

## Efforts to Improve Creativity and Knowledge Competence Using Project-Based Learning Methods

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### ABSTRACT:

*In metal welding workmanship requires skill capabilities with creativity so the results will be good. The work of welding on practical lessons for students as competencies requires skill skills with qualified creativity. The Department of Metal Fabrication and Welding Engineering at the Southern Coastal Community Academy applied a project-based learning strategy. Project-Based Learning methods (PjBL) are applied to enhance the creativity and competency of student knowledge in welding practice subjects. As a dominant strategy for classroom action research using three cycles. Where the subjects were students of the Metal Fabrication Engineering Department and the South Coastal Community Academy, totaling 26 students. Data collection techniques used include inquiry, observation and tests. Analysis of the data used in this study tested individual accuracy. The results of the study indicate that the application of project-based learning strategies can enhance the creativity and skills of student competency in welding practice courses.*

**KEYWORDS:** Project Based Learning Methods; Creativity; Knowledge Competence

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### I. INTRODUCTION

In a welding job, welding skills and creativity skills are needed to produce good objects. The relationship between the ability in the field of welding is very useful in ensuring that the welding produced will be of high quality. While the creativity component provides an alternative way to work so as to produce a quality product.

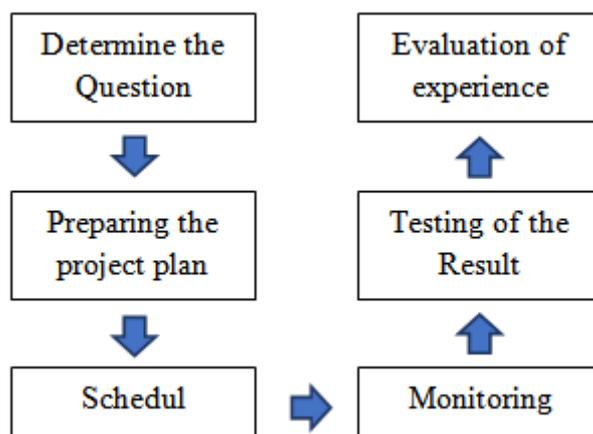
Vocational education is an academic community that has the goal of forming students who have good creativity and competency skills. In achieving it can be done various ways with learning strategies. In implementing the implementation of educational innovation, it is necessary to consider the challenges that always arise as a result of efforts to achieve educational goals. In addition, creativity is a typical meeting point between three psychological attributes: intelligence, cognitive style, and personality [1], [2]. Observations were made at Southern Coast Community College. Conventional welding learning is done by training students to weld metal pieces without knowing what the object will be. This causes students to feel bored in learning. Various concepts relating to brain ability, intelligence, and creativity, develop further, and further strengthen arguments that want to correct the weaknesses of conventional learning systems [3].

The learning model applied in this study uses a project-based learning strategy model [4], namely the Student Centered Learning (SCL) method. SCL is very appropriate to be implemented in the learning process, so that the creativity and competence of knowledge gained by students will be achieved [5]. The objectives of this study include knowing and revealing the impact of the application of the Project Based Learning (PjBL) learning model in enhancing students' creativity and knowledge competences in the Community Academy Metal Fabrication and Welding Engineering in the South Coast in a welding practice course. Creativity is closely related to imagination, because creativity develops thinking power, and intellectual fantasy power [6].

Creative thinking includes aptitude and non-aptitude features [7]. Aptitude characteristics are characteristics associated with cognition or thought processes, which include: Fluency, Flexibility, Originality, and Elaboration. While non-aptitude characteristics are characteristics that are more related to attitudes or feelings, motivation or encouragement than in doing something: curiosity, imaginative, challenged by pluralism, brave taking risks, and being respectful [8].

The ability of each individual's work which includes aspects of knowledge, skills and work attitudes in accordance with the standards specified shows their competence. Competencies that must be possessed by graduates of the Community Academy that Diploma 2 graduates are equivalent to level 4, this is in accordance with the Indonesian National Qualifications Framework (KKNI) which has been regulated in the Republic of Indonesia Presidential Regulation No. 8 of 2012 [9].

