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The Implementation of The Employability Skills Modules in a Computer and Network Engineering Expertise Program

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Abstract

A Vocational High School (VHS) is an institution that aims to prepare students to be ready for work. Therefore, the graduates must have employability skills. The purpose of this research was to find out the effectiveness of applying steam-PjBL approach-based employability skill modules to Computer and Network Engineering (CNE) skills competencies. This research took a sample of 36 students of class X majoring in CNE at Ngraho Public VHS. This research and development employed the ADDIE model, which consists of five stages: (1) Analysis; (2) Design; (3) Development; (4) Implementation; and (5) Evaluation. The research stages included conducting observations, validating research instruments by experts, and conducting trials by distributing pretest and posttest questionnaires to experimental and control classes to find out any different learning outcomes. The analysis technique was carried out using the IBM SPSS Statistics 25. The results of the feasibility test showed that the module was very suitable for use and was considered valid with revisions; the results of the practicality test showed that the modules were very practical; and the results of the effectiveness test showed that the modules were quite effective to be used to train cooperation, communication, problem-solving, and adaptability skills.

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INTRODUCTION

Education is a conscious effort to be carried out to broaden knowledge. Before a learning process begins, (educators and learners) have to be aware in advance of the goals to be achieved. Therefore, at the end of the learning process, the levels of achievement can be measured. The impact of a learning process can be a change in attitudes, behaviors, habits, and increased levels of intelligence.

The government provides a platform for people to get education according to their ages and needs. One type of secondary education is Vocational High School (SMK). SMK aims to prepare students to be ready for work. The curriculum used is designed in such a way to meet the needs of a particular industry.

The development of science and technology requires the world of education to synchronize curriculums periodically so that materials taught are expected to meet the needs of modern industry. Before getting graduates ready to jump into an industry, the school as the learning platform must develop strategies that make learning activities able to hone their employability skills (job skills).

Knowledge gained during the education period of 3-4 years in vocational school is expected to shape graduates with employability skills. This attitude can be realized skillfully in his field, independent spirit, has a working character while having an entrepreneurial mentality. An entrepreneurial mentality can be developed if previously trained to solve problems, cultivate a creative and innovative mindset, and withstand challenging conditions.

Students need fun learning methods and resources to hone creativity, encourage them to innovate, teach to work together, demand to adapt quickly, and utilize technology. Teachers must continuously learn so that the materials delivered are always relevant to the current time. Therefore, the school must provide the facilities and infrastructure to meet the goals.

One of the methods that can be implemented in teaching materials to train students' employability skills is by employing a *Project-Based Learning* (PjBL) approach or project-based learning. With the approach, students work in groups to complete projects. They will be trained to work together to solve problems, communicate, express opinions, create, adapt to the environment, and utilize technology.

Their success in completing a project using the PjBL approach has to be accompanied by continuous learning skills. Students have to be trained to have broad insights since they are expected to solve a problem quickly when they encounter one. The point of view of knowledge has to be expanded and should not only focus on one particular field. Therefore, this project-based learning must be juxtaposed with other approaches to train students to improve critical thinking skills.

The stimulation can be used by applying the STEAM (*Science Technology Engineering Art and Mathematics*) approach in the learning process. The stimulation can stimulate a systematic mindset ranging from observing, asking, predicting, researching, and discussing, which develops a thinking framework and recognizes problems to find solutions to solve problems (Sari and Maulani, 2019).

According to Herro, D. (2016), in his research entitled *Exploring teachers' perceptions of STEAM teaching through professional development: implications for teacher educators,* teachers consider teaching using the STEAM approach as a practical first step to change the practice on the grounds of the importance of integrated technological collaboration in the learning process. The implications in this study offer teachers to develop STEAM approaches to influence outcomes in the learning process.

The collaboration between STEAM and PjBL is expected to make students accustomed to involving critical thinking based on science and technology to solve a problem. Thus, the resulting product will have a high selling value, be acceptable to the market, be innovative, and competitive. If this can be obtained, it can be said that students have developed their employability skills, making them able to have competitiveness in the job market upon graduation.

The utilization of instructional media can create learning conditions, as aforementioned. Using instructional media, the expected goals of

learning activities become more targeted and focused. Media can be a means of connecting teachers and students. Concerning that condition, this study implemented an *employability skills* module based on the STEAM-PjBL approach. The module was developed for students majoring in Computer and Network Engineering (TKJ) in C2 subjects (Basic Program Expertise), namely Basic Graphic Design (DDG).

