Competency Mapping Based Work Area Electrical Industry Classification for Vocational Education and Training

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Abstract - The purpose of this study was to map the electrical field work competency based industry classification. Competency mapping work in this study considers the Regional Model Competency Standards (RMCS), namely: the task skills, task management skills, contingency management skills, job/role environment skills, and skills transfer. The research is a survey by the method of analysis tasks through DACUM approach. The survey was conducted in several industries to identify the types of industries. Subject of research focused on large industrial, namely Factory PT. Semen Tonasa Pangkep South Sulawesi. The results of research in the form of electrical competence, with 6 basic competencies, namely: (1) basic electricity, (2) basic electronics, (3) maintenance and repairs, (4) the operation of electric power, (5) the management of electricity, and (6) health work safety. Six basic competences can be used as basis for the development of vocational education and training.

Index Terms - mapping; competence; classification; vocational

1. Introduction

Education is a systematic process to improve human dignity that enables the human dimension to develop optimally. Thus, education is a strategic vehicle for efforts to develop all the potential of the individual, so that the ideals develop human can be achieved. In Article 1 of Law No. 20 of 2003 on National Education System, that education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners are actively developing the potential for him to have the spiritual strength of religious, self-control, personality, intelligence, noble character, and skills needed him, society, nation and state [1].

The development of industry in the era of globalization requires a competent workforce. One factor that led to the company cannot compete with foreign parties are less competent workforce, this has resulted in inefficient so that the cost is more expensive. According [2] that the lack of competent manpower for the company itself less able to identify and anticipate the needs of the workforce for the future.

The challenges of globalization and trade information currently demanding industrial world must produce the highest quality products with the support of technology and qualified human resources. Needs competent workforce is necessary for the industry to be competitive and increase company productivity. If an employee competencies are known then the company must continue to strive to help improve the competence of the employees through education and training.

Labor supply in Indonesia is done through education and training in the workplace. Educational paths take through formal, non-formal and in-formal. While the path taken training through vocational training centers and vocational skills courses. Development of education and vocational training should be based on the needs of the workforce.

Vocational High School (VHS) is one of the vocational educational and training institutions responsible for generating competent human resources so that graduates can have a good performance in the world of work. In accordance with Act No. 20 of 2003 states that the objective is to improve the ability of vocational learners to be able to develop themselves in line with the development of science and technology, as well as to prepare students to enter the workforce. Two things are the advantages of vocational education are: (1) graduates can fill the job opportunities in the industry and the business world, because it is associated with the certification owned graduates through competency test, (2) graduates can continue to pursue higher education, where graduates it meets the requirements [1].

Characteristics of vocational education provision should be oriented needs of the workforce, namely: (1) vocational education geared to prepare students to enter the job, (2) vocational education based on the "demand-driven", (3 focus the content of vocational education emphasis on the mastery of knowledge, skills, attitudes and values needed by the world of work, (4) the actual assessment of the success of learners should be on skill or performance of the world of work, (5) a close relationship with the world of work is the key to success of vocational education, (6) vocational education both are responsive and adaptable to the advancement of technology, (7) vocational education more emphasis on "learning by doing" and "hands-on experience", (8) vocational education requires cutting-edge facilities for practice, and (9) the need for qualified teachers in accordance with expertise. To support the enforceability of the educational process required of teachers who are competent and certified educators [3].

Implementation of continuous vocational education developed according to the needs of the workforce, so that the work is also important competency mapping done regularly. The condition of the domestic industry should be developed in order to improve competitiveness. One effort

is the work competency mapping the electrical field in accordance with the needs of industry. Competence of work includes three elements, namely: skills, knowledge, and attitude.

Competency mapping consider Regional Model Competency Standards (RMCS). Regional Model Competency standards (RMCS), is a standard that was developed based on the competencies required. RMCS broad-based (multi-skills), namely: (1) task skills; (2) Task management skills; (3) contingency management skills; (4) job / role environment skills; and (5) the transfer of skills.

The basic of the theory that is used as the basis development of competency standards (RMCR) is Blooms Taxonomy's theory ". Dividing the ability to learn to be 3 (three) domains: (a) cognitive, (b) Psychomotor, and (c) Affective.

