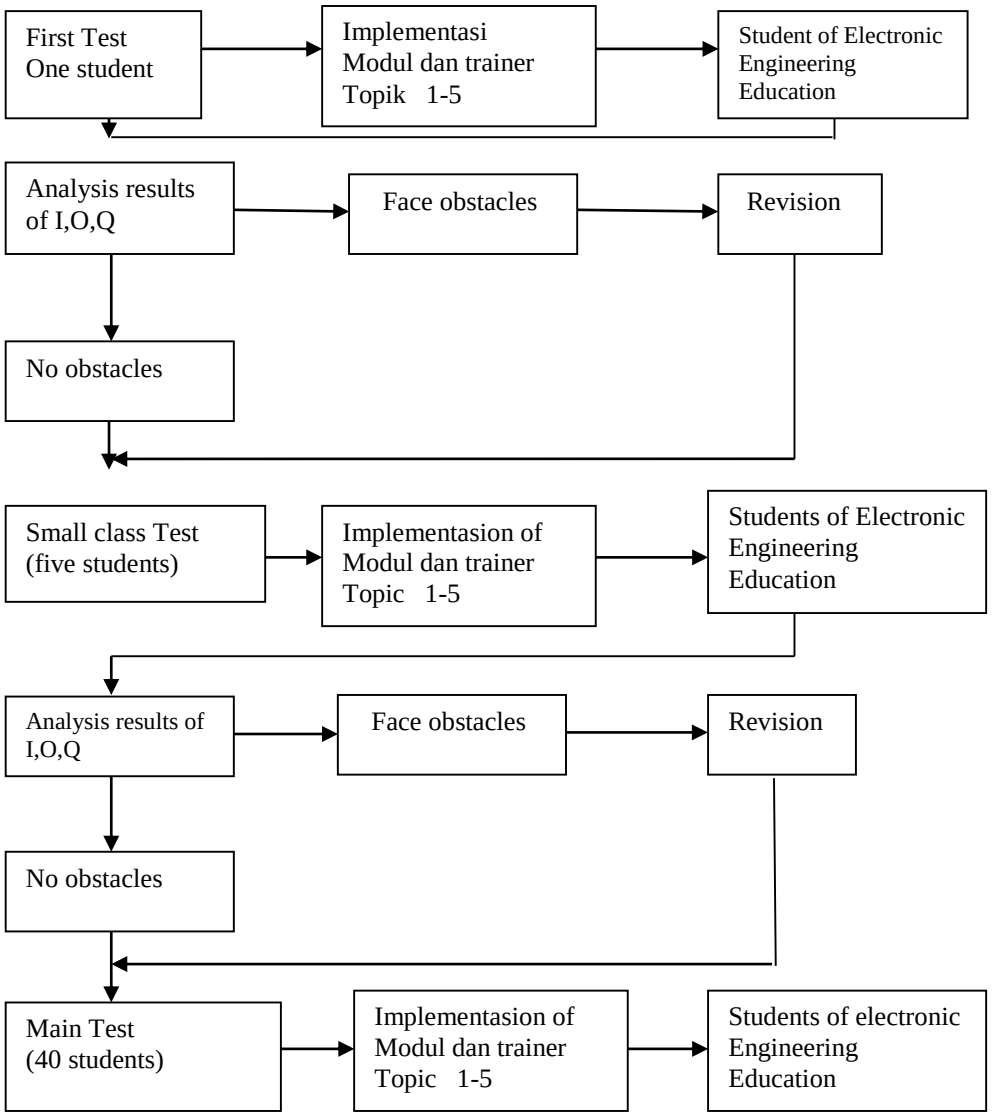
After the module and trainer fulfill the requirements so trials conducted.



