Effectiveness Model of Cooperative Learning Innovative, Creative, Productive Entrepreneurship Based on Areas of Expertise Technology and Engineering

R. Mursid\textsuperscript{1}, Sahat Siagian\textsuperscript{2}, and Eko Wahyu Nugrahadi\textsuperscript{2}

\textsuperscript{1,2}Faculty of Engineering, State University of Medan, North Sumatera, Indonesia
\textsuperscript{3}Faculty of Economics, State University of Medan, North Sumatera, Indonesia

Abstract. This study aims to determine the effectiveness of the use of innovative learning model, creative, productive entrepreneurship based on learning outcomes of students in the field of technology and engineering expertise in Vocational School. This research used experimental method with Randomized study design Subject Posttest Only Control Group Design. The samples consisted of two classes of experimental classes (cooperative learning strategies, innovative, creative and productive entrepreneurial-based) and the control class (expository strategy). Sampling was done by cluster random sampling. Cognitive aspects of data collection techniques using objective tests, psychomotor aspects of using the assignment method and affective aspects of using questionnaires. The data analysis technique for testing the hypothesis by using \textit{t}-test right parties. The results showed that the use of innovative learning model, creative, productive based entrepreneurship can effectively improve student learning outcomes in the cognitive aspects of material machining technique, aspects of psychomotor and affective aspects.

Keywords: Model of Innovative, Creative, Productive, Entrepreneurial-Based, Technology

Introduction

The success of Indonesia’s national development in all fields would be highly dependent on the quality of human resources in order to optimize and maximize the growth of all dimensions of development. Such efforts can be done through education, through both formal and non-formal. Educational unit on formal education which aims to prepare graduates mainly to have an edge in the working world is Vocational School.

Permendiknas in appendix No. 22 of 2006 on the Content Standards explain that vocational education aims to improve intelligence, knowledge, personality, noble character, and skills of students to live independently and to follow further education in accordance with the vocational program. To be able to work effectively and efficiently and develop expertise and skills, they must have high stamina, mastering his field of expertise and the basics of science and technology, has a high work ethic, and able to communicate in accordance with the demands of the job, and have the ability to develop themselves.
Increasing global competition is the case today requires Vocational School developed following the direction of development of the world of work, so that Vocational School needs to make adjustments to the opening of new competency skills or sharpen existing skills competencies to improve the quality of learning and consider its relevance to the demands of business and industry.

The field of engineering education should, in addition to providing sufficient theories, also need to give examples of solving real projects by utilizing learning strategies that support the field of engineering education. (Purnawan, 2007). Century, current knowledge, desire oriented learning paradigm on the project, problem, inquiry (inquiry), discovery and creation "(Wilson, 1996; Ardhana, 2000).

Vocational education is a form of education in which people equipped with practical skills that will enable them to engage in careers that involve manual or practical ability. School-to-Work opportunity is very significant policy development in the field of workforce preparation. Development of technology and vocational education should consider the relationship between several factors that are technocultural. These four factors are: (1) industrial relations (industrial relationships); (2) changes in technology (innovation); (3) organization of work (work organization); and (4) the formation of competence (skills). Rapid changes in the economic, social and technological require that the entire community needs to develop knowledge and skills on an ongoing basis, so that they can live and work well in the knowledge society.

Pavlova (2009: 7) argues about vocational education in general is able to direct preparation for work. Seen as the provision of specialized training that reproductive and based on the teacher's instructions. with the aim to develop an understanding of a particular industry, which consists of special skills or vocational trick. Motivation of students can be seen from the economic benefits brought to them in the future.

Improved quality and learning process in vocational need to creatively develop the concepts of learning and education of new, more comprehensive and competitive. This can be done by updating the model, strategies, methods, and media learning more flexible, by placing the student as the subject (student-centered learning = SCL), rather than as the object of education. The concept of education also need to be designed to foster partnerships with business and industry, entrepreneurial spirit and improved vocational skills, soft skills and success skills, so that vocational graduates will have the character of high confidence, had the wisdom to social values and character of the nation-quality, independence and strong leadership.

