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**PROJECT BASED LEARNING:
Learning Competency Skills Machining Production Technology
(Pembelajaran Kompetensi Keahlian Teknologi Produksi Pemesinan)**

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ABSTRACT : *Order of life in college formally is the most dominant civilizing process and the empowerment of learners that lasts a lifetime. Implementation of this process requires lecturers to provide exemplary, willingness to build, develop the potential and creativity of learners. The implication of this principle is to shift the paradigm of educational process, namely from the teaching paradigm to a learning paradigm. Learning is a process of interaction of learners with lecturers/teachers and learning resources. The learning process is planned, implemented, evaluated and monitored in order to run effectively and efficiently. Learning practices pursued education lecturers have not shown as a process of development of student creativity. Powered result of preliminary observations, namely the tendency of faculty in choosing and using methods of practice learning speculative, resulting in learning activities practice less attractive, boring, unchallenging, the products are not optimal and tendencies fails, it is not worth selling, it is difficult to achieve the target, not oriented production. In fact, most of the learning practices using intuition or based on the experience of their colleagues and lecturers tend to be concentrated on interests rather than the needs of students*

Key Word : *Project-based learning, Pembelajaran, Kompetensi keahlian*

I. INTRODUCTION

The mission of education in Indonesia is the nation's intellectual life. This can be done development in the field of education shown to make changes and updates over time, Such as the development of curricula that do change and renewal to achieve a better level of education.

Education was organized as a civilizing process and the empowerment of learners that lasts a lifetime. Implementation of this process requires lecturers to provide exemplary, willingness to build, develop the potential and creativity of learners. The implication of this principle is to shift the paradigm of educational process, namely from the teaching paradigm to a learning paradigm. Learning is a process of interaction of learners with lecturers / teachers and learning resources in a learning environment. The learning process needs to be planned, implemented, evaluated and monitored in order to run effectively and efficiently.

Based on data from the Badan Statistik Nasional (BPS) in 2011, there were 82.1 million Indonesian workers filled unskill group of workers (workers who do not have the skill or competence in the field). Unskill group of workers, the majority are graduates of public schools. While the group on it filled skill workers (workers with a skill or competence in their field) amounted to 20.4 million people. And the composition of the top-working expert (expert) with 4.8 million people. Seeing this



condition Indonesia would be difficult to compete with other countries in the era of globalization and intense competition present today and in the future.

Based on these facts, it becomes the responsibility of education especially vocational education to produce graduates who are competent. Therefore competencies that will be developed through a learning process should refer to the competencies required by the industry. One of the subjects in college is very important and strategic for the establishment of production machining technology competency skills. Therefore it is considered very important to always improve the quality process of competence machining production technology expertise. Based on a survey that has been implemented in the manufacturing industry, information was obtained that the manufacturing process one unit of product requires collaboration (cooperation) of various skills (collaborative skills). Without the cooperation is good then the end result of the expected product cannot be achieved. One effort to inculcate the attitude and behavior of students associated with the competencies demanded by the industrial world is to develop a competency model skills-based machining technology production project based learning.

II. LITERATURE

A. Project Based Learning

According to the Buck Institute for Education (BIE) (in Khamdi 2007) "Project Based Learning is a learning model that involves students in problem-solving activities and provide opportunities students work autonomously construct their own learning, and ultimately produce the works of students valuable and realistic.

Thus, Project Based Learning is an innovative learning centered on the learner (student centered) and put the professor as a motivator and facilitator, where learners are given the opportunity to work autonomously construct learning. Project Based Learning is perfect paired with production machining technology subjects. Based learning activities in the syllabus, the course of production machining technology requires learners to be active (student centered) while lecturers act as facilitators and motivators, learner collaboration with various materials to be provided.

Learners use the inquiry, research, planning skills, critical thinking and problem-solving skills in the process of completing the project. Actually, working on a project does not guarantee the learning. To ensure the study, the project needs to be chosen carefully and designed covers the required content. To that end, the PPA: 1) engage learners in issues and complex problems in the real world, and if possible, educate participants who select and define the issues or problems that are meaningful to them; 2) students use inquiry, research, planning skills, critical thinking, and problem-solving skills while completing the project; 3) learners learn and apply skills / specific standards on content and knowledge in various contexts when working on the project; 4) students have the opportunity to practice some of the skills needed for life and career in the future (eg skills allocate time and resources, interpersonal skills, and others.); 5) The activity ended with the results in the form



of a product or presentation which demonstrates there has been a learning and assessment.

