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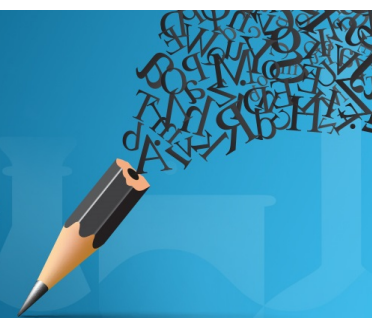


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Implementation Effect of Productive 4-Stage Field Orientation on the Student Technopreneur Skill in Vocational Schools

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Abstract. This model integrates project base learning by creating a product based on environmental needs. The Produktif Orientasi Lapangan 4 Tahap (POL4T) combines technical skills and entrepreneurial elements together in the learning process. This study is to implement the result of technopreneurship learning model development which is environment-oriented by combining technology and entrepreneurship components on Machining Skill Program. This study applies research and development design by optimizing experimental subject. Data were obtained from questionnaires, learning material validation, interpersonal, intrapersonal observation forms, skills, product, teachers and students' responses, and cognitive tasks. Expert validation and t-test calculation are applied to see how effective POL4T learning model. The result of the study is in the form of 4 steps learning model to enhance interpersonal and intrapersonal attitudes, develop practical products which orient to society and appropriate technology so that the products can have high selling value. The model is effective based on the students' post test result, which is better than the pre-test. The product obtained from POL4T model is proven to be better than the productive learning. POL4T model is recommended to be implemented for XI grade students. This is can develop entrepreneurial attitudes that are environment oriented, community needs and technical competencies students.

INTRODUCTION

“In the highly competitive global environment, knowledge and information are key factors in the competitiveness of nations”¹. “Human Resources is very important in competition as the impact of globalization”². Free trade demands the availability of skilled labor and high competence to compete in the regional, national and international markets. “Globalization has an impact on the increasing needs of Human Resources that are not only qualified but also competitive and innovative”³. Rokhamani⁴ argued that “to improve the quality of Human Resources is through education investment”. Education occupies a central position in development in Indonesia, due to its goal of improving the quality of Human Resources.

The learning atmosphere can create harmonious and productive academic surroundings if the functions supported by the competence human resource suitable with its field. The suitable between the implementation of practical and in theory learning management functions with the duties of teacher resource are very important for developing the

academic surroundings in the school⁵ As the productivity practical management that was done in vocational school, the implementation of each learning management function professionally can produce the achievement of practical action purpose.

An education will be maximized if the educational curriculum used is appropriate and reliable to the situation and conditions. Developing and implementing competency-based curriculum on life skill competence which is integration of hard skill and soft skill oriented ability of educational unit influenced by natural resources and local potency of school for vocational high graduates ready in globalization era. Enterpreunership competencies are needed for students to realize the readiness of globalization era that there are free labor market, free trade market and free market in investing someone to another country. Competence of enterpreunership as early as possible applied to vocational high school level can compete with other countries.

Riyanti's research "indicate that the provision of direct practice tailored to the field of expertise of students facilitate students to transfer of knowledge⁶ so there needs to be an integration between technopreneurship elements with the field technology that students are involved. A technopreneur means an entrepreneur who involves and deal with technology in their business. A technopreneur believes that technology would increase efficiency, productivity, product quality, broaden the market and helps to market the developed product widely⁷. Technopreneurship developed integrated with the learning process practice. Technopreneurship is an entrepreneurship characterized using technology, the lesson focused on its application is productive material. The result of developing technopreneurship combined in this practical learning is POL4T model (*Produktif Orientasi Lingkungan 4 Tahap*).

The result of product making can give real learning about leadership, task-orientation, responsibility for the students. The activity in making the products is initiated by digging self-potential and opportunity, designing tool, planning working time, component making, component assembling, test and socializing the products. Production based Learning Model provides spaces for the students to be more adventurous, creative, and critical thinking towards what they do. Besides that, it can give plus value scientifically and financially to be accepted by societies as a goods and services needed⁸.

