Development of Mapping Survey Learning Module with Approach the Competency Based Training (CBT)

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Abstract— *This research is motivated by the low student learning outcomes in the survey course so that it has not been able to complete the measurement properly. Some of the factors that cause low student learning outcomes are students tend to not understand the material contained in the learning module because the learning material in the module is not specific. For this reason, researchers feel the need to develop the module. Module development is done by making a system that can integrate individual needs with formation programs skill. The system is Competency Based Training (CBT). The development of modules with the approach is CBT very appropriate to be applied because it is a planned and sustainable effort for the learning process at the Community Academy.*

This research was conducted with research and development (R & D) methods, with the development model Four-D. The procedure for developing Four-D is Define (defining), Design (design), Develop (development) and Disseminate (spread). His research subjects were students of Mining Engineering, Sawahlunto Community Community Academy. Type of data is primary data where data is provided by expert lecturers and students. The instrument for data collection is a questionnaire. The data analysis technique used is descriptive data analysis technique that is describing validity, practicality. For effectiveness, the t-test is done by dividing the class into control and experimental classes.

The results obtained from this development research are as follows: (1). Produce a module with the approach Competency Based Training (CBT) in the Mapping Survey subject. (2) The validity of the module with the approach is Competency Based Training (CBT) declared valid on the material aspects in the module with a total validity value of 83% and in the aspect of the module format it is declared quite valid with a total value of 79%. (3) Modulewith the approach Competency Based Training based (CBT practicality)on the lecturer response is stated to be very practical with a total value of 90% and based on the response of students declared practical with a total score of 85.13%. (4) Effectiveness of the module with this approach Competency Based Training (CBT).declared effective in improving student learning outcomes. Based on the results of this study, it was concluded that the module with the approach was Competency Based Training (CBT) valid, practical and effective to use as a learning media in the Mapping Survey subject.

Keywords— *Learning Module, Learning Outcomes, Validity, Practicality, Effectiveness.*

I. INTRODUCTION

Community Academy is one of the vocational education level colleges that prepares workers who have the skills, knowledge, mindset, and attitude or character that are in accordance with the available study programs. Community Academy is Higher Education managed by local government,

with the hope that the ability and skills of high school / vocational school graduates in the region can be increased so that they can be more independent and able to improve the human capital of the Indonesian people to meet the ideal workforce. One of the Community Academies (AK) in the area is the Sawahlunto Community Community Academy in the city of Sawahlunto. The Sawahlunto Community Community Academy has two study programs, namely Mining Engineering and Heavy Equipment Engineering equivalent to Diploma Two (D2) with a degree of Young Expert (A. Ma). The Sawahlunto Community Community Academy is expected to be able to fill the position of skilled workers in the level of qualifications 3 (Three) and 4 (Four) according to KKNI standards. In accordance with the purpose, type and character of the Sawahlunto Community Community Academy was formed to develop SDA (Natural Resources) in the city of Sawahlunto, namely coal. Therefore, to do coal mining in Sawahlunto skilled workers are needed to help increase the Gross Enrollment Rate (APK) significantly. In addition, the establishment of the Sawahlunto Community Community Academy will also accommodate the people of Sawahlunto at the next level of Higher Education. Education at the Sawahlunto Community Community Academy can be said to be successful if students are able to understand lectures and practice well, so they can achieve the expected learning competencies.

As part of the Sawahlunto Community Community Academy in the Mining Engineering study program, researchers have the responsibility to improve the competence of graduates of the Sawahlunto Public Community Academy. There are four graduate competencies, namely Survey and Mapping, Underground Mine, Blasting and Drilling. To achieve one of these competencies, the curriculum made by the Sawahlunto Community Community Academy is described in the form of learning tools obtained during the education level at the Community Academy in accordance with the group of learning devices in each competency. For Survey and Mapping competencies, there are two expertise courses, namely the Mapping Survey subject and the Mine Measurement Science course. Mapping Survey is a course that forms Survey and Map skills, is able to retrieve measurement data and is able to map it on a flat plane. A person who is said to have competence in the field of Survey and Mapping is usually referred to as Surveyor. Surveyors are very much needed by coal mining companies.