Theoretically and conceptually, project-based learning is also supported by the theory of activity. Activity theory states that the basic structure of an activity consists of: (a) the objectives to be achieved, (b) subject in context, (c) a society in which the work was done by the hand, (d) tools, and (e) work rules and division of tasks. In the application class relies on active learning activities in the form of doing something (doing) rather than passively receive knowledge transfer activities of teachers (Wena, 2010).

Project-based learning is also supported by constructivist learning theory, which rests on the idea that students build their own knowledge within the context of his own experiences. Project-based learning can be seen as one approach to creating a learning environment that can encourage students to construct knowledge and personal skills. When done in a project-based learning model of collaborative learning in small groups of students, project-based learning is also supported by theoretical sourced from social constructivism Vygotsky that provides the foundation of cognitive development through increased intensity of interpersonal interaction. An opportunity to convey ideas, listen to others' ideas, and reflect his own ideas on others, is a form of individual learning. Interactive process with fellow colleagues help knowledge construction process. From the perspective of this theory of project-based learning can help students improve their skills and collaborative problem solving (Wena, 2010).

B. The concept of Project Base Learning (PjBL)

Based Learning Project (PjBL) is a learning method that uses a project / activity as a medium. Learners exploration, appraisal, interpretation, synthesis, and information to produce various forms of learning outcomes. Project Based Learning is a learning method that uses a problem as the first step in collecting and integrating new knowledge based on their experiences in the activity significantly. Project Based Learning is designed for use on complex issues that required learners in doing insvestigasi and understand it.

Through the Project Base Learning, the process begins with the inquiry raises questions guide (a guiding question) and guiding learners in a collaborative project that integrates a variety of subject (matter) in the curriculum. At the time a question is answered, directly learners can see the various major elements as various principles in a discipline that is being studies. The Project Base Learning is an in-depth investigation of a topic the real world, it would be valuable for the attention and effort of learners. Given that each of the students have different learning styles, then-Based Learning Project provides an opportunity for learners to explore the content (material) using a variety of ways that are meaningful to him, and conduct collaborative experiments. Project Based Learning is an in-depth investigation of a topic the real world, it would be valuable for the attention and effort of learners.

C. Why Use Project Base Learning (PjBL)

The PjBL emphasizes contextual learning experiences that can encourage learners to acquire



knowledge through: questioning (inquiry), solve problems, explore interests and develop skills that can be applied to his future life as a responsible decision maker in society. The PjBL also effectively achieve multi standard of learning and competence, often across disciplines / fields of study. This method is derived from the results of research in cognitive psychology and learning based on the understanding that so that learners can: understand the concept; think critically; analyzing information; communicate ideas; to work cooperatively; and develop knowledge and skills in earnest; learners need to practice these skills constantly in a variety of contexts. The project, in harmony with the traditional teaching practices can be a tool for providing the above context for learning.

The PjBL is used in learning in order to: 1) learners motivated and experienced learning; 2) students have many opportunities of acquiring and using new knowledge and skills and achieve the learning competencies; 3) learners associate: the field of study disciplines / fields of study other important, namely between the academic and technical fields; learn to work; and learn with reform initiatives.

D. Characteristics Project Base Learning (PjBL)

There are four characteristics of project-based learning, among other content, conditions, activities and results. Description of Project Based Learning characteristics presented CONTENTS: Loading an original idea a) complex issues; b) the students to find relationships between ideas proposed; c) students faced the problem of ill-defined; d) QUESTIONS tend to question the real-world problems. CONDITIONS: prioritizing student autonomy a) conduct inquiry in the context of the community; b) the students are able to manage time effectively and efficiently; c) students learn to fully control himself; d) simulates the working professional. ACTIVITIES: investigation of a collaborative group) Students berinvestigasi during a certain period; b) students perform complex problem solving; c) Students formulate relationships between his original idea to construct new capabilities; d) students use technology in solving problems. RESULTS: tangible products a) The students showed a real product based on the results of their investagi; b) students undertake a self-evaluation; c) the student is responsive to all the implications of its competence; d) students demonstrate social competence, management, personal, subsequent regulation (Satyasa, 2006: 11)

Project Based Learning (PjBL), active learners become more motivated in learning, faculty only as a facilitator, lecturer evaluate learner performance products include the outcomes that can be displayed on the results of the project.