The purpose of this study was to test the effectiveness of using the STEAM-PjBL approach-based *employability skills* module to develop *students' employability skill*s through one of its characteristics, namely increased creativity.

By implementing *employability skills* module built with a STEAM-PjBL-based approach, vocational graduates are expected to compete in the job market. The learning implementation with this approach is believed to make students accustomed to practicing their employability. Not only are the graduates' job skills likely to attract companies to use their energy, but they are also able to help them survive in their positions with their creativity, innovation, adaptability, problem-solving skills, and abilities to use technology honed during school.

METHOD

The method employed in this research is a quasi-experiment method of the *pretest-posttest* research type using *simple random sampling* where each member of the population has an equal opportunity to become a sample. The subject groups conducted a pretest, were subjected to treatment, and then given a posttest to measure learning outcomes.

This study used one experimental class: class X majoring in Computer and Network Engineering at SMK Neger Ngraho Bojonegoro East Java Odd Semester of The Academic Year 2021/ 2022.

The data collection methods used were observations and tests. Observations were conducted to determine the students' activeness when learning in groups. In addition, tests were carried out as a reference to discover the student learning outcomes. The tests questions were developed using creative thinking indicators, project assessment rubrics, and product assessment sheets.

The *pretest* and *posttest* used the same test instrument. Once validated, observations were carried out in the experimental and control classes. Students were given the *pretest* to find out their initial abilities. Then, the steam-PjBL approach-based employability skills module was implemented in the experimental class. After the learning session ended, the students did the *posttest.*

After the research was complete, data were obtained in the form of media feasibility test data, media practicality test data, and *pretest* and *posttest* results data to test the effectiveness of student learning outcomes. The following Table 1.1, Table 1.2, Table 1.3 present a grid of *pretest* and *posttest* questions to measure students' creative thinking abilities, project assessment guidelines, and product assessment guidelines.

Table 1.1 *Pretest* and *Posttest* Question Grid

No.	Aspects	Problem Level			Sum
		C4	C5	C6	
1	Fluency (thinking smoothly)	6, 7		12	3
2	Flexibility (flexible thinking)	1, 8, 9			3
3	Originality (thinking originality)	2, 4		11, 13	4
4	Elaboration (decomposition)	3, 10	5	14	4
Total					14

Table 1.2 Project Assessment Guideline Grid

No.	Assessment Component	Score	
		Maximum	Obtained
1	Title(s)	2	
2	Objective(s)	3	
3	Basic Theory(ies)	15	
4	Tools and Materials	5	
5	Working Procedure(s)	10	
6	Observation Data	10	
7	Discussions	25	
8	Conclusion(s)	10	
9	Bibliography(ies)	5	
10	Question Answers	10	
11	Interim Report(s)	5	
Total Value		100	

Table 1.3 Product Assessment Guideline Grid

No.	Aspects	Criterion			
		Very good (4)	Good (3)	Good enough (2)	Less Good (1)
1	Science				
2	Technology				
3	Engineering				
4	Arts				
5	Mathematics				

The data obtained were then analyzed and processed to determine how far the students' creative thinking has improved using the T-test with the IBM SPSS *Statistics 25 software.*

Research Activities in the Experimental Class

The research was conducted over six weeks using vector image processing software materials, vector image manipulation with effect features, and the creation of vector image-based designs. The research stages conducted in the experimental class are as follows:

In the first week of research, the activity started with spreading the *pretest* questions. The use of this module was under the teacher's supervision. The class went in an orderly manner; the teacher discussed the materials in the module; if there was still something that was not yet understood, students could ask questions. At the end of the lesson, students did exercises to measure their understanding.

In the second week of research, students studied materials regarding vector image processing using effect features. Learning was done in a computer laboratory. Students could open the Corel DRAW software and practice the examples in the module, from using tools in Corel DRAW, creating basic shapes, to drawing with effect features.

In the third week, students continued practice activities by re-practicing the previously given materials. At the end of the lesson, students were given assignments in groups. The formation of the groups was carried out by the teacher with an even distribution between students who were sufficiently capable, moderate, and high based on the observations on the practice in the last two weeks. Each group consisted of 3 students.

In the fourth week, students were no longer in the practice room. They were to do observations in the neighborhood around school or home. Observations were done to obtain data about MSMEs that would be used as targets to create a logo for each. The things students needed to know before creating a logo were poured into the observation sheet in the module.

In the fifth week, the students were back in the practice room. They began to design the logo for their chosen MSMEs using Corel DRAW.