Bloom's Taxonomy is the hierarchical structure that identifies skills ranging from low level to high. Cognitive sphere contains behavior that emphasizes intellectual aspects, such as knowledge, and thinking skills. Affective, include behaviors associated with emotions, such as feelings, values, interests, motivations, and attitudes. While the Psychomotor domain containing manipulative behaviors that emphasize function and motor skills.

First, the cognitive aspect is the thought process that must be mastered by the student to be able to apply theory into action. The cognitive domain consists of six levels, namely: (1) knowledge, (2) understanding, (3) application, (4) analysis, (5) synthesis, and (6) evaluation.

Second, is the affective realm of emotions, such as feelings, values, appreciation, enthusiasm, interest, motivation, and attitude. Five categories affective, namely: (1) acceptance, (2) responsive, (3) respect, (4) organizing, and (5) the internalization of values.

Third, is the psychomotor domain includes physical movement and coordination, motor skills and physical abilities. There are five categories in the psychomotor domain starting from the simple to the complex level, namely: (1) imitation, (2) manipulation, (3) precision, (4) articulation and (5) naturalization. The third sphere is used as the basis for determining the level of a person's competency to be achieved. Competence person can be improved through education and training.

Needs of human resources (HR) qualified and competent by the world of work, as well as the unavailability of labor competency mapping in detail the electricity sector, encourage researchers to conduct research on competency mapping work based on the needs of the electrical engineering industry.

One method that can be used to map and develop the competencies required work by the world of work is to approach DACUM (Developing a Curriculum). DACUM is a process that can be used to analyze a job in any field in the world. DACUM is used to create and update the education and training programs.

Mapping of electrical engineering job competence based classification is very important industry, in an effort to improve the quality of Indonesian workers through education and vocational training institutions. The results of this mapping gives a positive contribution in the development of curriculum in vocational schools and training institutions, as an effort to improve the quality of human resources (HR).

2. Methods

This research is descriptive qualitative research with survey method. The location of this research was conducted in South Sulawesi Province, the research subjects are as follows: (1) Cement Tonasa; (2) the State Electricity Company (PLN); (3) Professional Association electrical Indonesia (APEI); (4) Electrical Contractors Association of Indonesia (AKLI); and (5) Training Institute PLN. Assessment and mapping is done is the field of electricity. Competency mapping the electrical field using DACUM approach, namely: (a) identification and classification of the type of industry; (b) identification of the competencies required by the industry working with industry to direct observation (interviews and questionnaires); (c) The workshop involving industry through DACUM process; and (d) Mapping of job competence based on survey results and the results of workshops with industry.
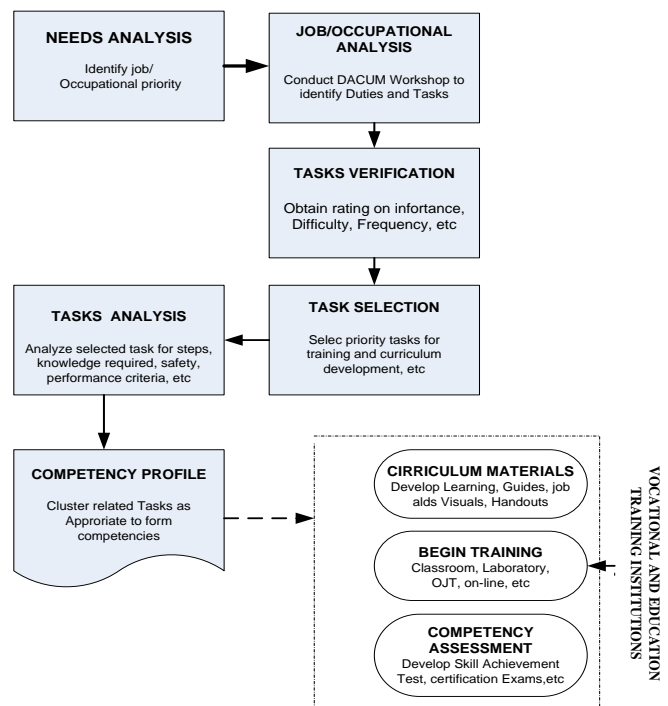

