

Effectiveness of E-Module Based on Integrated Project Based Learning Model Ethno-STEM Approach on Smartphones for Student Senior High School Grade XI

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Abstract— This study aims to determine the effectiveness of the E-Module based on an integrated project based learning model with the Ethno-STEM approach. The method used in this research is descriptive qualitative research which analyzes three competencies, namely attitude competence, knowledge competence, and skill competence. The instrument used is an assessment sheet on attitude and skill competence, while knowledge competence uses a test sheet and is analyzed by the N-Gain test. The subjects of this study were 38 students of class XI SMA Negeri 1 Tanjungpinang. The conclusion obtained is that the E-Module based on an integrated project based learning model with the Ethno-STEM approach is in the effective category of attitude, knowledge, and skill competencies.

Keywords— E-Module, Project Based Learning, Smartphones, Ethno-STEM Approach.

I. INTRODUCTION

Education is an important aspect in providing and preparing human resources that are useful both for themselves and those around them and even their environment [1]. At this time the world of education is in the 21st century education which has the principle of understanding societal change [2]. The purpose of 21st century education is to direct students to hone several skills that are appropriate to global conditions in the 21st century [3]. These skills are known as 4C Skills (creative thinking, critical thinking, collaboration skills, and communication skills) which is also known as the 21st century paradigm [4]. The government has taken steps to take steps to face the challenges of 21st century education. One of the steps that has been taken by the government is to transform the education curriculum which was previously KTSP into 2013 Curriculum. The 2013 curriculum is a curriculum that focuses more on student activities in learning (student center).

The role of digital technology, of course, can also be utilized in dealing with 21st century education. One of the digital technologies that are familiar to society, especially students, is smartphones [5]. The role of smartphones can certainly be an important role in increasing attention, motivation, and improving students' abilities in the learning process [6]. Smartphones can be a means of delivering interesting teaching materials or learning media for students. One of these teaching materials is E-Module. E-Modules are teaching materials that present subject matter systematically and are presented in electronic form in which there are animations, videos, audio that make the teaching materials interesting. The use of this E-Module is considered to be able to improve students' thinking skills [7]. As previously known, the 2013 Curriculum directs learning at the student center. One of the learning models that suit this is the project based learning model.

The project based learning model is a learning model that directs students to be active in learning, which is in the form of student activities in producing a project as a form of the results of the knowledge that they have gained [8]. The project based learning model is in accordance with the demands of 21st century education in improving student competencies such as critical thinking skills, creative thinking, collaborating and communicative [9]. In addition to learning models, learning approaches can also support the creation of good learning objectives and improve the quality of education. One approach that supports this is the Ethno-STEM approach. The Ethno-STEM approach is a learning approach that involves STEM aspects based on local local culture or also known as typical knowledge of the surrounding community, where the Ethno-STEM approach can improve students' abilities in terms of critical, creative, collaborative, and communicative [10]. The Ethno-STEM approach can also be said to be a collaboration of the Ethnoscience approach with the four aspects of STEM (science, technology, engineering, and mathematics) [11].

Based on this, in order to support the objectives of the 2013 Curriculum and to face 21st century education, there is a need for an E-Module based on an integrated project based learning model with an Ethno-STEM approach that is applied to smartphones, this was also obtained from previous research that discussed preliminary research in developing. E-Module based on an integrated project based learning model with an Ethno-STEM approach on smartphones [12]. From the problems that have been raised, this study aims to determine the effectiveness of the E-Module based on the integrated project based learning model of the Ethno-STEM approach on smartphones.

II. METHODS

This research is part of development research using the Plomp model, namely at the Assessment Phase [13]. The research method used is descriptive qualitative research which aims to obtain proper and detailed research data. The test subjects in this study were class XI MIPA 11 students at SMA Negeri 1 Tanjungpinang, totaling 38 students for the TA. 2019/2020 Semester 2. The E-Module was designed using Adobe Flash CS 6 software, because the software is plentiful and suitable for use in developing teaching materials. Physics [14].