Based on the results of observations with one of the Head of Mining Engineering on July 2, 2018, information was obtained that the surveyor was needed for the continuity of mining, without the mining surveyor the process could not be carried out or continued. So that students can be absorbed or accepted in mining companies so students must have good Survey and Mapping competencies in order to be able to work as a Surveyor. Creating a surveyor is not easy, because a surveyor must have material understanding and good practice skills.

In fact, based on the observations of researchers from the learning outcomes for the achievement of competencies in the Student Mapping Survey class of 2015, 2016 and 2017 it is still not optimal because most students are not yet skilled and have mastered competence well. This can be seen from the raw data of the learning outcomes of the Mapping Survey, namely the 2015 class students obtained a score of less than 65 around 65.38%, 53.84% for the 2016 class, and 60.86% for the 2017 class. 1.1.

TABLE 1.1. Learning Outcomes 2015, 2016, and 2017 class Student mapping survey courses

No	Force	Total Student	Completion			
			Score <65		Value ≥ 65	
			Total	Percentage %	Total	Percentage %
1	2015	26	17	65.38%	9	34.61%
2	2016	27	14	53, 84%	12	46%
3	2017	23	14	60.86%	9	39.13%

Source: Report on Learning Outcomes Survey mapping courses at the sawahlunto public community academy

Based on the above data, it can be concluded that the learning outcomes of the Mapping Survey subjects are still low. The low student learning outcomes in the enlightenment of competencies in this course will affect the creation of skilled surveyors, so that products from the Sawahlunto Community Academy in fulfilling the gross enrollment rates for skilled workers in Survey and Mapping are still far from expectations. From the results of the researchers' analysis, the factors that caused the low achievement of competency skills were the lack of a maximum learning process in the Mapping Survey subject.

The results of observations and interviews with educators at the Sawahlunto Community Academy on July 5, 2018, obtained information that the lecture / learning process at the Sawahlunto Community Academy was still relatively simple because students only relied on material explanations from lecturers and procedural learning tools. One of the AK educators said that in the learning device there is a learning module with limited material coverage, not yet adjusted to the background of the Community Academy students, and in the module used there is no purpose for student learning activities and independent learning practice questions. Learning tools contained in the Community Academy are as a guide for lecturers who teach courses in the delivery of lectures in theory and practice. Students are only given part of the topic of discussion that will be studied in the classroom because the learning device cannot be a guide for students in learning.

Interviews were also conducted with several students who had finished the Mapping Survey lecture, which was based on the delivery of students. It can be concluded that in the learning process students experienced difficulties in understanding the material contained in the modules used so far due to the limited learning modules provided by lecturers, so that they having difficulties when studying independently both in class and at home. The limitations of teaching material in the learning modules given by lecturers are caused by learning tools available on the AK campus.

In this study, the problem arose from the researchers found in the Sawahlunto Community Academy, which is related to the learning module. Learning modules according to [1] are a teaching package that has one unit concept of learning material. Teaching using modules is an individual teaching effort that allows students to master a unit of learning material before proceeding to the next unit. According to [2] "Learning modules are teaching materials that are arranged in a systematic and interesting way that includes the contents of the material, methods and evaluations that can be used independently to achieve the expected competencies". The advantages obtained in applying the module according to [3] are: (1) Increasing students' motivation, because every time they do a lesson assignments that are limited to clear and appropriate abilities; (2) After the evaluation process, educators and students can analyze module material that has been completed well; (3) Learning materials are more evenly distributed in one semester; (4) Education is more efficient, because learning materials are arranged according to academic levels.

