

Developing Soft Skills Learning Model for Mechanical Engineering Students Vocational High School

Suryo Hartanto
Universitas Riau
Pekan baru, Indonesia
suryo@fkip.unrika.ac.id

Asrul Huda
Padang State University
Padang, Indonesia
asrulhuda@gmail.com

Ratih Fordiana
SMK Negeri 5 Batam
Batam, Indonesia

Abstract—This research was based on the very low competency of soft skills acquired by graduates of Mechanical Engineering of Vocational High School performed at workplaces. The objectives of the research were to identify specific soft skills that should be mastered by students of Mechanical engineering and to develop instructional models to teach the soft skills. The research consisted of two parts: (1) to identify soft skills needed by students of Mechanical by using engineering survey and questionnaire, (2) to develop instructional models to teach soft skills, followed a modified Borg & Gail design through R&D research design. The instructional models were called six principles of soft skills instructional models, or MP2S6P. The effectiveness of the model of an experiment was conducted through a posttest-only control group design. Based on the research findings, there are 27 soft skills that should be mastered by students of Mechanical Engineering. The application of the developed MP26P model resulted in significant achievement which was better than by using conventional instruction towards the students at Mechanical Engineering Department. The teachers and students have positive perceptions about the MP2S6P model. Based on the results, it can be recommended that MP2S6P should be developed and used in teaching necessary soft skills in Vocational High Schools.

Keywords—soft skills; MP2S6P; research and development

I. INTRODUCTION

Soft skills play a dominant role supporting someone's work and career development [1]. "Future career success of students supports employers' opinions that some soft skills are a better predictor of adult success (Salaries, graduation rates, home ownership) than technical skills. Appropriate soft skills play an important role in a successful career as well as during social interactions in the society. Also Reviews These skills are highly sought after by employers recruiting fresh graduates [2]. The low soft skills of graduates of vocational greatly affect the absorption of labor vocational school graduates. Preliminary Survey of the study indicated problems of soft skills that are not optimal by employees of vocational school graduates, i.e.; a).

low attitude of responsibility in the work and tasks, low achievement of employment targets, lack of desire to learn and improving their *career*, high *lost time* due to *human error*, lack of work discipline, lack of understanding of safety, lack of independence, lack of integrity, lack of work ethic as well as the less scrupulous in work. The following table shows workplace accidents due to the lack of understanding of workplace safety, and b) Increased customer claim.

TABLE I. ACCIDENT EMPLOYEE

No.	Year	Human Error	Tool Error	Number
1	2010	60	9	69
2	2011	67	9	76
3	2012	30	8	38
4	2013	68	5	73
5	2014	50	5	55
TOTAL		275	36	311
PT.BSB. 2012-2014. [3].				

Vocational teaching and learning processes tend to rely on the ability of *hard skills* while the world of working requires a workforce that is efficient, effective and service-oriented to quality standards. Essentially learning *soft skills* should be directly integrated with work processes that shape the experiences of *hard skills* and *soft skills* in the learning process. *Soft skills are character traits, attitudes, and behaviors-rather than technical aptitude or knowledge.*" [3,4]. The purpose of this study was to reveal the coverage *soft skills* needed and very important needed by industry to be taught to students of Mechanical Engineering Department of Vocational high school (SMK) as well as to determine the validity, effectiveness, and practicalities of the developed *soft skills* learning model.

Learning *the hard skills* and *soft skills* in vocational students should be balanced. *Soft skills are as important as cognitive skills* [3]. *Soft skills of the individual to meet the world of work is needed in the future, "the future of the occupational structure in the Industrialized world is to Eliminate more and more such unskilled jobs and to put an*

increasing premium on higher levels of reading, computation, communication, or reasoning and problem-solving skills in essence. The skills Learned in school and the skills learned on the jobs will be Increasingly seen as complementary and interactive" [5].