Project Based Learning is an innovative student-centered learning method and the teacher as a motivator and facilitator. Students are given the opportunity to work independently in building their learning [10]. This method is compatible with the concept of educational engineering. Educational engineering is carried out in cases such as in basic student science cases that are useful in solving problems encountered, in the case of independent active students with material presentations integrated and relevant to actual student-centered reality, and in the case of students able to think critically develop initiative. So that the reflective method of solving problems, is the process of active, careful thinking, which is based on the thought process towards a definitive summary [11]. The learning steps of PjBL can be illustrated in the following diagram Figure 1.



**Figure 1:** Diagram of Steps of PjBL Learning Implementation

## II. THE RESEARCH METHODS

This research using class room action research method in three cycles [12]. Before the research was conducted at the Southern Coastal Community College at Jalan Sudirman, Sago Pesisir Selatan. The research time is done on the even semester of academic year 2015/2016 March to June 2016. The research timing refers to the academic calendar of the South Coast Community College.

Subjects in this study are students of South Coastal Community Academy Prodi Fabrication Technique and etal Welding Year Entry 2015, with the number of students 26 people.

This research applies the strategy of Project Based Learning in Fabrication and Metal Welding Course. The Project-based implementation steps use syntax as the following matrix:

**Table 1.** Matrix Student and Teacher Activities

No	Fase	Student activities	Teacher activities
1	Formulation of learning outcomes	Pay attention, ask questions and discuss tasks	Briefing the purpose of the project work task
2	Understanding the material concept of the welding process	a. Studying independently of teaching materials and modules in accordance with the courses. b. Discuss with peer and teacher	a. Giving the task of reading the modules and materials concerned withsubject. b. Conduct tests
3	Training of welding technique	Practice using a welding machine with a simple object	Demonstration and traning of welding machine operation
4	Project assignment (Project development tailored to the needs of equipment in fabrication and welding workshops)	a. Identify the required equipment in the workshop b. Analyze some discourses related to the project to be created c. Discuss with groups, tutorials with educators.	a. Stimulate the learners to find and identify the required equipment in the workshop b. Provision of project design tasks c. Carry out mentoring tasks, discussions and serve consultation learners
5	Project design	Choose project assignments to be drafted and suggest drafts to educators	Consider the project proposals of learners, provide input and approval
6	Making project design	Create project	Provide guidance, direction, consultation and

No	Fase	Student activities	Teacher activities
		specification tasks, make working drawings, materials and machinery needed, production costs, work procedures, and safety, design time of production	tutorial
7	Finishing design	Do and revise project tasks	Approval project task
8	Done the project tasks	a. Preparing materials, machinery and equipment needed b. work preparation c. Carry out work in accordance with SOP	a. Keep an eye on and help learners b. Provide guidance and time for consultation
9	Finishing project and feedback	a. Finishing of project tasks b. Discussion and summarize c. Work report	the final consultation
10	Evaluate processes and products	Following assessment and making a report	a. Give exams and provide feedback to learners b. Provide assessment of test results

Source [13]

In this study, the instruments used for data collection were questionnaire creativity, and assessment sheets. Steps taken before being used for data collection. Some aspects used in measuring creativity include fluency, flexibility, authenticity, decomposition. Number of item of 36. The test sheet has the following lattice:

**Table 2.** Matrix of Test Indicators

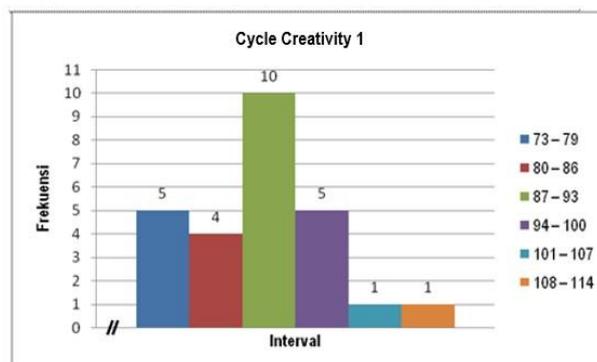
Cycle	Subject	Test Indicator	Number of item
1	Gas Oxy Acetylene	Knowledge of oxy acetylene gas welding material	10
2	Arc Welding	Knowledge of arc welding	10
3	Gas oxy acetylene and Arc welding	Knowledge of oxy acetylene and arc welding	10