I= Interview, O= Observasion, Q = Questionnaires

Figure 2. Stages of Implementation module and Trainer

The experiment results from The first, small group and large group The test are presented in Table 1

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Table 1: Students opinions on module and trainer that was developed

No	Questions	Percentage of students		
		First	Small Group Test	Large Group Test
1	Is module simple to use	67 %	100	97,5 %
2	Is the description of material easy to understand	100 %	100	100
3	Are module and trainer encourage your desire to learn	100 %	1000	100

Based on the above table, it can be concluded that the module and the trainer used are helpful to improve students learning outcomes, because the percentage of students answers showed over 85% said the module and _ trainer simple to use, easy to understand, and encourage students to learn. Similarly, the field of study on expert opinion and expert opinion of educational technology, stating that the developed module and trainer can improve students learning outcomes, because the contents of module has been able to provide a learning experience to achieve competency, good clear instructions given for lecturer and for students, each topic already contains descriptions of material that can achieve competence and the components on the trainer is complete in accordance with the topics covered, as presented in Table 2

Table 2. Data Of Experts' opinion

No	Questions	Experts' opinion	
		Experts of Educational Technology	Experts of Field Studies
1	The structure of the module has been able to provide a learning experience to achieve competency	very clear	very clear
2	Instructions provided to students and lecturer easy to understand	very clear	very clear
3	Every topic contains a description of the material that has been able to achieve competence	very clear	very clear
4	Components on the trainer is complete in accordance with the topic of discussion	very clear	very clear

To determine the effectiveness of instructional basic electronics module is done by providing test results of to students studying a large class of The test group, and the group students that learned without module and without trainer. So a comparison of learning outcomes by using t-test. If the results of the study group was significantly higher module, the module and trainer significantly effective to improve learning outcomes. The level of significance of differences in learning outcomes of both groups found using t-test at 95% significance level or = 0.5. Based on the average results of the analysis use module learning outcomes and trainer was 82.80 and the average

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learning outcomes without module and trainer 74.74. Furthermore, the calculation of the t-test showed t count> t table or 2.80> 1.690 at the 95% significance level, as summarized in Table 3

Table 3. Summary of t-test calculation

Bede Test	Dk	T_{count}	T_{table}
Group of modul and control	73	4,63	1,960

It can be concluded that there are significant differences between the learning outcomes students that learned basic electronics by using a module to learn without using module and trainer at ά = 0,5

DISCUSSION

Based on the The test results of one-on-one, small class The test, and the The test turned out to be a great class with a trainer basic electronics module that was developed can have traction, minimize the time to learn and electronic components, as well as effective to improve the learning outcomes of This is because the availability of a description subject matter that has been first extracted, equipped with component drawings in accordance with the original color and trainer containing a real component that is used to give the experience of how to determine the characteristics and condition of the components through the measurement makes easier for students to understand the subject matter in the end with easily achieve competence. Students that learned with trainer given the freedom to complete the module points to fit the pace of learning so it is to motivate students to be more active in learning. Learning without module and less trainer facilitate students in learning the material because the description obtained is very limited, less attractive instructional, do not pay attention to individual differences in the ability of students, most students are less active in practice but prefer to see her doing. Conditions as mentioned above resulted in an average value of students that learned with use module and trainer is higher when compared with the average value of the students that learned without module and trainer. The use of trainer in learning a very efficient use of the components, because it is rare components that were damaged and lost for the students to practice. This condition will provide an opportunity for schools using the funds for the development of other instructional module with trainer based on observations have drawbacks, among others:

1. Available time accordance with allocated time for the course per semester not provide the opportunity to use a longer time to the students in standart level.
2. Advance students can complete module shorter from the allotted time for the course each semester so that lecturer feel overwhelmed to provide additional activities do not interfere other students.

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IMPLICATION TO RESEARCH AND PRACTICE

This research is the correlationship with Finch and Crunkilton Theory (1985) concluded that module is complete tool in instructional to help student to improve learning achievement. Shaffer Peter S and McDermot Lilian C (1992) with the other statement on Research as a guide for curriculum development concluded that, the result from assessment described indicate comparable success in solving quantitative circuit problrm by student who had used the tutorial materials and by those who had not. The same as research by Cordray at all (2013) concluded that, the result can be replicated by instructor other than the developers of the modules, in a variety of student population and educational setting, and at other institutions. Overall, the challenge-based modules and other innovations have moderate overall effect on improve student performance. They can be implemented successively by other instructor in variety of educational setting and student populatin.