In the sixth week, the product was finished and presented to the teacher. The teacher gave comments and completed the project assessment and product assessment sheets. Lastly, the students did the *posttest.*

Research Activities in the Control Class

Learning done in the control class began with the *pretest.* Learning was conducted conventionally, as usual, using a limited number of school books, one book for 2-3 students. The students first read the material, followed by the teacher giving explanations. Then, the students worked on exercises. Practice activities were carried out in the third week. The students practiced using Corel DRAW, following the stages provided by the teacher. Lastly, they were assigned to create designs as their wishes with a defined theme. At the end of the lesson, the *posttest* was conducted.

Employability Skills Module

The module could be accessed by printing it out or opening the e-book through a computer or gadget. Here are the module overviews:

Figure 1.1 Front Cover Picture 1.2

Rear Cover

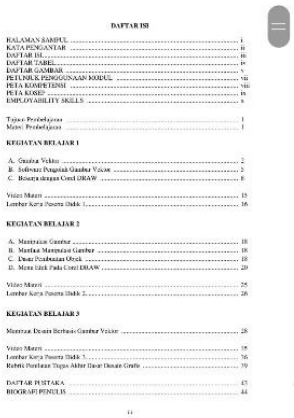
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Figure 1.3 Table of Contents Of Drawing Module 1.4 Competency Map

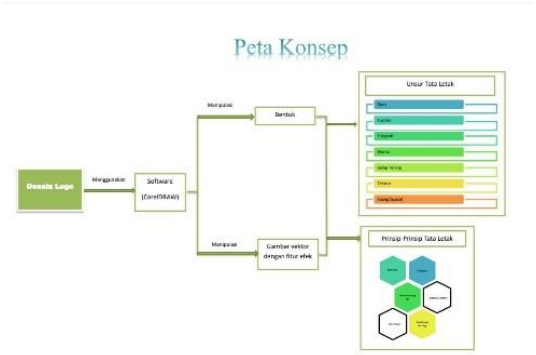
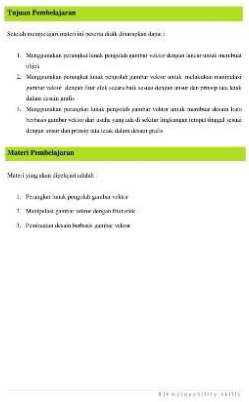


Figure 1.5 Concept Map



1.6 Purposes and Materials

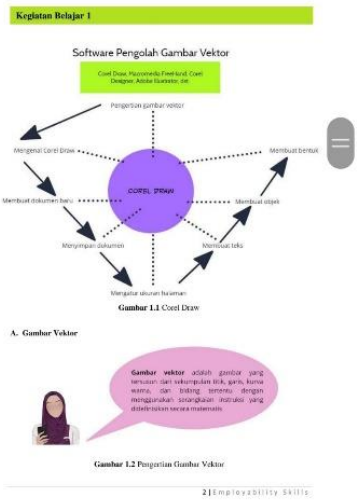
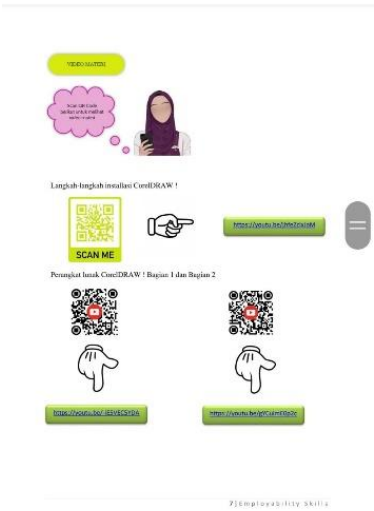


Figure 1.7 Presentation of Pictorial Material



1.8 Learning Video Link

RESULTS AND DISCUSSIONS

After the research was conducted, media feasibility test data, media practicality test data, and *pretest* and *posttest* results data were obtained to test the effectiveness of student learning outcomes.

Media Expert Feasibility Test

According to the data calculation, the responses of Media Experts acquired an average score of 4.49, which fell under a very decent category. Based on the Media Experts' assessment results, the module was said to be very feasible for use. Here are the results.

