Requirement analysis of work competence of vocational graduates in heavy equipment industry

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Abstract Engineering of heavy equipment as one of the competencies of skills developed in Vocational High School (SMK) should be able to refer to the standard needs of the industry. This study aims to (1) Identify the work competence of the heavy appliances graduation based on SKKNI, LSP profession certification scheme and heavy equipment industry standard; (2) To know the relevance of the curriculum of high school voctional of heavy equipment technology (productive) work subject to industry standard based on SKKNI and professional certification scheme. This research uses qualitative approach, from SMK and heavy equipment industry. Data collection using observation method, interview, study of document and triangulation. Observation is done to see the learning process in school and work process in industry. Interviews in schools aim to gather information about learning processes in SMK, interviews at industry to gather information of the heavy equipment engineering work standards. Documents studied are curriculum SMK of the heavy equipment engineering, SKKNI and professional certification scheme. The result of data analysis concludes that the competence of the heavy equipment engineering graduate based on SKKNI and professional certification institution is at the level II for machine engine mechanic. Heavy-duty hydraulic mechanical work is located on the hydraulic mechanical junior heavy equipment (Level II). Engine subjects and heavy equipment units accommodate SKKNI mechanical engine of heavy equipment of 44.4%. The subjects of powertrain and undercarriage of heavy equipment accommodate SKKNI mechanical engine of heavy equipment of 33.3%. The subjects of electrical systems and machine controls accommodate work competence on SKKNI mechanical engine of heavy equipment 33.3%. Hydraulic heavy equipment subjects accommodate the work competence of SKKNI heavy equipment hydraulic mechanics by 60%.

1. Introduction
The globalization process makes the world economy more competitive and challenging. Globalization affects all aspects of people's lives [1]. In a global context, each country should have a strategy to conduct long-term educational planning [2]. Globalization gives rise to the social and economic order that demands new policies and strategies for the educational process [3]. This change will create new demands on the labor market. The education sector is a key factor in generating skilled labor for the
service and economic industries [4]. Thus the role of vocational education is expected in improving the quality and quantity of human resources [5].

Competence can be conceptualized from two basic meanings, the first of which includes the amount of knowledge, skills and attitudes that enable professionals to take the most appropriate in each case and decision in every situation. The second includes the characteristics and quality of individuals to carry out effective activities that explain the added value of professionals into practice and outcomes [6]. The idea of research based on competence and skill , is the development of competency information that must be continuously developed and concluded to obtain linear professional competence [7].

Competence for vocational technology education is an important task, skill, attitudes, values, and appreciation to succeed in life and / or earn a living [8]. The above shows that the competence includes the tasks, skills, attitudes, and appreciation that the student must have in order to carry out the tasks he / she studies in the school in accordance with the capabilities required by the world of work [9]. Competency development and procedure improvement, implemented to meet the need for new professional competence improvement, such as the use of information technology, the development of teaching, the improvement of subjects taught [10]. Competence comes from the ability to obtain information well and continuously [11]. Competencies need to be implemented according to the use of the latest information technology, to gain competence that meets the demands of the industry [12].

Employment demand analysis can predict changes in information about more accurate labor demand in the future. This will reduce the inconsistency between supply and demand, thus the unemployment rate will be suppressed, and will also affect the company's satisfaction with the competencies of the prospective workforce [13]. The essence of work competence is determined by the modern development of higher education on the basis of integrative nature analysis, the importance of integrative nature enhances the more advanced educational system [14].

This research was conducted with the aim to analyze the work competency standardized by heavy equipment industry for labor graduates of SMK based on Indonesian National Work Competence Standards (SKKNI). The results of this study are expected to provide data and information about the curriculum condition of vocational engineering equipment and its relevance to the needs of work. The data and information are expected to be used for the improvement of curriculum content and the learning process in SMK for heavy equipment engineering achieving the ideal work competence in the field of heavy equipment mechanics so as to meet the needs of skilled workers in accordance with their qualifications.

2. Research methods
This research is a research qualitative work done by collecting data, presents accurate and objective information [15]. Qualitative research is defined as an approach or a search to explore and comprehensive a central phenomenon [16] [17]. Form of data or respondents This research is an industry institution in the field of heavy equipment, vocational education institutions and government agencies in charge of employment. Selection of informants / sources of information used by researchers is a purposive sample technique [18], which aims to provide consideration to select informants who meet the criteria in providing accurate information. Selection of informants is very important that should be done carefully, then the researcher decided the first informant or key informant. Initial data of a number of respondents based on sources of informants who have been selected through interviews continue to roll up to experience saturation point (Snowball Sampling) [19].