The development of learning modules is beneficial for students to achieve certain competencies, because the learning module can help students obtain information about the material learned through independent and systematic learning activities. The development of the right learning module can create skills in achieving student competence at the Sawahlunto Community Academy. Module development at the Sawahlunto Community Academy is tailored to the educational background of students who will study at the Community Academy. The module developed will also be adapted to the curriculum according to the competency achievements set by the Sawahlunto Community Academy in the Mapping Survey course, which is to create competent students as well as the creation of a worker at a training institution that is ready to work. So, to achieve this, module development can be done by creating a system that can integrate individual needs with formation programs skill. The system in question is Competency Based Training (CBT). CBT is a vocational training approach which is not only oriented towards graduate outcomes, but also focuses on the training process itself and refers to certain industry standards. [4] states that with industry standards being the basis of the curriculum, assessment materials and lessons designed and developed, the CBT program will be appropriately applied. CBT can be measured by a list of competencies, assessment of achievement of competencies, use of modules, assessment based on work results, and assessment of learning outcomes. According to [5] "CBT is a system of training which is geared

toward specific outcome". CBT must produce products that improve performance and skills in accordance with the standard system and work processes.

The approach applied to Competency Based Training (CBT) is not only in the form of training, but also includes behavioral learning theories found in the objectives of the training which will be used as references and the results can be measured later after the training ends [5]. In other words, the development of the Mapping Survey learning module with the approach Competency Based Training (CBT) for the Sawahlunto Public Community Academy is very suitable to be applied because it is a planned and sustainable effort for Survey and Mapping learning which will be applied to D2-Mining Engineering students at the Sawahlunto Community Academy for improvement of skills according to the background and purpose of establishing the Community Academy itself. Then, with the background of several issues above the researcher will conduct research under the title "Development of Mapping Survey Learning Module withApproach for the Competency Based Training (CBT) PDD Academy of Community Sawahlunto Mining Engineering Study Program".

II. RESEARCH METHOD

This Research is research *and development*, also known as R & D research. R & D research is a research process used to develop a product that already exists and perfects it. [6] States that development research is the steps to develop the product and validate the educational product. Whereas according to [7] development research is a method used by researchers to get a result of a particular product, then testing the effectiveness of the product being tested. Based on the definitions of several experts, it can be interpreted that development research (R & D) is a process used for product development and validation of products developed, then the results of these products are tested for practicality and effectiveness so that they are suitable for use in the world of education. In this development research the product that will be developed is a learning module based on *Competency Based Training (CBT)* mapping in the mapping survey course.

Product development model the research used in this study is a 4-D development model. The 4-D development model was developed by [8] which has four stages of development namely *Define, Design Develop, Disseminate*. The steps of the design development of the mapping survey module as follows:

1. Phase definition (Define)

At the stage of defining the terms of the determination to do the learning, according to [9] the definition phase consists of: (1) Front Line Analysis is to determine the fundamental problems faced by the lecturer in the learning process, in analyzing the front lines, consideration of various alternatives for the development of learning modules is needed; (2) Student Analysis is needed to study students, by identifying the background and characteristics of students in accordance with the learning module which will later be developed; (3) Task and Concept Analysis, which is a set of procedures needed to determine the contents of a detailed learning module

according to learning material; (4) Objective Analysis is to formulate the learning objectives to be achieved by students.

2. Design Phase (Design)

The results of the defining stage will be used at the design stage. The design phase aims to design the development of the Mapping Survey module through the approach Competency based Training (CBT). The development of this module will be designed with a number of things as follows:

a. Selection of the format, suitability of the material with the syllabus
b. Module designed, arranged according to the demands of the Mapping Survey syllabus.
c. How to present material that is influential in the development of learning modules Mapping Survey.

3. Development Phase (develop)

The development phase aims to produce modules that are valid, practical, and effective. At this stage the following actions will be carried out:

a. Validation phase

Before being used, the module is validated first by the expert. The validity variables used are content validity, language construct and appearance. The purpose of module validity is to determine whether the product functions based on material criteria, construction, and compliance. Validation is said to be complete, if the validator declares valid for the module to be used, so that the module is ready to be tested. The input submitted by the validator is used to improve and revise the module developed. Validation activities are usually carried out by filling out the module validation sheet to produce valid modules according to experts.

b. Pacticality stage

Practicality namely the level of use of the survey module by lecturers and students, namely by implementing the learning process using modules that have been revised based on the assessment by the validator. Practicality is obtained based on the results of data analysis and observation of the lecture process using modules that are declared valid by the validator. The practicality stage aims to determine the level of ease, time efficiency and the benefits of using the survey learning module. The practicality of the module is assessed by the lecturer using a questionnaire. The lecturer provides an assessment of the module and can assist the lecturer in the learning process. The results of this questionnaire are used as a basis for making improvements to the modules that will be developed.

c. Effectiveness stage

After the module is declared practical, then it is to evaluate whether the mapping survey module created using the approach Competency Bed Training can be used effectively in learning activities. The aspect of effectiveness observed is student learning activities and student learning outcomes when using the developed module.