The analysis used in this study consisted of an analysis of attitude competence, knowledge competence, and skill competence. The instrument used was an observation sheet for the analysis of attitude and skill competencies and a test sheet in the form of a pretest and posttest. Attitude competency analysis uses the following equation with the assessment categories in Table 1 below [15].

$$Nilai = \frac{prolehan\ skor}{skor\ maksimum} \times 100\% \quad (1)$$

Table 1. Attitude Assessment Category

Interval	Kategori
0 – 20	Tidak Baik (E)
21 – 40	Kurang Baik (D)
41 – 60	Cukup Baik (C)
61 – 80	Baik (B)
81 – 100	Sangat Baik (A)

The use of E-Modules can be said to be effective, if overall students get a good score (B). The next analysis is knowledge analysis, where the pretest and posttest value data are analyzed by using N-Gain statistical test using the equations and assessment categories as shown in Table 2 below [16].

$$\langle g \rangle = \frac{\% \langle Spost \rangle - \% \langle Spre \rangle}{100 - \% \langle Spre \rangle} \quad (2)$$

Table 2. Normalized Gain Category

Skor (<g>)	Kategori
(<g>)>0,7	Tinggi
0,7≥(<g>)>0,3	Sedang
(<g>)≤0,3	Rendah

E-Module is declared effective in knowledge competency analysis if it obtains a minimum N-Gain category in the medium category. In addition, E-Modules can also be said to be effective if overall students get a minimum of 85% logical class mastery [17]. The final analysis is an analysis of skill competencies as seen from the value obtained by students in groups when making projects and project results given and presentations by students in groups. Skill competency analysis uses the following equation with assessment categories which can be seen in Table 3 [15].

$$Nilai = \frac{prolehan\ skor}{skor\ maksimum} \times 100\% \quad (3)$$

Table 3. Skill Assessment Category

Interval (%)	Kategori
0 – 20	Tidak Baik (E)
21 – 40	Kurang Baik (D)
41 – 60	Cukup Baik (C)
61 – 80	Baik (B)
81 – 100	Sangat Baik (A)

E-Module is said to be effective on skill competence if overall students get a minimum score in the Good category (B).

III. RESULT AND DISCUSSION

3.1 RESULT

The research results obtained are used as the results of the Assessment Phase which is the stage of the Plomp development model. Assessment is done by analyzing three competencies, namely the competence of attitudes, knowledge, and skills. Attitude competency assessment was obtained through an assessment sheet at three meetings with sound wave subject material. Attitude assessment indicators consist of religious (RG), curiosity (RIT), conscientious (TL), responsibility (TJ). The results of the analysis of the attitude competency assessment of students can be seen in Figure 1 as follows.