Source [14]

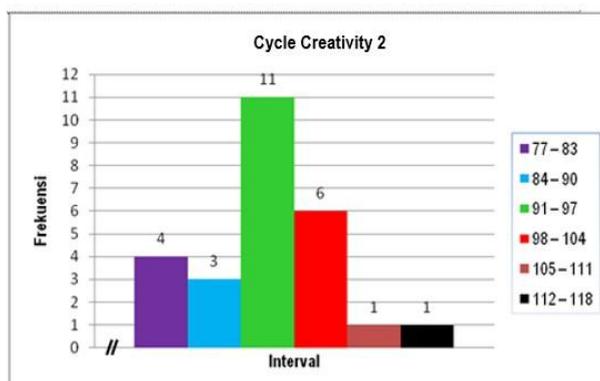
Test the validity and reliability of the instrument before using it. this test uses SPSS version 15.0 [15]. Test instruments were given to 22 respondents with 36 item items, r table value 0.423 from the value obtained 33 items valid and 3 items invalid.

### III. RESULTS AND DISCUSSION

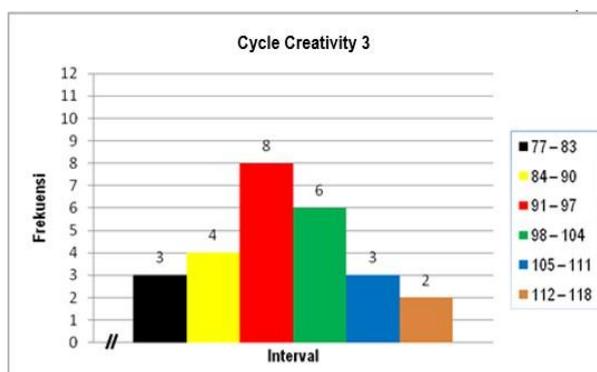
This research was conducted in three cycles with the result of measurement about creativity and knowledge competence as follows (Figure 2):



(a). Score on Cycle 1



(b). Score on Cycle2



(c) Score on Cycle3

Figure 2: Creativity score on cycle 1, 2, and 3

Measurement of Knowledge Competency

Table 3. Matrix of Test Indicators

Cycle	Past			
	< 55 (failed)		≥ 55 (success)	
	N	%	N	%
1	5	19,2	21	80,8
2	3	11,5	23	88,5
3	0	0	26	100

N =number of students

In cycle 1 students' creativity is obtained in sufficient categories. In cycles 2 and 3 the creativity of students falls into the good category. This shows an increase in creativity from the first cycle to the third cycle. From this condition it can be stated that the use of project-based learning applications can improve student creativity. Students look more active in applying learning when implementing project-based learning strategies. Group discussions are carried out by students when students have difficulty completing the project. But if students experience a deadlock they immediately ask the instructor for welding practice.

The application of project-based learning strategies can improve student creativity. Where this strategy is an innovative learning model that involves students actively in building students' knowledge. In addition, it can develop students' potential through a series of processes that help students understand what they are learning through action. In PjBL students are facilitated in realizing ideas and ideas through products with a series of creative and meaningful processes. Basically PjBL as motivation in giving meaning to productive learning as learning with maximum transfer.

Based on the description presented, it can be shown that the Project Based Learning learning model can direct someone to practice and understand complex thinking and know how to integrate in the form of skills that are often associated with real life. The ability to take advantage of finding various sources, critical thinking, solving project problems they get. Giving project assignments to the implementation of the PjBL strategy can stimulate all the senses of students to carry out tasks or problems given by educators. Students will be actively and creatively in solving problems given. Thus the PjBL model can produce better creative thinking skills.

Implementation of the Project Based Learning learning model can improve student competency skills. From the research data, it was found that an increase in the number of students who achieved graduation in cycle 1 was 21 people (80.8%) and those who had not reached graduation were 5 people (19.2%). While in

cycle 2 the number of students who graduated increased to 23 people (88.5%) and students who had not yet graduated decreased to 3 people (11.5%). While for cycle 3 the number of students who achieved graduation increased again to 26 people (100%).