The learning model is a structured procedure used to achieve the learning objectives of effective, practical and efficient in the process learning to achieve optimal student competence [6-8]. MP2S6P is a learning model that is integrated with the world of work and it is developed based on the needs of the soft skills of industrial jobs. Identifying the soft skills used as a basis to develop methods, approaches, and strategies suitable for the use in teaching soft skills. MP2S6P compiled systematically taking into account the needs of student competence, assessment, and evaluation of soft skills. MP2S6P is integrated with the strategy of work shadowing and provides meaningful learning. Intelligence and creativity can be formed from the neighborhood and school [9]. Soft skills with work shadowing refer to the six principles of approaches: learning by doing, learning by participating, exemplary, disciplined, habituation and contextual teaching-learning where it obtained through a mentoring process with experts in the industry in accordance with the machines competences. Work shadowing gives students the opportunity to learn and feel instantly becoming part of the work did [10,3].

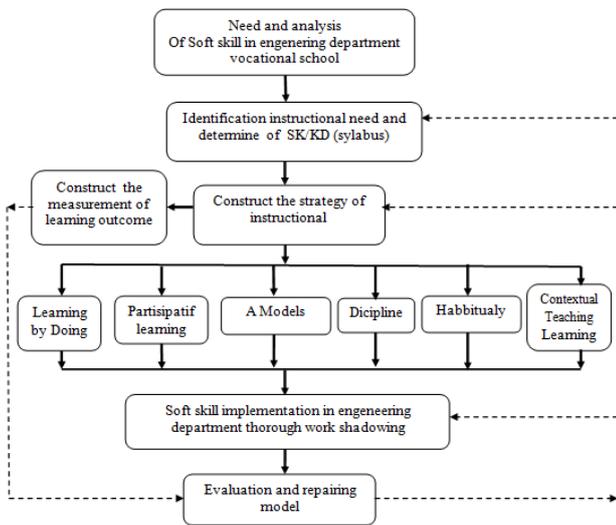


Fig. 1. Six principles of soft skills instructional model.

II. RESEARCH METHOD

This study consisted of two stages. First was the analysis of needs (need analysis) through an approach DACUM (Developing curriculum) [3,5,11]. The second was using research & development (R and D). It was through the design of the modified by Borg and Gall, with a four-step process: (1) Perform analysis of the product to be developed, (2) Develop initial product, (3) Validation experts and revision, and (4) The field trials and the final product.

The samples of needs analysis were 50 respondents: the machining industry practitioners, teachers, and experts Machining vocational training fields of human resource

development in the Province of Riau Islands. Likert scale questionnaire instrument used categories of; Very Important, Important, Less Important and Not important. Results of needs analysis were being as the basis for a second study with the results of the product are MP2S6P to support learning model books, guidebooks instructors, teachers, and students.

The second research product was the validity, effectiveness, and practicalities of the product. Test of the validity was using content validity, through a questionnaire, by five experts selected who are appropriate in the relevant field. The validity test results were delivered in a descriptive form and Interclass correlation. Test of the effectiveness of the learning model MP2S6 was delivered through the actions of the experiment, where the sample and population were students of XI grade student of SMK at Batam. Samples were selected by using random cluster sampling technique where the students, who are conducting industrial work practices, are divided into two groups. The control group was students who perform with a conventional industry practice without using the strategy work shadowing and learning soft skills. The experimental group was working students practice industries using learning model soft skills six principles (MP2S6P) with strategy work shadowing. Test of the practicalities of the perception of teachers and students to MP2S6P after the industrial working practices conducted as measured using a questionnaire, the experimental group students, and teachers in Engineering machine. Data were analyzed using descriptive quantitative.

III. RESULT AND DISCUSSION

Based on the results of the first study, there are 27 items of soft skills in machining work. Soft skills that must be possessed by students of Mechanical Engineering Department of SMK [3], in the general categories, namely: (1) Demonstrate a willingness to develop a career, (2) Shows the communication ethics, (3) Demonstrate interpersonal relationships, (4) Demonstrate cooperation, (5) Demonstrate a high work ethic, (6) Showing actions solve the problem, (7) Maintaining timely attendance, (8) Demonstrate high initiative, (9) Demonstrate honesty, (10) Observe all the rules of work, (11) Demonstrate a responsible attitude on the job, (12) Shows adaptation of work [3], of soft skills Special machining the workforce, namely: (13) Trying to comply with appropriate design of work processes of production, (14) Trying to adhere to production quotas, (15) Shows being supportive, caring for and maintaining the company's success, (16) Motivated to follow self-development training, (17) Shows appropriate operational planning and product specs, (18) Always demonstrate Warming up machines, (19) Indicates operational readiness of equipment, checking the engine unit (20) Shows, (21) setting the machine according to the specifications, demonstrating (22) material handling, (23) Demonstrating health and safety, (24) Showing prudence in operating machines, (25) Indicates maintenance and engine maintenance, (26) Demonstrate checking the work, turn off the engine, and (27) Demonstrate appropriate procedure.