The harmony between technopreneurship and productive practice learning can enhance students' entrepreneurship attitudes, especially to finish their study in Vocational School. The synergistic learning outcome between technopreneurship and practice learning is actualized in the form of technopreneurship learning which is Productive Field-Oriented in 4 Steps (POL4T). This learning model is practice-oriented according to the needed competency and this model also yields products according to people's need which is based on students' observation.

The above condition considers several considerations; (1) it is because of globalization challenge dealing with vocational school students' readiness and low quality in entrepreneurship; (2) unemployment rate from vocational school graduates which is quite high because most of the graduates do not obtain job according to their skills; (3) entrepreneurship learning given in Vocational School Program, especially at Machining Skill Program is still too general and does not have any relation with practice learning outcome. POL4T learning objectives are students able to master theory and even practice to quickly adjust in the business, industry and integrate knowledge of technopreneurship in productive subjects, thus increasing the ability of students to work or create jobs after graduated. The purposes of this study are: (1) to describe technopreneurship learning model (POL4T); (2) to explain the implementation of technopreneurship learning model (POL4T).

RESEARCH METHOD

This study applies Research and Development (R&D) design toward *technopreneur-ship* learning model. Borg and Gall⁹ there are 10 Reseach and Development steps according. The subjects in this study are technopreneurship learning group in Saraswati Salatiga Vocational School. The data include questionnaires, written test, observation form and assessment form. The assessed variables include interpersonal and intrapersonal variables, knowledge and appropriate technology. T-test calculation and practicality test (respondents' response analysis) are used to analyzed data in this study. The influence of this learning can be seen attitude and skill of student after apply model of POL4T with t test.

RESULTS AND DISCUSSION

The diagram of Technopreneurship learning model (POL4T) on Machining Skill Program is as the following The implementation of this learning model will be optimally applied on students of grade XI at their second semester. This is because their curriculum on entrepreneurship subject has reached some correlated materials such as; marketing strategy, opportunity reading technique, pricing, production cost, and industrial management. Those materials support technopreneurship POL4T learning model. The accomplishment of certain competence in technopreneurship will help students in achieving creativity and innovation after they get knowledge, solve problem and find opportunity¹⁰.

The materials used in POL4T learning model is productive which is in line with the available syllabus. Productive materials are added with technopreneurship using method, and learning process that enhance students' technopreneurship attitudes including *interpersonal*, *intrapersonal* and *extra personal* aspects. Guided materials which are given to the students are in line with observation result implementation. The observation is yielded after environment condition for making practice tool has been conducted.