Fig. 1. Process of DACUM [4]

DACUM is a relatively new approach and innovative for job analysis. It proved to be very effective and rapid method for determining the competence or tasks that must be performed by persons employed in a particular job or work area, with relatively low costs. DACUM methodology used in the United States, Canada, and several other countries simply because: 1) highly effective; 2) fast; and 3) low cost. DACUM narrow the gap between what is normally taught in the classroom and what workers actually need to know to achieve the best in the workplace [4]. DACUM analysis can be used as a basis for (1) the development of curriculum, (2) training needs assessment, (3) recruitment, (4) evaluation of the performance of workers, (5) the development of competency testing, and (6) a description of the job [4].

This study was designed to generate electricity sector job competence based on industry classification, types of work, and a description of work to be done. The results of this mapping can be used to develop models of vocational and education training (VET).

The method of data collection was a questionnaire, interview and observation sheet. Questionnaire is used to filter data on the classification and qualification industry, type of work and competencies required by industry. Interviews are used to filter data on work units that exist in the industry, the qualification level of employee education and policies on education and training. While the observation sheet used to observe the activities of employees in industries. Identification of job competence required electrical industry field obtained from DACUM workshop.

The results of the workshop involve industry as a basis for mapping the electrical work competence. Job competency mapping procedure based classification electrical engineering industry with DACUM approach can be illustrated as in Figure 1.

3. Results and Discussion

1. Identification Industrial Classification

Job competence is closely related to human resources (HR) labor. Therefore, the classification of industries that were examined in this study is based on the industry classification of labor and the amount of capital. Based on the amount of labor used, the industry can be divided into:

a. Small industry, that industry work force numbered about 5 to 19 people, the workforce comes from the surrounding environment or still be brothers. Characteristic of small businesses have investment value up to IDR. 200.000.000, (two hundred million dollars) excluding land and business buildings, for example: industrial tile, brick industry, and rattan processing industry. Based on the initial survey conducted turns small industry does not need a job competence electricity sector in particular, so that in this study is not discussed further.

b. Industry is, the industry uses a workforce of approximately 20 to 99 people. Industry characteristics being to have a large enough capital, the greater the investment value of IDR. 200.000.000 (two hundred million dollars) to IDR. 5.000.000.000 (five billion dollars) excluding land and building businesses. Labor certain have skills, and the leadership of the company have certain managerial Traffic. For example: industrial convection, industrial embroidery, and ceramics industries. But also do not require electrical work competence in particular areas, only basic electrical competence and basic competences needed to operate a computer course. Therefore, in this study, are not discussed further.

c. Large industries, industries with a workforce of more than 100 people. Is a major industry characteristics have a large capital gathered collectively in the form of stock ownership, the investment value of more than IDR. 5.000.000.000, - (five billion dollars) excluding land and building businesses. Labor required must have special

skills, and leadership of the company selected through Traffic and feasibility testing. For example: the textile industry, automobile industry, the steel industry and cement industry, and others.

The industrialization in almost all economic sectors has brought many changes in the world of work and lead to new occupational competences, which have never been existent before. Not only new competences are come up, on the contrary many old and traditional competences are not performed anymore in work processes [5].

Based on survey results on small industries and industries are being turned out both the industry did not require new job competence electricity sector in particular, so that in this study electrical engineering job competence of small and medium industries are not assessed. Assessed only on large industrial electricity sector requires special competence, so that the work competency mapping electrical engineering major industrial classification. The study was carried out on an industrial cement plant in Pangkep Tonasa, South-Sulawesi, Indonesia.

2. Competency mapping work in the Industry

Labor required on large industrial, should have a special competence, including the competence field of electricity, so in this study, to be studied further and become a subject of research. Subjects were PT. Semen Tonasa which represents one of the major industries as consumer of electricity.

Law No. 13 of 2003 on employment Article 1 (10), that "Competence is the ability of each individual that includes aspects of knowledge, skills and attitudes that work in accordance with established standards". Furthermore, in explanation of Article 35 (1), Law No. 20 of 2003 on National Education System, stated that "The competence of graduates are qualified graduate capabilities that include attitudes, knowledge and skills in accordance with the agreed national standards". The two statements illustrate that competence is the result of integration of knowledge, skills and attitudes that allow carry out a job effectively. In a broad sense, the competence is a set of intelligent action, the full responsibility of a person as a condition to be considered capable by the community in carrying out tasks in certain occupations.

