The Implementation of Project-Based Learning in Productive Skill Programs for the Development of 21st Century Vocational School Students

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The Implementation of Project-Based Learning in Productive Skill Programs for the Development of 21st Century Vocational School Students

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Abstract

The learning process of productive vocational programs has a strategic role in nurturing 21st century skills through the planning and implementation of the intensive project-based learning model. Of the four aspects of skills (communicative, collaborative, critical thinking- problem solving, and creative- innovative), there are 15 indicators of 21st century skills that can be developed. The purpose of this study is to design a project-based learning model and measure the results of its application to productive programs in vocational schools in developing the 21st century skills indicators. The results showed that 10 indicators of the 21st century skills have been able to develop well. On the other hand, five skills indicators experienced under development. The five indicators were: (1) multimedia communication (communication); (2) personal flexibility in the workplace (collaboration);(3) analytical thinking skills and critical thinking and problem solving ; (4) attempting to solve the problems; and (5) being open and responsive to new and different perspectives. The teachers of the productive programs on the vocational school program need to be more intensive in planning and implementing the project-based learning model regarding the five indicators, so that it can develop well.

Keywords: *project-based learning*, productive vocational school programs, 21st century skills.

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1. Introduction

1.1. Background

The 2013 curriculum policy categorizes the structure of vocational school subjects into three groups: group A (normative), B (adaptive), and C (productive) subjects. The three subject groups have different characteristics in the implementation of learning. Specifically in the productive subject group, its characteristics are to nurture productive skills of the students through learning by doing activities in the form of making / producing goods

and / or services in accordance with business / industry standards. This characteristic has implications for models of learning that is consistent with the learning characteristics of productive program.

Empirically there are several learning models that correspond with the characteristics of productive program learning process: problem-based learning, production-based learning, and project-based learning. Those three learning models have a flow and rhythm that can develop the productive skills. The problem-based learning develops the formulation of problems in productive activities. As a consequence, the students can formulate the steps for solving them. Product -based learning provides guidance for the students to produce goods and / or services based on the tasks assigned by the teacher. In addition, the project – based learning in productive programs requires students (generally in groups) to analyze needs, plan project activities, carry out project activities, and formulate results and communicate results.

Based on the description above, the project-based learning model has a comprehensive plot and rhythm, especially in providing learning experiences for the students. Therefore, the application of project-based learning in productive program has a strategic role to the development of 21st century skills (communication, collaboration, critical thinking, and creativity).

1.2. The purpose of the study

The purposes of the study are formulated as follows:

1. Designing and implementing project-based learning model in productive programs at vocational schools;

2. Analyzing the results of the application of the project-based learning model in vocational productive programs for the development of 21st century skills (communication, collaboration, critical thinking, and creativity).

2. The Method of the Study

2.1. Research design

This study employed the experimental method with direct design implementation (one-shot case study). The design of the project-based learning model was validated by experts (expert judgment). The teacher of the productive program on the vocational

school was involved as the model validator. The hypothetically generated model described as a model that can be implemented. Design model of the project-based learning whose core activities of learning process used the syntax that has been validated was implemented in the classroom by teachers at the productive program, program Automotive Engineering, and Marketing department at the vocational schools.

2.2. The subject of the study

This study was conducted in Semarang. This study employed purposive sampling. Furthermore, this study involved the vocational school at field of engineering and technology, Automotive Engineering program, and the vocational school at field of business and management, the marketing program.

2.3. Data collection and analysis techniques

The data collection of this study were carried out using the observation technique carried out by productive program teachers on students' attitudes and behavior during the learning process based on 21st century skills indicators (collaboration, communication, critical thinking, and creative), which were then translated into 15 indicators. The data collection instrument employed an attitude scale (four scales), modifying the Likert. Data analysis was carried out descriptively for each indicator based on the observation.