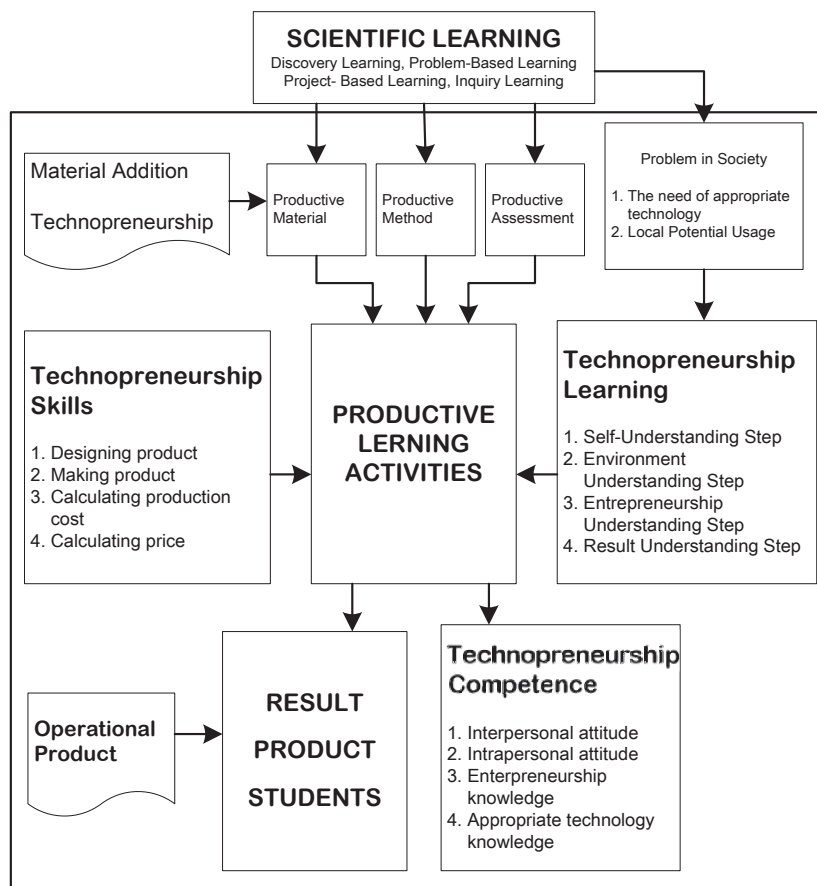


FIGURE 1. The Process of Technopreneurship POL4T Model Development

The learning methods used in this study are; teacher's presentation, reality description about technology need, students' observation, the identification of technology problems in society, problem solving, designing suitable practical products which have been consulted to be done in practice learning. Those steps in technopreneurship learning involve students' direct role to solve technology problems in the society. Therefore, it can enhance students'

sympathy, opportunity reading, and problem solving which are the realization of technopreneurship characters¹¹. Simply, the proposed technopreneurship learning model may enhance technopreneur indicators.

The assessment is based on students' products and students' technopreneurship competence which includes interpersonal, intrapersonal, extra personal attitudes, entrepreneurship knowledge and appropriate technology knowledge (TTG). Assessment process is similar to the available productive assessment and technopreneurship assessment including interpersonal, intrapersonal attitudes, technopreneurship knowledge and skill and operational products.

Time allocation for technopreneurship learning model is similar to productive learning. Technopreneurship learning model implementation does not use blocking system as in practice learning. Technopreneurship learning process is conducted in group by the teachers from productive learning subjects. Techopreneurship learning is taught collaboratively in team teaching with minimum 2 teachers and maximum 4 teachers. The teachers assigned to teach this subject must have productive competence and entrepreneurship competence.

Steps in Technopreneurship POL4T Learning Model

There are 4 steps in technopreneurship POL4T learning model; self-understanding, environment understanding, entrepreneurship understanding, and products knowledge. The skills learned in each steps include; product designing, product making, calculating production cost and price. Technopreneurship step in Machining Skill program is as follow:

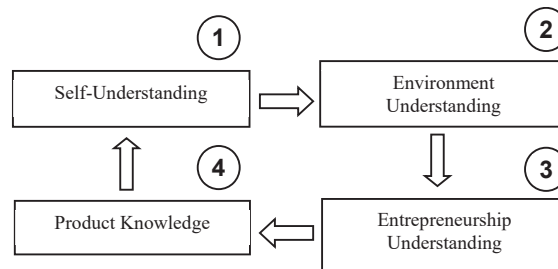


FIGURE 2. POL 4T in Machining Skill Program at Vocational School

Self-Understanding

In this step, the teachers help students understand self-potential, hobby, students' skill and competence. This step is to assist students to know their self-strengths, such as self-potential, goals, knowledge, technical and productive skills so that they could work optimally in groups especially dealing with task distribution and responsibility matters. The students coordinate with their peers in a group based on their suitable skill and knowledge which has been optimized when they were at grade II of odd semesters and also when they experienced field working internship in industries. They have different internship location; therefore they also have different experiences. The member in the group has different internship experiences.