Integrated entrepreneurial education system in Vocational School must be designed to involve all the elements of education in schools as teaching and learning in the classroom, extracurricular, personal development and school culture. Furthermore it should also pay attention to the process of the formation of the entrepreneur according to Bygrave (2003) starts from innovation, triggering, implementation and growth. In general, vocational and industrial technology group experienced constraints in the practice of entrepreneurship in schools. With the design of integrated learning is expected model of entrepreneurial learning
not only leads to a purely business, but also leads to the entrepreneurial character education so that its sustainability can be maintained.

A phenomenon that occurs in the Vocational School because no matter how big contribution in printer graduates generally prepares graduates become job seekers rather than create jobs (job creators). One alternative solution to reduce unemployment vocational graduates this is by adding entrepreneurship curriculum through the concept of Entrepreneurship Hidden Curriculum (EHC), which provide students the skills soft skills and hard skills to entrepreneurship by introducing the charge of entrepreneurship both in the substance of the values of entrepreneurship and application at any learning process.

Application of this model is needed to educate the student's character (character building) and the image of vocational education institutions are managed. Therefore, the curriculum forward in learning strategies can use learning model developed is capable of: (1) to equip students to be able to use to create their own work (self-employment) or work in business and industry, (2) developing the discipline of students, (3) creating a character building, (5) allows students to get a job, (4) creating graduates produced in accordance with the standards of the school and the standards needs of the workforce, and (5) improve and create excellence, as well as provisions to adapt to the development of science and technology.

Relation to the application of the learning model serves to direct us to design learning is used as a guideline in the implementation of learning in order to achieve effective learning, efficient, powerful attraction, and humanist. Joyce & Weil (1980) describes the learning model is a plan or a pattern that is used as a guide in the classroom learning or learning in tutorials and to define the learning tools and direct us in designing learning to help learners so that the learning objectives achieved.

Innovative learning model, creative and productive entrepreneurial-based developed and designed according to the needs of student-oriented products. Teaching system should be able to build up the students to create, innovate, and the creation of the product. Learning with models developed in accordance with the characteristics of vocational students.

Framework entrepreneurship education integrated in vocational education involves entrepreneurial character can be done through: (1) the implementation of character education entrepreneurship to all subjects, (2) learning entrepreneurial class, (3) entrepreneurial activities extracurricular, (4) entrepreneurial activities through the development of self and (5) the development of the school culture as a medium for the internalization of the character of entrepreneurship into the school community (Puskur, 2009).

However, the implementation of character education in vocational entrepreneurship, especially in the field of technology and industry are usually not as easy as the field of tourism. Therefore the entrepreneurial educational process if it is not possible to arrive at the implementation of business practices (implementation and growth), can be carried out until the stage of innovation and triggering. For the implementation of entrepreneurial the implementation stage and growth can be done after the graduate with the knowledge and the results of the internalization of entrepreneurial character that has been done in Vocational School.
Learning innovative, creative and productive is a model developed with reference to a variety of learning approaches that are assumed to improve the quality of learning processes and outcomes. Such approaches include: active learning, creative, constructive, collaborative and cooperative. The essential characteristics of each of these approaches are integrated to produce a product that comes from their understanding of the concepts being studied. Some of these characteristics are as follows:

1) Students are intellectually and emotionally involved in learning. This involvement is facilitated through the provision of opportunities for students to explore the concept of science that is under review and interpret the results of the exploration. Students are given the freedom to explore a variety of sources relevant to the topic/concept/problem being studied. This exploration will allow students to interact to construct knowledge.

2) Students are encouraged to find/construct their own concept of what is being assessed through interpretation done in various ways, such as observation, discussion, or experiment. In this way, the concept is not transferred by the teacher to the student, but was formed by the students, based on experience and interaction with the environment that occurred when exploration and interpretation.

3) Students are encouraged to construct meaning from experience, so that the understanding of the phenomena being studied to be increased. In addition, students are encouraged to bring a variety of perspectives on the topic/concept/the same problem, and to maintain the angle pastures, using arguments that are relevant. These things is one realization of the essence of constructivism in learning.

4) Students are given the opportunity to take responsibility for completing the task together. This opportunity is given through the exploration, interpretation, and re-creations.