3. Results and Discussion

3.1. The project-based learning model design for productive programs

The design of the project-based learning model of productive programs for Automotive Engineering and Marketing expertise program on the vocational schools has been produced and validated. The design of the learning process was outlined in the lesson plan by applying the project-based learning model. The core activities involved the syntax as follows: (a) determining the fundamental question *(start with the essential question);* (b) designing the project planning; (c) creating the schedule; (d) monitoring learners and the progress of the project; (e) assessing the outcome; and (f) evaluating the experience.

3.2. Development of 4 C skills in all programs

Two programs were involved in the trial for the implementation of the project-based learning model: the automotive engineering program with a total of 68 students, and the marketing program with a total of 36 students. The teacher of the productive program with the following results performed the evaluation of the project-based learning models implementation for the development of the 4C proficiency indicators (communication, collaboration, critical thinking, and creative and innovation):

Based on the data in table 1, it can be explained as follows:

1. For the aspect of communication skills, indicators of communication in the use of multimedia has not developed maximally, there are 10% less good .

2. For the indicators of personal responsibility and flexibility in the workplace, in the aspect of collaboration has not developed optimally, there are 6% less development .

3. The ability to gather and present, analyze, and solve problems is 4%. It is less well developed;

4. The ability to solve the problems has not been developed optimally, there are 4 % of this indicator which is less well developed.

5. being open and responsive to new and different perspectives has not yet developed maximally, there are 6 % of this indicator which is less well developed.

Based on the data above it was found that in every aspect of 21st century learning skills (*communication, collaboration, critical thinking, and creative and innovation*) there are still indicators that are not well developed, meaning that there were obstacles in its development.

3.3. The development of 4C skills in the automotive engineering program

The results of the implementation of *project-based learning* to the development of 4C at the Automotive Engineering program can be seen as follows:

At the automotive engineering program, these following indicators were not developed maximally: communication in form and content through the use of multimedia 17.2%; personal responsibility and personal flexibility, at work 2.9%; and being open and responsive to new and different things 5.7%. The development of the aspects

TABLE 1: The Development of 4C skills in all Expertise Programs.

No. /Aspect	Indicator	Results in percentage (%)			
		4	3	2	1
1 *Communication* (communication)	**Students are able to understand, manage, and create effective communication in these following various forms and content:**				
	1. oral	33	67	-	-
	2. writing	36	64	-	-
	3. multimedia	22	68	10	-
2 *Collaboration* (collaboration)	1. able to cooperate in groups and leadership;	22	78	-	-
	2. respect the different perspective of in the environment;	18	82	-	-
	3. able to adapt in various roles and responsibilities;	16	84	-	-
	4. work productively with others;	23	77	-	-
	5. has empathy (care / attention) in place;	16	84	-	-
	6. are able to perform personal responsibility and flexibility in personal, workplace, and public relations;	13	81	6	-
3 *Critical thinking and problem solving* (critical thinking and problem solving)	1. can provide reasonable reasoning in understanding and making complicated choices;	25	75	-	-
	2. have the ability to collect and present, analyze, and solve problems;	17	79	4	-
	3. use their capabilities to try to solve the problems they face independently;	22	74	4	-
	4. understand interconnection between systems (interconnection between several fields / parts);	15	85	-	-
4 *Creativity and innovation* (creativity and innovation)	1. learners have the ability to develop, implement, and provide novel ideas to the other;	16	84	-	-
	2. be open and responsive to new and different perspectives.	17	7 7	6	-

Score information: 4: very good ; 3 : good ; 2 : moderate ; and 1: poor .

of critical thinking and problem solving did not experience obstacles. Those aspects developed well.

3.4. Development of 4 C skills in the marketing expertise program

The results of the implementation of project-based learning on the development of 4 C skills in the marketing expertise program can be seen on this following table:

TABLE 2: Development of skills 4 C in the Automotive Engineering Expertise Program.