Environment Understanding

The second step is environment understanding. This step covers environment observation to yield ideas in creating a product which is needed by the society. Environment understanding is done by direct observation, seeing the available technology, watching video, drawing to actualize an idea. In this step, some aspects are stimulated. Those aspects include; creativity, innovation, future orientation, leadership, sharing opinion and communication. Skill aspect that arises in this step is students' competence in designing tool based on observation and people need. Designing proses is done in groups with 2 teachers' guidance in their team teaching. The outcome of this step is in the form of practical product design to be consulted to the teacher. Practical product is made during practice learning.

Entrepreneurship Understanding

This step covers entrepreneurship knowledge such as; business definition, entrepreneurship aspects, entrepreneurship characteristics, how to calculate production cost, marketing, how to face obstacles and risks. This step combines students' entrepreneurship knowledge which has been obtained at their entrepreneurship subject during practice learning. Through team teaching, 3 teachers guide the students in this step. In group, the students design a product then create it operationally and test the product at last. Product making is done by all teachers in their team teaching. Each teacher is responsible for a group but they create the products together with other groups.

Those knowledge steps are for achieving entrepreneurship knowledge. This is in line with Alberti's opinion is important knowledge for an entrepreneur is general knowledge about business, opportunity reading, and business management¹⁰.

According to Schumpeter, the capabilities of innovating, introducing new technologies, increasing efficiency and productivity, or generating new products or services, are characteristic qualities of entrepreneurs. Entrepreneurs are catalysts for economic change, and researchers argue that entrepreneurs are highly creative individuals with a tendency to imagine new solutions by finding opportunities for profit or reward¹².

Knowledge steps in technopreneurship learning model POL4T are as suggested by Minniti and Bygrave¹⁰. They stated that an entrepreneur must understand business process, opportunity reading, financial estimation, business capital, and business plan. Therefore, skill aspects in technopreneurship POL4T are; designing product, making product, calculating production cost and calculating price. Those 4 aspects represent skills that must be owned by an entrepreneur. Designing a product is done as the basis of making product, deciding production cost and pricing.

Product Knowledge

In this step, students present about their product in front of the class in group. Product knowledge deals with the reasons why the product is made, how to make it, how much the product costs, the materials which are needed to make the product, price matter, Break Event Point (BEP) matter, and how the product works.

Learning Outcome

Learning outcome in this model is knowledge and skill gaining based on students' competence which has to be achieved according to learning syllabus. Meanwhile, students' operational product can help people with technology problem especially appropriate technology. Learning assessment in technopreneurship (POL4T) model covers several aspects; interpersonal and intrapersonal attitudes, entrepreneurship knowledge and students' knowledge about appropriate technology. Attitude assessment is based on teacher's observation. Knowledge assessment is written by giving direct questions to the student. Skill assessment is based on observation and students' products.

THE CHARACTERISTICS OF TECHNOPRENEURSHIP POL4T MODEL

The product resulted from this R&D study—technopreneurship POL4T model, has several characteristics as the following:

1. Technopreneurship learning concerns only on technopreneurship attitude which includes interpersonal and intrapersonal attitude, technopreneurship knowledge, technopreneurship skill, and products resulted from learning outcome.
2. Productive competences which uses Technopreneurship POL4T model are limited on psychomotor competences. This is because technopreneurship deals with creativity and innovation aspects.
3. The implementation of technopreneurship POL4T learning model must cover minimum competence to make operational product which includes the competence of using handtools, working safety, welding, the competence of using machine tools and the students have to accomplish their internship in a particular industrial enterprise.
4. Technopreneurship POL4T learning model is suitable to enhance creativity, innovation, an direct experience for students to prepare young technopreneur from the scratch.
5. Technopreneurship POL4T learning could enhance student's care toward environment and stimulate the ability of managing the surrounding nature.