Table 1.4 Overall Suspension Data on Every Aspect of the Validator

No.	Aspects	Media Expert 1	Media Expert 2	Material Expert 1	Material Expert 2	Material Expert 3	Average	Category
1	Graphic eligibility	4.19	4.79	-	-	-	4.49	Very Worthy
2	*Self-Instruction*	-	-	4.33	4.5	4.5	4.44	Very Worthy
3	*Self-Contained*	-	-	4.75	4.58	4.75	4.69	Very Worthy
4	*Stand Alone*	-	-	4.5	4.5	4	4.33	Very Worthy
5	*Adaptive*	-	-	5	5	5	5	Very Worthy
6	*User Friendly*	-	-	5	5	5	5	Very Worthy
$\bar{x}$ Average Overall Expert Response Score							4.66	Very Worthy

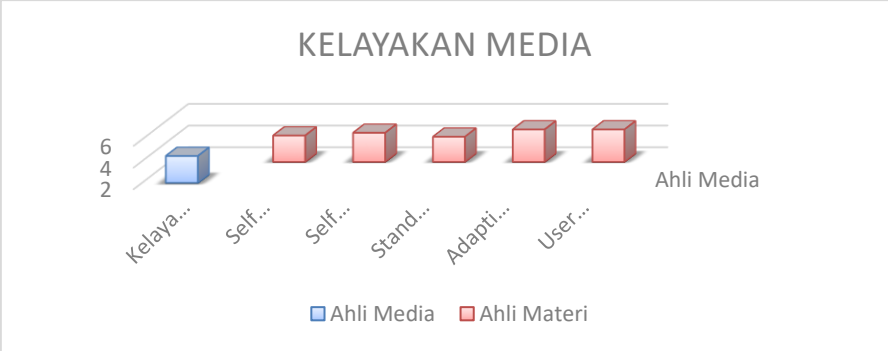


Figure 1.9 Media Feasibility Test Results

Practicality Test

The practicality test of the module was carried out by distributing a questionnaire to teachers and students. A practicality questionnaire was given to three teachers and some of the students majoring in TKJ.

Table 1. 5 Practicality Test Analysis Data by Teachers and Students

No.	Response Indicator	Average Validator		Average	Category
		Teacher	Student		
1	Interest	100%	81,25%	90%	Very Practical
2	Material	88%	96%	92%	Very Practical
3	Language	86%	91%	88%	Very Practical
4	Competence	91%	93%	92%	Very Practical
$\bar{x}$ Average Overall User Score				90%	Very Practical

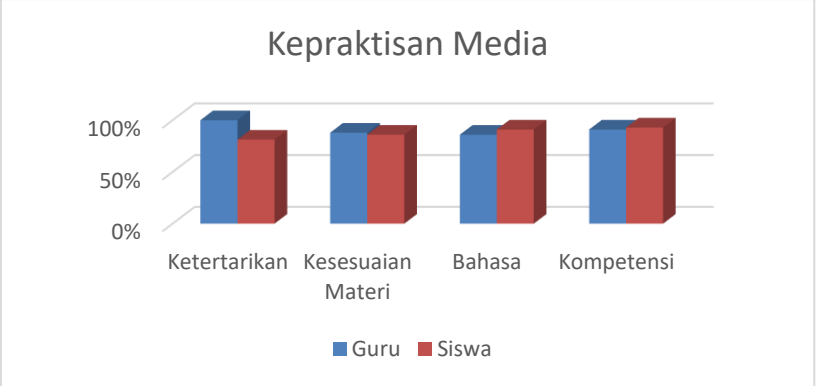


Figure 1.10 Media Practicality Test Results

Based on Table 1.5, the results obtained with the average score of the practicality test is 90%. Then, it can be inferred that the module product developed was very practical for teachers and students.

Effectiveness Test

Table 1. 6 N-Gain Score Tests for Module Effectiveness

No.	Experiment Class	No.	Control Class
	N-Gain Score (%)		*N-Gain Score (%)*
Average	70.25	Average	46.9
Minimal	42.86	Minimal	4.76
Maximum	95	Maximum	82.61

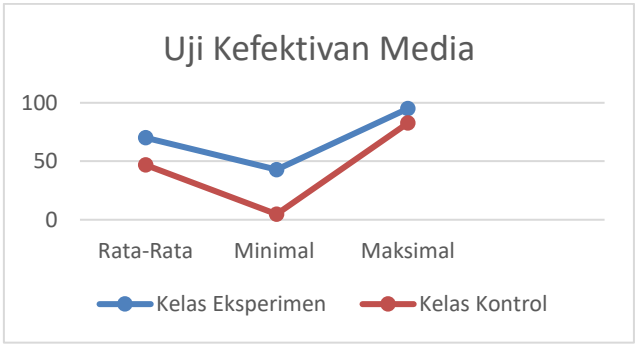


Figure 1.11 Media Effectiveness Test Results

Based on the interpretation of the effectiveness of the N-Gain score obtained, it can be said that the implementation of the *employability skills* module based on the STEAM-PjBL approach was effective enough to increase students' creativity. While in conventional methods, the N-Gain score obtained is 46.9%, which signifies the lack of effectiveness, therefore not applicable to increase students' creativity. There is a significant difference in the average score between the experimental and control classes at 23.35%.