Student learning outcomes can be influenced by increased learning activities that have implications for improving learning outcomes. As revealed G. Kuh [16] that "learning outcomes factors can be grouped into two main factors, namely factors from within and factors from outside the student." These factors can be the level of intelligence, how to learn, talent, study time, burden or task of learning, level of self-discipline, application of available teaching materials, learning strategies used and so on.

Implementation of learning-based project learning models can improve students' competency skills. This is because learning project-based learning methods have been shown to increase learners' motivation, because in the project-based learning method students must be active in learning and try to complete the project given. Students will be more enthusiastic in learning because students are required to work together in solving problems given. That is what causes learning-based learning models to improve students' competency skills.

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#### V. CONCLUSION

Based on the research that has been done about the application of learning model of project based learning, it can be concluded that implementation of project based learning model of learning can improve the creativity of learners in the course of practice las ii and the competence of the students

#### REFERENCES

- [1]. N. J. Entwistle, *Styles of learning and teaching: An integrated outline of educational psychology for students, teachers and lecturers*. David Fulton Publishers, 2013.
- [2]. T. M. Amabile, *Creativity in context: Update to the social psychology of creativity*. Routledge, 2018.
- [3]. R. Refdinal, A. Ambiyar, W. Waskito, and H. Nurdin, "Assessment Methods with Gradations of Answers on Learning through E-Learning," in 5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018), 2019.
- [4]. Kemendikbud, "Model Pembelajaran Berbasis Proyek/Project Based Learning," Jakarta, 2014.
- [5]. B. Elmedni and B. P. Lyons, "Writing Skills Development for Graduate Students: Workshop Intervention Using a Student-Centered Learning Approach," *Journal of Education & Social Policy*, vol. 2, no. 1, pp. 38–49, 2015.
- [6]. R. Petrovic, V. Trifunovic, and R. Milovanovic, "Giftedness and Creativity of Students and Teachers in the Process of Education.," *International Education Studies*, vol. 6, no. 7, pp. 111–118, 2013.
- [7]. J. P. Guilford, "others: The relations of creative thinking aptitudes to Non-aptitude personality traits," *Reports from the Psychological Laboratory*, vol. 20.
- [8]. J. C. Kaufman and R. J. Sternberg, *The Cambridge handbook of creativity*. Cambridge University Press, 2010.
- [9]. P. R. Indonesia, "Peraturan Presiden Republik Indonesia Nomor 8 Tahun 2012 Tentang Kerangka Kualifikasi Nasional Indonesia," Jakarta: Kementerian Riset, Teknologi, dan Pendidikan Tinggi, 2012.
- [10]. G. Lucas, "George Lucas educational foundation," Retrieved March, vol. 20, p. 2005, 2005.
- [11]. Hendri Nurdin, Hasanuddin, Waskito, Refdinal, and Darmawi, "Assessment of Product Prototype Existence As a Media Of Learning to Accelerate The Transfer of Technology And Diversification In Rural Industries," in 4th IC TVET, Padang, 2017, vol. 1, pp. 76–81.
- [12]. A. Suharsimi and S. Suhardjono, "Penelitian tindakan kelas," Jakarta: Bumi Aksara, 2006.
- [13]. N. Jalinus, Ramli, Muhibbuddin., "Pengembangan Model Pembelajaran Kompetensi Teknik Pemesinan Berbasis Project-Based Learning Pada Pendidikan Vokasi dan Kejuruan di Sumatera Barat," *Penelitian Tim Pascasarjana - Dikti*, 2015.
- [14]. N. Sudjana and P. H. P. B. Mengajar, Bandung: PT. Tarsito, 2005.
- [15]. I. SPSS, "SPSS for Windows (Version 15.0. 1.1)," Chicago, IL: SPSS, 2007.
- [16]. G. Kuh, *Involving Colleges: Successful Approaches to Fostering Student Learning and Development outside the Classroom..* ERIC, 1991.

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