If the module to be developed has not met the criteria of valid, practical, and effective, then a revision of the criteria that are considered to be less is done. We will use the results of the revision as an improvement to the module developed.

d. Deployment phase (Disseminate)

Deployment stage is the final stage of the model development stage module with Four-D. After being validated and practically tested and effective in the experimental class, a valid, practical, and effective survey module for the survey was then carried out on a limited scale deployment process.

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III. RESEARCH RESULT & DISCUSSION

Presentation of Data Analysis

In this section all data collected from each stage of the development of the survey learning module with the approach are presented Competency Based Training (CBT).

1. Data Analysis Test Validity of Learning Modules Survey Mapping with Approach CBT

The results of the assessment of each aspect given by the validator were analyzed using the statistical formula Aiken's V. The results obtained were validation values for the development of the products produced.

The results of the analysis of the validity test to the module format experts obtained an average aspect given by validator 1 of 0.76> 0.667 then the learning module is included in the Valid category. Then the results of the validation given by validator 2 are 0.85> 0.667 so the learning module is included in the valid category. Furthermore, the average aspect given by validator 3 is 0.78> 0.667 so the learning module is included in the valid category.

The results of the analysis of the validity test to the module material experts obtained an average aspect given validator 1 of 0.83> 0.667 then the learning module is included in the Valid category. Then the results of the validation given by validator 2 are 0.83> 0.667 so the learning module is included in the Valid category. Furthermore, the average aspect given by validator 3 is 0.84> 0.667, then the learning module is included in the Valid category.

2. Practicality Test Data Analysis Learning Module Mapping Survey with Approach CBT

a. Lecturer Response to Practicality Learning Module is

Results the analysis obtained the average practical test results of the mapping survey learning module with the approach Competency Based Training (CBT) according to the lecturers of the relevant subjects, namely 90% with very practical interpretations.

b. Student Response to Practicality of Learning Modules Survey Mapping with Approach CBT

The results of the analysis obtained the results of practical test mapping survey approach with Competency Based Training (CBT) according to students is 85.13% with practical interpretations.

3. Data Analysis of Learning Module Effectiveness Test Mapping Survey with Approach The CBT

Effectiveness of using survey learning modules with the approach is Competency Based Training (CBT) reviewed by

calculating the experimental class data and the control classes pretest and posttest using paired sample t test

Hypothesis testing is done by analysis of paired t test (paired sample test) using SPSS. The decision criterion is if the value of t count> t table, then the proposed hypothesis is accepted. Based on the test, the value of tcount is 3.770 with ttable 2.073, because tcount> ttable (3.770> 2.073), so it can be concluded that the proposed hypothesis is accepted. This is reinforced by a significance value of 0.003 (0.003 <0.05) meaning that there are significant differences in the learning outcomes of the experimental and control class students at the stage posttest. So that it can be concluded that giving treatment to the experimental class in the form of a survey learning module with the approach Competency Based Training (CBT) to the mining engineering study program PDD Academy of Community Sawahlunto is successfully implemented.

IV. CONCLUSION

A Based on the research findings of the development of a survey learning module with the approach Competency Based Training (CBT), the following conclusions are obtained:

1. The mapping learning module with approach Competency Based Training (CBT) has been developed, which is generated inform hardcopy.
2. The survey learning module with the approach Competency Based Training (CBT) developed has been validly used in the course Mapping Survey at the Sawahlunto Community Academy.
3. The mapping survey learning module with the approach Competency Based Training (CBT) developed has been very practical to use in the course Mapping Survey at the Sawahlunto Community Academy.
4. The mapping survey learning module with the approach Competency Based Training (CBT) developed has been effectively used in the course Mapping Survey at the Sawahlunto Community Academy.

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