E. Advantages and Disadvantages of Project Base Learning (PjBL)

Advantages of project-based learning: 1) Increase the motivation of learners to learn, encourage their ability to do important work, and they need to be respected; 2) Improve the ability of solving problems; 3) Make learners become more active and managed to solve complex problems; 4) Improve collaboration; 5) To encourage students to develop and practice communication skills; 6) Improve the skills of learners in managing resources; 7) Provide to the students learning experience and practice in



organizing the project, and make the allocation of time and other resources such as equipment to complete the task; 8) Provide learning experiences that engage learners are complex and designed to develop according to the real world; 9) Involving the learners to learn to take the information and demonstrate knowledge, then implemented with the real world; 10) Create a learning atmosphere to be fun, so that students and teachers enjoy the learning process. Weaknesses in project-based learning 1) It requires a lot of time to solve the problem; 2) Requires considerable expenses; 3) Many instructors who are comfortable with traditional classroom, where the instructor plays a central role in the classroom; 4) The amount of equipment to be provided; 5) Students who have a weakness in the trial and will have difficulty gathering information; 6) There is a possibility of learners who are less active in the group work; 7) When the topic is given to each group is different, it is feared learners cannot understand the topic as a whole.

Overcome the weaknesses of project-based learning at the top of an educator must be overcome by facilitating learners in dealing with problems, limit the time students in completing the project, minimize and provide simple tools that are in the neighborhood, choosing research sites are within easy reach so that no requires a lot of time and costs, creating a fun learning atmosphere so that instructors and learners to feel comfortable in the learning process.

Project Based Learning also requires learners to develop skills such as collaboration and reflection. According to research studies, Project Based Learning helps learners to improve their social skills, often leads to reduced absenteeism and fewer discipline problems in the classroom. Students also become more confident talking to groups of people, including adults.

F. Syntax and Application Project Base Learning (PjBL)

Carrying out this project methods in teaching and learning activities carried out in six phases as follows: Phase I; Identify the real problem; Learning begins with the lecturer motivate or ask the learners with regard to authentic problems that exist in everyday life, so that in this description will arise a problem that will be answered or resolved by learners. Phase II; Formulation Strategy / Issues and Problems: Based on the existing problems, learners in the study group with the guidance of faculty makes the formulation of strategies or alternative solutions to those problems. Phase III: Product Design / Design Event learners work in groups looking for all the information or sources of support to make a product design and product manufacturing operations planning. Stage IV: The production process / activity Once the product design is complete, learners collect and collate material products according to design products to be made, then of the design and the results in the investigation to the person who masterfully. Phase V: Presentation of the results obtained from each group demonstrate their products to other groups, while teachers to pass judgment on the outcome of the respective product groups. Phase VI: Evaluation Provide individual evaluation exercises to determine the ability to accept the concept of self-developed material.

G. Evaluation Project Base Learning (PBL)



The evaluation phase is an important stage in the project-based learning. In order to know the extent to which faculty practice learning objectives can be achieved. Assessment through the tasks performed on tasks that learners individually or in groups for a certain period. The task is often associated with the collection of data / materials, data analysis, presentation of data or materials, and report generation. Assessment tasks can be performed on a task or process during the execution of the final test. Thus, professors can assign things that need to be assessed. Implementation of the assessment can use the check list (checklist) or the assessment scale (rating scale).

The successful implementation of project-based learning to the learners depends on the design of the learning phase. Phase lessons that are designed to be able to dig their own inventions. The role of the faculty in this study is as a mediator and facilitator, where the implementation of project-based learning, educators should be able to motivate learners to express their opinions in the presentation of the project democratically.

H. Learning on Vocational Education

Implementation of learning for Production Machining Technology courses in the Department of Mechanical Engineering held in Production Technology Laboratory. Practical lesson in the laboratory is intended that keterlaksanaan learning according to the learning objectives in the mastery of competencies as written in the standard of competence which is the basis for curriculum development. Learning in the lab is a very important part of the learning process. Learners will learn and remember information longer after carrying out laboratory experiments. Baillie and Hazel (2003: 4-8) suggests forms of learning activities in the laboratory, namely: the exercise of control, investigation and project work. According Asirvatham (2002) in http://www.colorado.edu/gtp/training/publications/responsibility_lab_instructor_is_helping_students_achieve_the_learning_objectives, namely:

Give the student the opportunity to carry out experiments, (2) Make careful observations and record information accurately, (3) Become proficient in laboratory techniques and the use of instruments, (4) Collect data, and analyze it in a scientific manner, (5) Learn to interpret results and draw valid conclusions, (6) Provide applications of concepts and principles discussed in lecture, (7) Learn to work independently and make decisions, (8) Develop the ability to plan and carry out lab tests, (9) Cultivate a team spirit when experiments call for students to work in pairs or groups, (10) Gain respect for the difficulties involved in performing some types of experiments, (11) Acquire skills in using the scientific method, (12) Stimulate interest, enthusiasm and appreciation for science and its impact on everyday life and living.