5) Students have the opportunity to help his friend in completing a task. Togetherness, both in the exploration, interpretation, and re-creations and display the results of an arena of interaction that enriches the experience.

6) Students have the opportunity to help his friend in completing a task. Togetherness, both in the exploration, interpretation, and re-creations and display the results of an arena of interaction that enriches the experience.

7) Students are encouraged to be creative, one must work hard, dedicated, enthusiastic, and confident. In the context of learning, creativity can be nurtured to create a classroom atmosphere that allows students and teachers feel free to review and explore important topics of curriculum and development of entrepreneurship and the cultivation of character.

8) Students think hard, then pursue the students’ opinions about great ideas from the various perspectives of the questions made by the teacher.

9) Students are encouraged by teachers to show / demonstrate understanding of important topics in the curriculum in its own way.

With reference to these characteristics, innovative learning model, creative and productive entrepreneurial based assumed to be able to motivate the students in carrying out various activities, so they are challenged to complete their tasks creatively. With such characteristics, this model can be applied in teaching various fields of study, both under on topics that are abstract and which are concrete in theoretical and practical aspects.

The effectiveness of cooperative learning model of innovative, creative, productive and expository-based entrepreneurial subjects in vocational machining technology. This study aimed to describe the effectiveness of the instructional model of innovative, creative,
entrepreneurial-based productive in terms of: (1) the completeness and suitability of learning planning tools; (2) the learning process, (3) assessment of learning; (4) the response of students to the learning activities; and (5) the study of students.

Effectiveness is an achievement level of success of an activity in order to be consistent with the objectives that have been set previously. According to Soewardi (2005: 44), a learning strategy is said to be effective if it can involve students actively in the learning process, and they can achieve the goals that have been set. This is in line with the opinion of Soewardi (2005: 44) who say that effective learning is the unity of skills, feelings, mastery of the material, and the understanding of the sense of learning that leads to a behavior, the ability to build and develop an optimal student learning. From the second definition above, it can be concluded that a lesson can be effective if all students can capture knowledge well in accordance with predetermined objectives. Measurement of achievement of these goals proved to improving student learning outcomes.

Based on the above issues in this study is whether the use of innovative learning model, creative, productive based entrepreneurship can improve learning outcomes in the cognitive, psychomotor, and affective on the material machining technique class XI student of SMK Kota Medan 2014/2015 school year.

Methodology
The research was conducted on a class XI student of Vocational School Medan semester academic year 2014/2015. This study used a quasi-experimental method to the study design Subject Posttest Only Control Group Design. The sampling technique in this research using random cluster sampling technique consisting of 5 classes taken randomly XI.2 class. XI.1 The study sample was selected consisting of 36 students as an experimental class, the class that uses an innovative model of cooperative learning, creative, productive based entrepreneurship, and XI.3 class consisting of 36 students as the control class, the class that uses strategy expository.

Data collection techniques with test method to determine the results of the cognitive outcomes of students, assignment to measure the results of students psychomotor and affective questionnaire to measure students' results. Analysis of the data in this study using a statistical t-test right parties. Before performing the test needs to be done right the prerequisite test, the normality and homogeneity test data. After being tested for normality and homogeneity tests, found that the sample comes from a normal distributed population and two groups of samples have the same variance so that the hypothesis test used was t-test.

Results and Discussion
Results
The data obtained from this study is the result of data written multiple choice test. From the data of pretest and posttest students both in the experimental class and control class will be analyzed to test the hypothesis testing is done by t test. But first need to normality test to determine whether the data were normally distributed or not. After the normality test to determine homogeneity of variance test data is done. If both assumptions above are met, the data is normally distributed and homogeneous can then test the hypothesis.
Data obtained from this study that the results of the experimental class normality test and control group showed normal distributed based on the obtained data calculation table 1 as follows:

Table 1: Descriptive Statistics Data Group

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Treatment</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Experiment</td>
<td>36</td>
<td>80.58</td>
<td>1.903</td>
<td>0.317</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>36</td>
<td>77.38</td>
<td>2.997</td>
<td>0.499</td>
</tr>
<tr>
<td>Psychomotor</td>
<td>Experiment</td>
<td>36</td>
<td>80.08</td>
<td>1.976</td>
<td>0.329</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>36</td>
<td>77.33</td>
<td>2.414</td>
<td>0.402</td>
</tr>
<tr>
<td>Affective</td>
<td>Experiment</td>
<td>36</td>
<td>79.61</td>
<td>2.046</td>
<td>0.341</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>36</td>
<td>77.58</td>
<td>3.074</td>
<td>0.512</td>
</tr>
</tbody>
</table>

Based on Table 1 is produced that average learning outcomes on cognitive aspects, aspects of the psychomotor, and affective aspects of students on the posttest obtained under the experimental group using innovative learning model, creative, productive, entrepreneurial and group-based control by using the model of expository.

Based on the results of research on cognitive aspects, obtained an average score of classroom learning model innovative, creative, productive, entrepreneurial and class-based model expository. The average score of the class with innovative learning model, creative, productive based entrepreneurship is higher than the average score of the class with expository models, namely 80.58. While the average score of 77.38 expository models. Means experimental group that uses innovative learning model, creative, productive based entrepreneurship is higher than in the control group using expository models for learning outcomes on the cognitive aspects of engineering students in the machining program.

Based on the results of research on aspects of the psychomotor, obtained an average score of classroom learning model innovative, creative, productive, entrepreneurial and class-based model expository. The average score of the class with innovative learning model, creative, productive based entrepreneurship is higher than the average score of the class with expository models, namely 80.08. While the average score of 77.33 expository models. Means experimental group that uses innovative learning model, creative, productive based entrepreneurship is higher than in the control group using expository models for learning outcomes in the psychomotor aspects of engineering students in the machining program.

Based on the results of research on affective aspects, obtained an average score of classroom learning model innovative, creative, productive, entrepreneurial and class-based model expository. The average score of the class with innovative learning model, creative, productive based entrepreneurship is higher than the average score of the class with expository models, namely 79.61. While the average score of 77.58 expository models. Means experimental group that uses innovative learning model, creative, productive based entrepreneurship is higher than in the control group using expository models for learning outcomes in the affective aspects of students in the engineering machining program.
Normality test was conducted using Lilliefors at a significance level of 5%. Normality test results showed that all the samples are normally distributed classes. While the homogeneity test was conducted by Bartlett at the 5% significance level. From these tests, it can be concluded that all the samples in a state of homogeneous classes.

T-test results right the cognitive aspects of learning outcomes, aspects of the psychomotor, and affective aspects of students can be seen in table 2.

<table>
<thead>
<tr>
<th>Student Results on Aspect</th>
<th>F</th>
<th>Sig.</th>
<th>t</th>
<th>df</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>17.41</td>
<td>0.000</td>
<td>5.39</td>
<td>70</td>
<td>3.19</td>
<td>0.59</td>
<td>2.01, 4.37</td>
</tr>
<tr>
<td>Psychomotor</td>
<td>7.59</td>
<td>0.007</td>
<td>5.28</td>
<td>70</td>
<td>2.75</td>
<td>0.52</td>
<td>1.71, 3.78</td>
</tr>
<tr>
<td>Affective</td>
<td>4.96</td>
<td>0.029</td>
<td>3.29</td>
<td>70</td>
<td>2.02</td>
<td>0.61</td>
<td>0.80, 3.25</td>
</tr>
</tbody>
</table>

Results of research on cognitive aspects tested through hypothesis testing using t-test of the calculation results, obtained that the student learning outcomes in the cognitive aspects, \( t_{\text{count}} = 5.39 > t_{\text{table}} = 1.684 \). Based on test criteria, if \( t_{\text{count}} < t_{\text{table}} \), then accept the null hypothesis. Because \( t_{\text{count}} > t_{\text{table}} \), then the null hypothesis is rejected. This means that the average student learning outcomes in the cognitive aspects of learning using innovative learning model, creative, productive, entrepreneurial-based better than the model of expository. Thus, it can be concluded that the innovative learning model, creative, productive based entrepreneurship is more effective when compared with expository model study on the cognitive aspects of the student.