Table 1. 6 T-test results in experimental class and control class

		Levene's Test for Equality of Variances		T-test for Equality of Means			
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference
N-Gain Percent	Equal Variences assumed	3.554	0.064	-8.22	68	0.000	-19.36

Source**:** Calculation Results (2022)

The independent sample test results with the average N-Gain score on the table show that the N-Gain Percent data has a Sig. (2-tailed) 0.000 (smaller than the significance level of 0.05), meaning the N-Gain Percent data in the study was effectively and significantly distributed.

Adriyawati, et al. (2020), in their research entitled *STEAM-Project Based Learning Integration to Improve Elementary School Student's Scientific Literacy on Alternative Energy Learning,* concluded that the integration of STEAM-PjBL into science learning encouraged students to be able to see relevant knowledge of phenomena in everyday life, develop curiosity and problem-solving skills and increase the courage to ask questions and explore various sources of information.

Annisa R, et al. (2018), in their research entitled *Improving Students' Creative Thinking Skills by Using STEAM-Based Project Based Learning Model on Acid and Alkaline Materials at SMAN 11 Jambi,* concluded that there was a significant difference between students' thinking skills with the use of project-based learning model on acidic and alkaline materials at SMAN 11 Jambi.

According to Sunardi and Hasanudik (2019) in their research entitled *Employability Skills Development of Vocational Students Through STEM-Project Based Learning,* project-based learning is a learning model that is appropriate to be applied to vocational education. They believed that student competence, both employability skills and hard skills that would meet the needs of the job market, could be achieved with this learning method as it combines competency-based learning and production-based learning.

Based on the research conducted by Ismayani, A. (2016) entitled *The Effect of STEM Project-Based Learning* Implementation on Mathematical Creativity of Vocational Students, it was stated that the implementation of STEAM *Project-Based Learning* in Mathematics learning in vocational school was highly recommended. Based on the initial ability level – KAM (high, medium, low), it indicated that the increase in the ability was at high and medium levels at all KAM levels. While from the aspect of creative attitude, after STEM Project-Based Learning was conducted, the creative attitude of the students was considered generally well.

Concerning the studies' results as mentioned above, this study proves that the STEAM-PjBL-based approach can train cooperation, communication, problem-solving, and adaptability skills. Implementing the STEAM-PjBL approach can familiarize the students with critical, creative, innovative, collaborative thinking but still be responsible. The following is some documentation of the students' activities during the research.

The module was handed out in the experimental class at the first meeting. After the pretest was done to determine the initial ability, the students began to study the module.

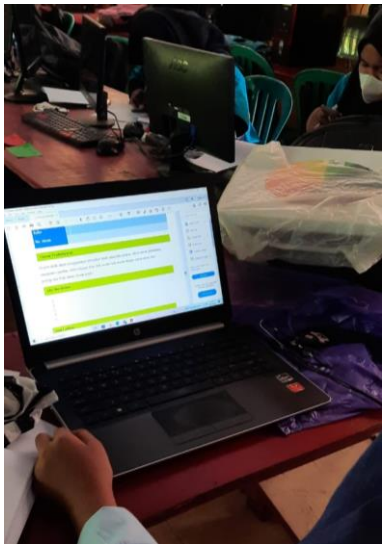


Figure 1.12 Studying the module

At the third meeting, the students began to practice using vector image processing software, as shown in the following picture:

Figure 1.12 Designing logos

In the sixth week, the logo design results by the students in groups can be seen in the following images:

Figure 1.13 Logo Design Results

CONCLUSION

The module provides a means of developing employability skills by presenting a form of learning that hones character development by doing assessments on the students' learning process. The assessment was outlined in the project assessment sheet and product assessment sheet. The development of the STEAM-PjBL approach-based *employability skills* module was considered feasible on all aspects of learning media development and was declared valid with revision. The practical aspects of the module were stated to be very practical for use by teachers and students. In terms of the

effectiveness of media use, the module was declared quite effective.

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