According to Dickman (2009) in <http://tep.uoregon.edu/resources/librarylinks/>, learning in the laboratory may have benefits in:

(1) Get to know your students and create a safe and friendly atmosphere, (2) Get students to work in small groups with other students, (3) Motivate students with hand-on examples, (4) Allow students to be creative, (5) Help students to understand the significance of the activity, (6) Challenge students to construct their own models and to investigate them, (7) Familiarize students with techniques and laboratory tools.



According Wena (2010: 135) laboratory training learning strategies include: the formation of groups, presentation of the material, training / practice, and training / practice real problems. According to Unesco recommendations (2001), technical and vocational education for the orientation and education of students should include learning theory and practice are balanced. In addition the study program managers must cooperate with the professional community in the field. The learning process in the study program should: (1) is based on problem-solving and experimental approach and involve experience in planning methods and decision-making; (2) introduce the learner to a broad spectrum of technology and productive work situations; (3) develop special procedures concerning valuable practical skills such as tool use, repair and maintenance and safety procedures, and appreciate the value of work; (4) develop an appreciation of the design, workmanship and good quality; (5) develop the ability to function as a team member and to communicate technical information; (6) close to the local environment without limiting yourself.

Vocational education is characterized by a very close relationship with the workplace. Theoretical and practical learning are combined such that compliance is assured. Students in vocational education learning real skills in the practical world, and learn about and reflect upon the theoretical world. In vocational education both theory and practice have the same value for learning in school and learning in the workplace. Thus, both theoretical and practical learning is not confined to student learning (DG Education and Culture, 2005: 6).

Based on the above, it is understood that the implementation of learning in vocational education include learning theory and practice. The study program in cooperation with the professional community in the field, so that the learning carried out in the laboratory and in the workplace in accordance with the courses studied. Thus, learning in vocational education leads to learning according to the working world.

I. Competency

Competence in specific and technical sense described by Nordhaug (1998: 8-19), that competence consists of knowledge about methods, processes, and techniques designed to carry out specific tasks and the ability to use tools and equipment. This means in terms of specific competencies and technical knowledge covers the working principle and working procedures, as well as the ability to operate a tool to carry out a specific task or job. Bowden & Masters (1993: 39) expressly says that competence should be defined as one who truly do a person, not a has been obtained from the learning that may not be possible. This means that competence refers to a person's performance-ability. Preston & Walker (1993: 127) gives the definition of competencies with a holistic approach as a combination of knowledge, skills and attitudes that enable a person can do its job.

Competence by Bunk, Kaizer & Zedler (Prihadi, 2004: 15), identified in four groups, namely: (1) "Vocational competence"; carry out work on a specific activity, (2) "Methodical competence", is systemic reactions and systemic action on each challenge are shown as performance, in order to obtain



independent solutions and are able to use the experience in order to obtain a meaningful way to address the problems of employment; (3) "Social competence", is the ability to communicate with others and work together in a way cooperative, exhibit behavioral group orientation and empathy, (4) "participative competence", the finesse of work and adaptation to the work environment in the broad sense, the ability to organize and make a decision, and readiness to take responsibility.

The learning model by Joyce & Weil (1996: 20) is a planning or patterns that can be used for curriculum (long learning materials), design of learning materials, and to deliver learning inside and outside the classroom. Joyce & Weil (1996: 46) describes the learning model is a plan that is used as a guide in the classroom learning or learning in tutorials and to determine learning tools and direct us in designing learning to help learners so that the learning objectives achieved.

Therefore, the development of good learning model must be adapted to specific conditions. This condition is a little big or complex case of an educational institution, the scope of the duty of educational institutions, as well as the ability of a manager. Joyce & Weil (1996: 87) describes the learning model is a plan that is used as a guide in the classroom learning or learning in tutorials and learning tools to determine and direct us in designing learning to help learners so that the learning objectives achieved.

Teaching models according to taxonomy Gustafson (2003: 112) is divided into four categories, namely, model-oriented; (1) class, (2) product, (3) system, and (4) organization. According to the model the manufacture of products has three main characteristics; (1) the assumption that the required learning products, (2) the necessary testing and revision of the air and over again until steady and (3) the assumption that the product must be used by a variety of learning manager. In connection with the manufacture of the product models, such as modules and / or instructional materials teaching, learning model that is premised development is the Model Dick & Carey (2005) and other models that are considered relevant. It can be seen that at this time we need a learning model that is able to empower students to achieve their competencies.