6. Technopreneurship POL4T learning must be taught in team teaching way, with minimally 2 teachers and maximally 4 teachers according to the 4 steps as required in this model.
7. The implementation of Technopreneurship POL4T is best conducted minimally at grade XI, second semester. This is because of several considerations as the following: (a) the students have accomplished internship in industrial sector (at least the students have experienced entrepreneurship and business); (b) at grade IX, the curriculum of entrepreneurship subject has reached some taught materials such as marketing, managing business, pricing and producing, (c) productive competence, which has been accomplished in that level, has fulfilled the need of making operational product skill.
8. Technopreneurship POL4T model is more effective in enhancing students' learning motivation and it yields operational product at the end of the learning. Operational product is a product which can be used for daily need and it can also be used by the society in general.
9. The implementation of technopreneurship POL4T model can be inserted in the available practical schedule, and there is no blocking system in the learning process.
10. Great financial support is necessary to support this model implementation, especially for the teachers. Since the learning outcome is in the form of practical products that support operational need.
11. The implementation of technopreneurship POL4T model may add inventory list on appropriate technology at school as well as the fulfillment of appropriate technology need for the society.
12. The learning outcome of technopreneurship POL4T model can be sold or can be used voluntarily for people's need who urgently need the technology.

THE IMPLEMENTATION OF TECHNOPRENEURSHIP

POL4T Model

The assessment of *technopreneurship* POL4T model implementation was given to one class with group of 4 students in limited scale test. Pre-test and post-test were given. An analysis is drafted to figure out the students' learning outcome before and after the model was applied as it is shown on Table 1. Pre-test and post test results are described as the following:

TABLE 1. Pre-Test and Post-Test

No	Assessed Aspects	<i>Pre-Test Average</i>	<i>Post-Test Average</i>
1	Interpersonal Attitude	2,42	3,56
2	Intrapersonal Attitude	2,69	3,64
3	Knowledge	1,37	2,69
4	Skill	1,75	3,50
5	Skill on TTG Tool	1,00	3,66

This technopreneurship learning model is effective based on comprehensive model test and there is significant difference after technopreneurship learning model is applied. Interpersonal attitude is skill aspect that explains the ability to manage working environment so that it can adapt working situation¹³.

This productive learning model yields practical products that can be used for operational need. There is interpersonal aspect development in terms of confidence. It happens because this learning model is done in group and the students have more opportunity to conduct group discussion and interact with their friends during product making. In group learning, the ability to control and influence peers arise, consequently self-confidence also ascends. Task-oriented attitude also develops during group learning since every student in the group is given practical tasks to make an operational product. The relation between the speed and product outcome will influence group assessment. It is also suggested by Geoffery G. Meredith¹⁴. Task-oriented attitude has some characteristics such as achievement need, result orientation, perseverance, and patience, as well as hardworking attitude, high-motivated attitude, energetic and innovative. Innovative attitude will arise during operational product making as the result of people's need observation. Prodan stated that innovation will arise if it is supported by bigger group or outside community—the society in this case. Practice application in group will increase one's innovating attitude¹⁵.

Communication and members' advice are found during group working, this stimulates the ability of conveying opinion and criticize others. According to Geoffery G. Meredith, leadership attitude has several characteristics such as being a leader, being friendly and easy-going person, and being able to response to advices and criticism. Communication aspect increases significantly in 'being friendly and easy-going person' aspect since practice learning is done in group¹⁴.

CONCLUSION

Based on the model development as discussed in this study, it can be concluded that: (1) technopreneurship POL4T learning model in machining skill program has combined productive technopreneurship competence by resulting practical products which is based on appropriate technology for people, (2) the implementation of technopreneurship POL4T learning model is effective to be applied in machining skill program. This is shown from the result of posttest which is better than pre-test, (3) the ability to control, influence peers arise, and consequently self-confidence also ascends. Task-oriented attitude also develops during group learning since every student in the group is given practical tasks to make an operational product, (4) this model can increase the attitude of task orientation such as adjusting needs, result orientation, perseverance, and patience, hard work, high motivation, energetic and innovative.

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