No. /Aspect	Indicator	Results in percentage (%)			
		4	3	2	1
1 *Communication* (communication)	**Students are able to understand, manage, and create effective communication in these following various forms and content:**				
	1. oral	31.4	68.6	-	-
	2. writing	60.0	40.0	-	-
	3. multimedia	11.4	71.4	17.2	-
2 *Collaboration* (collaboration)	1. able to cooperate in groups and leadership;	20.0	80.0	-	-
	2. respect different perspectives in the environment;	8.6	91.4	-	-
	3. able to adapt in various roles and responsibilities;	17.1	82,9	-	-
	4. work productively with others;	17.1	82,9	-	-
	5. have the empathy (care / attention) in place;	5.7	94.3	-	-
	6. are able to perform personal responsibility and flexibility in personal, workplace, and public relations;	8.6	88.5	2.9	-
3 *Critical thinking and problem solving* (critical thinking and problem solving)	1. can provide reasonable reasoning in understanding and making complicated choices;	14.3	85.7	-	-
	2. have the ability to collect and present, analyze, and solve problems;	17.1	82,9	-	-
	3. use their capabilities to try to solve the problems they face independently;	17.1	82,9	-	-
	4. understand interconnection between systems (interconnection between several fields / parts);	14.3	85.7	-	-
4 *Creativity and innovation* (creativity and innovation)	1. learners have the ability to develop, implement, and provide novel ideas to others;	14.3	85.7	-	-
	2. be open and responsive to new and different perspectives.	8.6	85.7	5.7	-

Based on the table above, there are five indicators that have not developed optimally (poorly) in the skills training program: communication in form and content through the utilization of multimedia 14.3%; personal responsibility and personal flexibility at work 14.3%; the ability to collect and present, analyze, and solve problems 11.5%; solve the problems11.5%; and being open and responsive to new and different perspectives and 5.7%.

TABLE 3: Development of 4 C skills in the Marketing Expertise Program.

No. /Aspect	Indicator	Measurement results (%)			
		4	3	2	1
1 *Communication* (communication)	**Students are able to understand, manage, and create effective communication in these following various forms and content:**				
	1. oral	22,9	77.1	-	-
	2. writing	22,9	77.1	-	-
	3. multimedia	8.6	77.1	14.3	-
2 *Collaboration* (collaboration)	1. able to cooperate in groups and leadership;	8.6	91.4	-	-
	2. respect different perspectives in the environment;	8.6	91.4	-	-
	3. able to adapt in various roles and responsibilities;	8.6	91.4	-	-
	4. work productively with others;	8,6	91.4	-	-
	5. place empathy (care / attention) in place;	2.9	97.1	-	-
	6. are able to perform personal responsibility and flexibility in personal, workplace, and public relations;	28.6	57.1	14.3	-
3 *Critical thinking and problem solving* (critical thinking and problem solving)	1. can provide reasonable reasoning in understanding and making complicated choices;	5.7	94.3	-	-
	2. have the ability to collect and present, analyze, and solve problems;	5.7	82.8	11.5	-
	3. use their capabilities to try to solve the problems they face independently;	5.7	82.8	11.5	-
	4. understand interconnection between systems (interconnections between several fields / parts);	5.7	94.3	-	-
4 *Creativity and innovation* (creativity and innovation)	1. learners have the ability to develop, implement, and provide novel ideas to others;	8.6	91.4	-	-
	2. be open and responsive to new and different perspectives.	2.8	91.5	5.7	-

Based on evaluation above, the marketing expertise program showed that there was not tendency to face greater obstacles in the development of four aspects *(communication, collaboration, critical thinking, and creative and innovation)* compated to the automotive engineering.

4. Discussion

The development of 21ˢᵗ century skills which were described in 15 indicators is the important and strategic step considering the future challenges in outcomes which are increasingly complex for the vocational school. The outcomes of the vocational schools are expected to have a high level of adaptation ability to the change and demand of the business / industry. The four main aspects of 21ˢᵗ century skills need to be a reference in the education and learning process in vocational schools, so that graduates have optimal skills to meet demands and job requirements.