Competence with respect to the group of skills and knowledge are applied to perform a task or function in accordance with the requirements specified by the job. Based on the etymological meaning, competence is defined as the ability to carry out the work that is based on the knowledge, skills and attitudes to work. So it can be formulated that competence as the ability of a person who can observed include: knowledge, skills, and attitudes work in completing a job set working standards [6].

Based on the above definition, it is generally understood that competence is a set of knowledge (cognitive), skills (psychomotor), and attitude (affective) that are required by a particular job that requires special education and training, which can be observed, measured and evaluated. As explained in the identification of industry classifications that are a focus of this study is the major industry is represented by PT. Semen Tonasa industry. Therefore, a study done on

the job qualifications and competencies electrical engineering work required by the company.

Surveys conducted at the company focused on competency mapping work in the field of electricity. In Semen Tonasa Company survey at 4 different divisions, namely: (a) Slag Production Department; (b) Maintenance of Electrical and Instrument; (c) Power; (d) Maintenance Electrical. The data obtained in the study obtained from questionnaires and interviews with the heads of division of each piece, then reinforced by the results of the workshop DACUM, in order to obtain the competencies electrical engineering work required by the industry. Job competence field of electricity a basic competency achievement of competence, more are presented in Table 1 below.

Table 1. Work Competence electrical field is required Industry

No	Basic Competencies	Competence of Work
1	Basic electrical	Able to read engineering drawings
		Electricity can use measuring tools
		Can understand the electrical circuit
2	Basic electronics	Can read electronic image
		Can read digital and analog measuring devices
		Understanding and application of electronic components
3	Maintenance and repair of equipment	Can take care of industrial equipment
		Can detect damage
		Can improve the impairment
		Creative repairing equipment
		Can maintain the PLC system
		Can maintain industrial automation systems
4	Operation of electric power	Can operate electrical equipment
		Can operate the system control
		Operate industrial automation/ PLC
		Can operate a computer with a variety of application programs
5	Electrical management	Can plan the implementation of industrial operations
		Can coordinate materials and equipment
		Provide technical leadership in the workplace
		Monitor and evaluate the electrical energy consumption
		Identifying and selecting materials for work activities
		Using routine work equipment at the workplace
		Applying technologies and concepts for work activities
6	Occupational health and safety	Understanding the occupational health and safety
		Understanding the risks posed by workplace accidents
		Can apply the occupational health and safety in implementing employment

Based on competency mapping the electrical work in the industry as in Table 1, it is concluded that the electrical work competence required by Industry grouped into six core competencies, namely: (1) fundamentals of electricity, (2) fundamentals of electronics, (3) maintenance and repair of electrical equipment industry, (4) operation of electric power, (5) management of electricity, and (6) health and safety. Therefore, the six core competencies that can be used as a basis for the development of learning tools in technical and vocational education and training institutions.

The division of the company's job description is based on stratum level of education, length of employment, as well as the experience of the employees concerned. Based on survey results obtained pattern of variation in the level of education that is owned by this company. For the initial recruitment, graduate school/vocational school at the level of the plant operational work, diploma working in the field of maintenance and graduate S1 or S2 at the level of maintenance work, supervision and administration (management of electricity).

Translating the concept of sustainability efforts, the Company has always held principle or Triple Bottom Line Three Main Pillars, one of which is the concept of "Man" who has always been the basis for the company in formulating policies human resource management.

4. Conclusion

Based on the initial investigation and analysis of the needs of job competence in world industry, the industry can be classified types of small, medium and large industries based on the number of workers, and the value of business investment. The results of the study with DACUM approach is electrical engineering job competence profiles that are grouped into six core competencies, namely: (1) fundamentals of electricity, (2) fundamentals of electronics, (3) maintenance and repair of electrical equipment industry, (4) the operation of electric power, (5) management of electricity, and (6) health and safety Work. Therefore, the six components of the core competencies can be used as a basis in the development of learning tools in technical and vocational education and training institutions.

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