Based on the results of a questionnaire given to the lecturer and students of all respondents including 5 professors and 32 students, the overall agree if the subject matter is given in the form of modules, and is equipped with a trainer**.** Through literature review compiled description of the subject matter is based on the formulation of competencies and the outlines of subject matter, and eventually produced the module containing the nine subject matter, material description, the experience of doing the practice and training, along with guidance to students and lecturer in the use of the module. To provide practical experience of doing the necessary components recorded, the next planned layout of components and eventually built a trainer. Based on the opinion expert of educational technology content module structure can provide a learning experience to achieve competency in the use of color pictures Description facilitate understanding of student materials, theory with practice and learning activities that are facilitating the achievement of competence, and the phrase used in the module is easy to understand. Based on the opinion of the field study module already contains description of material that can achieve competence, it tracks and clear, which is already suitable practice to support the achievement of competencies, components and source voltage available to the trainer is ideal for achieving psychomotor competency, components that are in trainer is complete in accordance with the subject matter, and the question of the training provided is suitable for students to measure student mastery of the material.

According to the opinion of the module students are able to induce a desire to learn because it has appeal and the time used to understand the material is lower than if assigned to writing a paper. According to the results of observations in the form of trainer preparation component is to improve the efficiency component practice because there is no activity for a lost or damaged components. The results of this study indicate that the module and trainers can improve student learning outcomes. Therefore the module and the trainer are the very important factors that should be considered by the faculty on learning basic electronics. The results of this study have implications for lecture and students. For lecture, this research is very useful to be used for improving the quality of student learning in the classroom through. For the students, it will give a higher motivation to study harder so that increased learning outcomes.

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CONCLUSION

Based on our results it appears that basic of electronics module contains 9 topic of description with creative, practical experience and training, guidance to the students in the use, implementation guidance to lecturers, student assessment sheets, trainer containing electrical components, power supply and the board has spread attraction, efficient, and effective way to improve student learning outcomes electronics basic. This is due to: (1) basic electronics module serves description of the subject matter easy to understand, to help and facilitate students to achieve competency standards, (2) trainer containing electrical components, power supply board spread and give the opportunity to students to do activities practice, until further clarifying the concept of basic electronics by showing the facts Using the trainer on practicing electrical components is more efficient, because all components will not damage or lose when it is used by students.

FUTURE RESEARCH

Students who learned with trainer given the freedom to complete the module points to fit the pace of learning so it is to motivate students to be more active in learning. Learning without modules and less trainer facilitate students in learning the material because the description obtained is very limited, less attractive learning, do not pay attention to individual differences in the ability of students, most students are less active in practice but prefer to see her perform. Conditions as mentioned above resulted in an average value of students who learned with using modules and trainer higher when compared with the average value of the students that learned without modules and tariner.

The use of trainers in learning a very efficient use of the components, because it is rare components that were damaged and lost for the students to practice. This condition will provide an opportunity for schools to use the funds for the development of other learning modules and trainer. Based on observations have drawbacks, among others:

1. Available time according to the time allocated for the course every semester not provide the opportunity to use a longer time to the students that intelligence is.
2. Students can complete the module smarter shorter than the time allotted for the course each semester so that faculty feel overwhelmed to provide additional activities not to disturb her.

According to this research know that module and trainer efficient and effective way to improve student learning outcomes electronic basic that is (1) basic electronics module serves description of the subject matter easy to understand, to help and facilitate students to achieve competency standards, (2) trainer give the opportunity to students to do activities practice, until further clarifying the concept of basic electronics by showing the facts. To help students more easily understand the subjects of other courses, modules and trainers can be considered as one of the factors that determine the quality of learning. Therefore, future study using teaching materials that can help facilitate students to understand the course material needs to be developed and used in

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teaching. In addition to module teaching materials, aids tool that can allow students to carry out the practice, also need to be developed and used in lectures, so that increased student learning outcomes

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