The Word Economic Forum (2016) states that in 2020 there are top 10 skills rankings required in the workforce: (1) complex problem solving; (2) critical thinking; (3) creativity; (4) people management; (5) coordinating with others; (6) emotional intelligence; (7) judgment and decision making; (8) service orientation; (9) negotiation; and (10) cognitive flexibility.

The learning process of the productive programs on the vocational schools has a strategic role to develop 21st century skills, especially through the implementation of project-based learning. Of the 15 indicators of 21ˢᵗ century skills, there are at least 10 indicators that can now be developed optimally through the implementation of project-based learning, the remaining five indicators are not yet optimal (poor). The five indicators are as follows: (1) multimedia communication (communication); (2) personal flexibility in the workplace (collaboration); (3) the ability to think analytically and problem solving (critical thinking and problem solving); (4) have the ability to solve the problems; and (5) being open and responsive to new and different things (creative and innovation). For these five indicators, teachers of productive vocational school programs need to be more intensive in planning and implementing project-based learning, so that the five indicators of skills can develop optimally.

An overview of 21st century skills indicators that have not developed optimally (poorly) in the implementation of *project-based learning* are illustrated in the following graph:

Capability indicator information :

1: communication through multimedia utilization;

2: personal responsibility and personal flexibility at the workplace;

3: the ability to compile and present, analyze, and solve problem;

4: the ability to solve the problems;

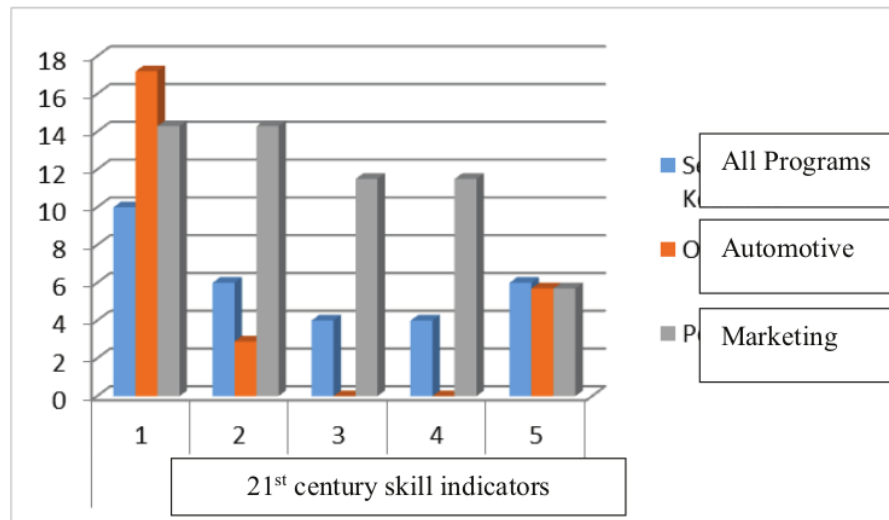5: being open and responsive to new and different perspectives.

Figure 1: 21st century skills indicators which was poorly developed.

5. Conclusions and Suggestions

5.1. Conclusion

1. The models design of the project-based learning with the learning core activities can be generated which referred to the syntax: (a) start with the e ssential question; (b) design project planning; (c) create a schedule); (d) monitor the students and the progress of the project); (e) assess the outcome; and (f) evaluate the experience.

2. Through the implementation of the project-based learning model :

3. There are 10 indicators of 21st century skills that can be developed optimally. Those indicators were categorized as good and very good.

4. There are five indicators of 21st century proficiency that have not developed well: (1) multimedia communication (*communication*); (2) personal flexibility in the workplace (collaboration); (3) analytical thinking skills and critical thinking and problem solving ; (4) have the ability to solve the problems; and (5) being open and responsive to new and different perspectives (creative and innovation).

5.2. Suggestion

1. Briefing and assistance are necessary for teachers of productive program at the vocational school to master the preparation of project-based learning plans.

2. Teachers of productive vocational school programs need to be more intensive in planning and implementing project-based learning, so that the five indicators of the 21st century skills that are still in poor condition / results can develop optimally (good and very good).

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