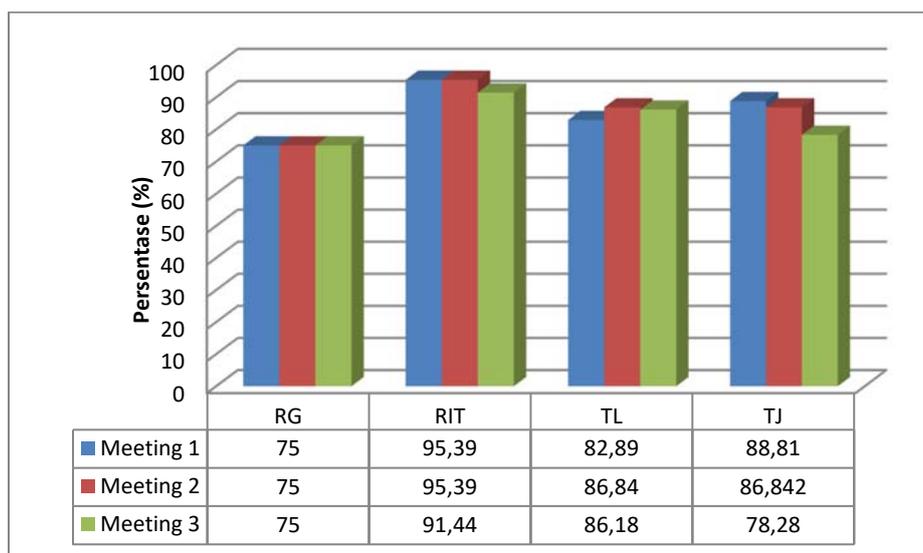


Fig. 1. Graph of Student Attitude Competence Assessment

Based on Figure 1, it can be seen that the attitude competency assessment of students obtained an average score above 75 so that it can be ascertained that they were in the Good category. This shows that the E-Module is said to be effective on the attitude competency of students. The next analysis is an analysis of knowledge competency. Assessment of knowledge competency using test sheets given before (pretest) and after (posttest) using E-Modules in the learning process. Then the data obtained is processed using the N-Gain equation. Overall, the students' pretest scores obtained an average score of 50.00 and a pretest score of 77.37. The results obtained after the N-Gain test obtained a value of 0.62 which was in the medium category. For classical completeness obtained as a whole has increased which can be seen from the pretest and posttest scores. In the pretest, there were no students who had not achieved classical completeness, while in the posttest of classical completeness students obtained a percentage of 84.21%. From the results of the N-Gain test and classical completeness obtained, it becomes the basis that the E-Modul is said to be Effective on the knowledge competency of students.

Skill competency analysis is obtained using an assessment sheet as long as students work in groups in groups to work on the designed project, starting from the design stage to the group presentation stage in explaining the resulting project. The results of the skills competency assessment analysis can be seen in Table 4 as follows.

Table 4. Results of Student Skill Competency Analysis

No	Aspect	Group Score						Group Final Score					
		1	2	3	4	5	6	1	2	3	4	5	6
1	Papers (15%)	87	83	82	83	83	87	13	12.4	12.3	12.4	12.4	13
2	Implementation (30%)	95	95	80	95	90	100	28.5	28.5	24	28.5	27	30
3	Reporting (20%)	81	81	62	75	68	68	16.5	16.2	12.5	15	13.8	13.8
4	Presentation(15%)	79	79	63	75	77	72	11.9	11.9	9.6	11.2	11.6	10.9
5	Final Product (20%)	87	93	100	93	93	81	17.5	18.8	20	18.8	18.8	16.2
Score								87.4	88.1	78.4	85.9	83.6	83.9
Mean								84.55					

Table 4 shows the results of the analysis of the skills assessment obtained by students in groups. Based on Table 4 shows the average value of the skills of students in groups to get a score of 85.2 which is in the Good category. This shows that the E-Module is said to be effective in the competence of the students' skills and can make students more active with these activities.

3.2 DISCUSSION

Assessment of the effectiveness of using E-Module based on an integrated project based learning model of the Ethno-STEM approach seen from the competence of attitudes, knowledge, and skills. Based on the results of the attitude competency analysis of students, the average attitude competence of students is in the Good category, which indicates that the E-Module is effective on the attitude competence of students. This is in accordance with Azfin and Fauzi's research [18] which states that the use of E-Modules with a STEM approach can improve student attitudes. Then the research of Kuen-Yi [19] also found that the use of project based learning STEM learning can have a positive effect on the attitudes of students in the learning process.

Assessment of the effectiveness of the E-Module on knowledge competence is obtained by using the N-Gain test and students' classical completeness as a whole after using the E-Module in the learning process. The results obtained that the N-Gain test scores are in the medium category and the students' overall classical completeness is above 85%. Based on the results obtained, the E-Module on effective criteria for the knowledge competence of students. The results obtained are in accordance with several studies, namely Annida [20] who concluded that the use of STEM integrated project based learning E-Modules has increased in terms of knowledge before and after students are given treatment. In addition, research from Sumarni and Kardawati [10] suggests that Ethno-STEM project based learning increases students' knowledge after being given treatment. Related to E-Module research, research by Nurul and Fauzi [21] also found research results that E-Modules are useful in the Physics learning process to increase students' knowledge.

Skill competency assessment analysis is taken from project work carried out by students in groups. The results obtained related to the competence of students' skills are in the good category, this shows that the E-Module is effective in the competence of students' skills and can increase the activities of students in learning. The results obtained are also supported by research conducted by Darmin et al [10], Sumarni and Kadarwati [11], Sumarni et al [22] which suggests learning using Ethno-STEM project based learning can improve student skills well and make students more active in learning.

IV. CONCLUSION

Based on the results of research that has been obtained from three competencies, namely; competence of attitudes, knowledge, and skills, it can be concluded that the application of E-Module based on an integrated project based learning approach to the Ethno-STEM approach is said to be effective in the learning process. This is indicated by the acquisition of the attitude and skill competencies of students who are in the good category as well as an increase in the competence of students' knowledge and classical mastery of students after being given treatment which has a percentage above 85%.

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