Results of research on aspects of the psychomotor test by testing the hypothesis by using t-test of the calculation results, obtained that the student learning outcomes in psychomotor aspects, \( t_{\text{count}} = 5.28 > t_{\text{table}} = 1.684 \). Based on test criteria, if \( t_{\text{count}} < t_{\text{table}} \), then accept the null hypothesis. Because \( t_{\text{count}} > t_{\text{table}} \), then the null hypothesis is rejected. This means that the average student learning outcomes in the psychomotor aspects of learning using innovative learning model, creative, productive, entrepreneurial-based better than the model of expository. Thus, it can be concluded that the innovative learning model, creative, productive based entrepreneurship is more effective when compared with expository model study on psychomotor aspects of the student.

Results of research on affective aspects tested through hypothesis testing using t-test of the calculation results, obtained that the student learning outcomes in affective aspects, \( t_{\text{count}} = 3.29 > t_{\text{table}} = 1.684 \). Based on test criteria, if \( t_{\text{count}} < t_{\text{table}} \), then accept the null hypothesis. Because \( t_{\text{count}} > t_{\text{table}} \), then the null hypothesis is rejected. This means that the average student learning outcomes in the affective aspects of learning using innovative learning model, creative, productive, entrepreneurial-based better than the model of expository. Thus, it can
be concluded that the innovative learning model, creative, productive based entrepreneurship is more effective when compared with expository model study on affective aspects of students.

Discussion
Differences in achievement of learning outcomes between the experimental class (innovative learning model, creative, productive based entrepreneurship) and grade control (model expository) is possible because of differences in the use of learning strategies that affect learning outcomes cognitive aspects, aspects of the psychomotor, and affective aspects of students. In the experimental group used an innovative learning model, creative, productive-based entrepreneurship. Students are actively in the learning process, students also learn to solve problems, and discuss issues with their peers. Students can also find the concept and working in groups or individually through some structured tasks in machining technology mastery given by the teacher that will make the learning process interesting and enjoyable learning atmosphere becomes. While in the process of learning with expository models only provide structured learning without making the students as subjects who should be able to explore themselves through tasks and learning problems that must be solved either together or independently.

In the study by using innovative learning model, creative, productive, entrepreneurial-based, students were divided into groups with members of heterogeneous groups for discussion. Learning begins with understanding the material performed by students between the group, after which students are given some questions to be answered through discussions between the group and the task. Questions provided in the form of case studies and questions on practical assignments using a mechanical engineering workshop. At the end of the lesson the students were asked to sum up the results of discussions, presentations, and recreation on the results they have done. All activities in the learning process can be known achievements through learning outcomes on cognitive aspects, aspects of the psychomotor, and affective aspects (competence). While competence Mulyasa (2010: 38) is as knowledge, skills, and abilities controlled by someone who has been a part of him, so he can do the behaviors of cognitive, affective and psychomotor as well as possible. So overall the learning outcomes to program machining engineering skills students are expected to competent and able to produce products based entrepreneurship. Effective learning is learning that provides learning opportunities themselves or conduct their own activities (Hamalik, 2005: 171).

The division of groups of students in the learning will encourage relations of mutual support between group members. Students who have difficulty can ask your friends in the group, so hopefully it can improve students' problem-solving abilities and learning outcomes gained more leverage. Differences of opinion can lead students in a discussion to exchange ideas and help each other among individuals in the group to master the concept.

Material machining technique is one of the materials is important because the subject is very close to everyday life, are informative, requires considerable understanding and practice of students. With innovative learning model, creative, productive based entrepreneurship students can build their own concepts through the questions contained in the student worksheet or questions provided by the teacher. In step brainstorming in innovative learning model, creative, productive, entrepreneurial-based, providing ample opportunity for students to discuss exchanging ideas in mastering the concept of theoretical and practical material.
Learning teaching model is innovative, creative, productive based entrepreneurship has the advantage, among others, give to the students understand the concepts by means of solving a problem, making the students active in learning, developing thinking skills of students and enables students to apply the knowledge they already have, and can present the results that they do, either in groups or individually. To train the expected competencies and linking with the entrepreneurial spirit of students.