Based on the results of research and development, the validity of the expert judgment, using a Likert scale questionnaire with the assessment, it was declared that the product was valid. Test of effectiveness was by assessing

learning outcomes of learning *soft skills* by the students at the experimental action. Soft skills assessment was conducted by instructors on industrial working practices with instrument rating action. Effectiveness test was aimed to see the results of hypothesis in the following table 2:

TABLE II. HYPOTHESIS MP2S6P

		Scores of Control Group	Scores of KSP Group	
Test Value = 0	T	39.017	31.439	
	Df	14	14	
	Sig.	(2-tailed),000,	000	
	Mean Difference	74.400	81.000	
	95% Confidence Interval of the Difference	Lower	70.31	75.47
		Upper	78.49	86.53

Based on table 2, number $t_{\text{count}} = 39.017$ for the control group, whereas for t_{count} of experimental groups was 31.439 with the t_{table} at $df = 14$ significance at $5\% = 1.761$. Thus, if the mark of $t_{\text{count}} > t_{\text{table}}$, ($39.017 > 1.762$ and $31.439 > 1.761$), the H_0 was rejected and H_a was received (significantly). Based on the *mean difference* on the chart of a control group of 74,400 and 81,000 for the experimental group, the application of learning model *soft skills* for six principles are effectively improve learning outcomes of students' *soft skills* at Mechanical Engineering Department of SMK.

Test of practicalities was conducted by identifying the perceptions of students in the experimental group and teacher of Mechanical Engineering at SMK. Based on the data obtained, calculation of practicalities was 86.8% for teachers and 80.6% of students' respondents, with the categories of "Good". Then, test the practicalities of learning model *soft skills* for six principles stated as the **Good** category.

TABLE III. DISTRIBUTION OF PERCEPTION DATA OF TEACHER AND STUDENT

Respondents	Teacher	Student	Respondents	Teacher	Student
Sample	12	15	Variance	82.932	72.352
Mean	143.25	148.27	Minimum	123	137
Median	142.00	148.00	Maximum	157	166
Mode	142	137 ^a	Sum	1719	2224

Soft skills provide an important role in the field of machining work [12,13], which is a necessity in the face of the working world of the 21st century [5,4], *communication, relationships and collaboration, critical thinking and decision making, and initiative and self-direction*. Soft skills possessed by the individual in the learning process will be interconnected to support the field of employment [14]. 1). *Introduce students to basic people skills so they understand how to get along with people.* 2) *Segue to teaching essential customer service skills.* 3). *Foster student understanding by facilitating a problem-*

solving discussion based on real-life situations. 4). *Have students demonstrated the people skills they have learned using role-play exercises in a mock business setting.* Student learning outcomes can be influenced by several factors, among others, is the accuracy of teachers choose learning model that results will improve understanding and experience of the students in learning [15,16], learning model, a blueprint in teaching for a teacher who provides structure and guidance to teachers in the learning process. MP2S6P provide concrete learning experiences that correspond to the learning needs of school learning with the learning process directly on the specialist field of mechanical engineering [17-19]. Learning is integrated with the world of work, provide experience to students and build bridges between school education with the world of professional work to combine the theoretical capability in education direct application in the world of work. MP2S6P is an effort to prepare individual learners to have the ability in certain areas of work [20].

IV. CONCLUSION

There are 27 *soft skills* in Mechanical Engineering of vocational high school found through needs analysis; 12 soft skills for the general category and 15 soft skills for specific machines categories. Through the technique of Learning Model of *Soft Skills* of Six Principles, the 27 soft skills taught to students. Results of research and development with the *soft skills* learning model towards the students of Mechanical Engineering Department of SMK was declared valid, effective and practical.

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