The main components of learning theory according Reigeluth & Merrill (1983: 22), namely: methods, conditions, and results. What is meant by learning methods are various ways to achieve various results, in various macarn conditions. Learning conditions is a factor that affects the impact of the method, and it is therefore important to determine the method. Learning outcomes are the consequences of which can be used to measure the usefulness of various methods in various conditions. Learning strategies (instructional strategy) is a plan to help the learner through a variety of efforts to achieve each goal.

Furthermore, Seels and Richey (1994: 31) says that learning strategies are the specifications for selecting and sorting processes and activities in a lesson. Meanwhile, Dick & Carey (2005) says that the learning strategy usually describes a common component of a set of learning materials and procedures that will be used with other ingredients to produce the specific learning outcomes of the



students. Furthermore, Dick & Carey (2005: 190-198) also details the five components of learning strategies, namely: (1) pre-instructional activities, (2) the presentation of information, (3) the participation of students, (4) tests, and (5) follow-up.

The learning activities according to Gagne and Briggs (Dick & Carey, 2005: 189), namely; (1) providing motivation or draw attention; (2) explains the purpose of learning to students; (3) remind competency prerequisites; (4) provide a stimulus (issues, topics, concepts); (5) give instructions to learn (how to learn); (6) creates the appearance of a student; (7) provide feedback; (8) assessing performance; and (9) Summing up. These aspects are all used in the implementation of the strategy developed in the practical lesson learning model development. The same is stated by Arends (2004: 97-100) in lesson planning is good to be able to involve the use of time allocation, selecting appropriate learning methods, create student interest, and build a productive learning environment. In fact, careful planning is needed for many aspects of modern life. However, the learning plan can also have the unintended consequence of rendering the lecturer is not sensitive to the needs and ideas of students.

III. ANALYSIS AND DISCUSSION

Project Based Learning is a learning model that involves students in problem-solving activities and provide opportunities students work autonomously construct their own learning, and ultimately produce valuable and realistic work of students. Satyasa (2006) also explained that in the PBL project was done in collaboration and innovative focus on solving problems associated with student life or community. Based on these opinions indicate that PBL implementation emphasis on collaborative learning.

In the passage of time, the students carry out all activities ranging from the preparation of their project implementation to monitor and report the temporary lecturers monitor the progress of projects student groups and provide the necessary guidance. In the next phase, after the student reported the results of projects they do, lecturers assess student achievement gain in terms of both knowledge (knowledge of related concepts that are relevant to the topic), to skills and attitudes that go with it. Finally, the lecturer then give students the opportunity to reflect on all the activities (activities) in project-based learning that they have done so in other learning opportunities and project completion activities to be better again.

This model has several advantages and disadvantages. The surplus is to be able to remodel the mindset of learners from a narrow becoming more extensive and thorough in looking at and solving problems encountered in life, the knowledge gained is functional, a student studying seriously in working together, and children are fully responsible for the work, while weakness is applicable curriculum in our country today, either vertically or horizontally, yet supporting the implementation of these methods, organization of material, planning and implementation of this method is difficult and requires special expertise of the lecturers, while the lecturers are not ready for this and study materials



often be wide, so it can obscure the basic unit are discussed.

IV. CONCLUSIONS

Based on the results of the analysis concludes that LPTK-PTK in the implementation of the demands of relevance to business and industry (DUDI), is a characteristic of the most important characteristics for vocational education. Embodiments of reciprocity in the form of the willingness of businesses and industries (DUDI), to accommodate the students to have the opportunity of learning experience in employment / industry is translated into material for the planning and implementation of educational programs, and other forms of cooperation more mutually beneficial. Education Vocational Technology has broad implications to the learning process. Appropriate learning in the Vocational Technology Education is learning to use a competency-based approach that is based on two basic philosophies. The first is the idea of "human competence" is an ability that is really visible. Knowledge, attitudes, and skills is worthless if it is not in-show with their results. The second philosophy of "mastery learning" to mention that almost everyone can learn all things well, when getting a quality learning and adequate time.

Based on the conclusion, here are some suggestions put forward in the learning process of vocational education / vocational as part of the national education system plays a very strategic role for the realization of a highly skilled workforce. From various studies that the opportunity to have high economic growth and sustainable of the country would be even greater if supported by human resources that have: (1) basic knowledge and skills to meet the demands and dynamics of ongoing developments; (2) the higher the level of education; (3) skill backgrounds in science and technology (science and technology); and (4) the ability to produce products both of quality and price, able to compete with other products in the global market.



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