Innovative learning model, creative, productive based entrepreneurship develop creative thinking skills. The learning model is an efficient tool that could serve as guidelines for developing thinking skills. This can increase the value posttest students using innovative learning model, creative, productive-based entrepreneurship. As supporting implementation of the theoretical and practical learning activities of students used a mechanical engineering workshop equipment such as machine tools and mechanical tools in the workshop are well-managed and attractive to make students become saturated.

Innovative learning model, creative, productive based entrepreneurship is a model or approach to innovative learning, which emphasizes learning contextual through activities complex (Cord, 2001; Thomas, Mergendoller, and Michaelson, 1999; Moss, Van-Duzer, Carol, 1998). Innovative learning model, creative, productive based entrepreneurship focuses on the concepts and principles of the main (central) of a discipline, involving students in problem-solving activities and tasks meaningful other, giving an opportunity students work autonomously construct their own learning, and ultimately produce valuable student work, and realistic (Okudan. Gul E. and Sarah E. Rzasa, 2004).

In the material machining techniques are the concepts and practices directly or tangibly associated with production-oriented products on the basis of entrepreneurial submitted in the application of learning models for the experimental group. Whereas in the control group carried out in accordance with the usual routine of learning in the delivery of concepts through direct exposure to theory and practice in accordance with a given task without seeing the needs of business and industry-oriented entrepreneurial students. In the expository learning by using a model that is applied to the control class, learning to put the teacher as the main source of information play a dominant role in the learning process. Teachers transfer knowledge to students so that students become passive. Students tend to learn to memorize and do not build their own knowledge so that the creativity of students is less developed. These conditions do not support the students in improving problem solving skills, innovative, creative, and productive.

Based on the observations of researchers in the control class, it appears that students feel lazy and sleepy in participating in the learning process. Although occasionally accompanied by a question and answer, question and answer, but the lack debriefing assist students in finding concepts, because previously students had given the concept of the material by the teacher. Affective aspects in this study includes several variables, such as attitudes, interests, self-concept, values and morals. A student will be difficult to achieve the optimum success of the study if the student does not have a particular interest in the subject, in this case the lesson machining techniques.
Based on research, the students taught using innovative learning model, creative, productive entrepreneurial activity based learning higher than students taught using conventional methods. The learning model is based on contextual learning as a learning process, as cited by Johnson (2010: 21) is an educational process that aims to help students see meaning in academic material they learned by linking academic subjects in the context of daily life. In the contextual teaching learning teacher believes that nurturing individual and individual differences and social should be the driving force for meaningful learning, mutual respect in order to realize the skills that will affect student achievement. The learning activities include the activities of the students asked, creative, productive, and innovative. Students who are interested in for a lesson will always ask about things that are not yet understood. So that the affective aspects into supporting the success of the aspects of cognitive learning.

From the above discussion, it is known that learning by using innovative learning model, creative, productive based entrepreneurship equipped with learning machine shop can make students more active in the learning process and students easily grasp the concept in theory and practice because it is supported by media interest, so it will increase memory and assist in the work on the problems and tasks as learning evaluation process. Therefore learning techniques to program machining expertise vocational students using innovative learning model, creative, productive based entrepreneurship can improve student achievement.

**Conclusion**

Based on the results of research and discussion, we concluded that the innovative learning model, creative, productive, entrepreneurial-based effective in terms of theoretical and practical understanding of the students. This is evident from a theoretical understanding and practical technique of machining student learning using innovative learning model, creative, productive based entrepreneurship better than the theoretical understanding and practical technique of machining student learning using a model of expository in class XI student of Vocational School Medan in academic year 2014/2015.

**Recommendations**

Innovative learning model, creative, productive implemented based entrepreneurship can improve the performance of student learning outcomes in the cognitive, psychomotor, and affective. Design of innovative learning model, creative, productive based entrepreneurship has a high level of implementation in the implementation of learning that can directly create a conducive learning atmosphere. Because all components in the learning of steps or stages when done well will produce good quality on student learning outcomes and can directly improve their competence.

**References**