3. Finding and Discussion
The geographical condition of Indonesia as a country that has a lot of natural resources have an effect on the amount in the mining industry, be it oil, gas and other minerals it [20]. Infrastructure preparation can not be separated from construction services, especially to open land and build roads connecting economic paths in various regions. Realization of construction services will encourage the use of heavy equipment, hereinafter consequences preparing human resources appropriate to their expertise [21]. Consequently, equipment resources are also required so that this condition increases the number of
heavy equipment populations with various brands and types, in the mining, construction, agro-industry and forestry sectors. Data from Indoanalisis shows that the market share of heavy equipment by industry sector 2000-2016 show: Mining sector 20%, construction 50%, estates 15% and forestry 15% [22]. The growth of the mining, construction and plantation industries will be directly proportional to the need for heavy equipment technology used in field work processes. The need for manpower in the field of heavy equipment mechanics as one part of the work in exploring the natural resources will also increase.

A classic problem for the world of vocational education in Indonesia that links and matches between the output of vocational education and the industrial world as a user of vocational education graduates has not been achieved, one of the problems is on the quality of vocational education graduates who are not in accordance with the standards of competence established by the world of work [13]. The relevance of the SMK curriculum to industry needs is categorized into 4 types: (1) for some areas of competence, SMK curriculum in categories relevant to industry needs, (2) Industry required competencies are not provided in the curriculum in SMK, (3) Unnecessary Competencies but implemented in the SMK curriculum (4) Competence required in the Industry and is in the curriculum but not implemented in SMK [23].

Central Bureau of Statistics recorded in February 2017, the number of open unemployment reached 7,02 million people (5.3%). 9.27% of them are vocational high school graduates [24]. Industry practitioners say that SMK graduates are not able to meet the standard of human resource demand for heavy equipment operations, government programs are still lacking in producing ready-to-use labor in heavy equipment technology [25]. The Indonesian National Work Competence Standards (SKKNI) in the construction sector refer to 2 (two) regulations issued by the government, namely SKKNI work position issued by the Ministry of Public Works in 2008, and SKKNI Heavy Mechanical Hydraulic Mechanics determined by the number KEP.88 / MEN / V / 2010.

Standards of competence are the benchmarks or measures of knowledge, skills, and work ethics in order for a person to perform a job or task in accordance with required performance. Competency standards do not mean just the ability to complete the task, but based on how, and why the task is done. Competency standards include factors that support knowledge and ability to perform tasks in normal workplace conditions as well as the ability to transfer and apply skills and knowledge in different situations and environments. Indonesian National Work Competency Standards (SKKNI) is a formulation of work skills that includes aspects of knowledge, skills and / or skills (skills) and attitude relevant to the implementation of duties and terms of office established in accordance with the provisions of legislation, applicable invitations. SKKNI is developed in consultation with related industries, to ensure suitability of needs in the workplace. SKKNI is used primarily for designing and implementing job training, conducting training output assessments, as well as assessing the current skill and skill level of a person.

Based on the analysis engine SKKNI heavy equipment mechanics and hydraulic mechanics SKKNI heavy equipment, to be able to get certification on core competencies, a mechanic must master the general competences [26]. Mechanics of engine prior to mastering competencies in identifying the major components of the engine must have competencies in implementing K3-LH, implementing workplace communication, and implementing workplace cooperation. Demands the competence of the industrial world, a mechanic in addition to having the technical ability according to his field must also have the ability to communicate and cooperation in his work environment.

Description of job title / profession of heavy equipment engine mechanics is to carry out maintenance, repair, trouble shooting machine engines and job reports. Office work qualifications engine mechanical work heavy equipment divided into three (3) classes according to the level of difficulty of the job and the task in hand which positions the engine mechanical work heavy equipment class III, class II and class I (Kepmenakertran, 2010). The heavy equipment industry classifies the mechanics of SMK graduates starting in basic technician positions. Competencies to be mastered are soft skills consisting of K3-LH, communication, and cooperation in the workplace. The skills that must be mastered are basic maintenance, preventive maintenance and minor repair.
Based on document analysis, observation and interview results, an employee does not possess a standardized competency unit of SKKNI and heavy equipment industry through a professional certification scheme. The cause is not mastered by the competency unit because the competency unit material has not been accommodated in the vocational machine engineering curriculum. Employees have not gained knowledge of SKKNI competency units, so they do not have the ability to perform work according to industry standards. For example, a machine mechanic other than having the ability to make improvements must also be able to operate the heavy equipment unit. Material about the operation of this heavy equipment unit is not mastered because it is not available in the vocational machine engineering curriculum.

Based on the data obtained, the teaching materials that must be submitted to the candidate ideal mechanic of heavy equipment include: safety, engine & machine design, jackin, blocking, lifting; seals, bearings, gaskets; measuring tools, fastener, workshop tools, literature, contamination control, fundamental engine, fundamental powertrain, fundamental hydraulic, fundamental electric, and battery maintenance. However, for senior mechanical personnel, in addition to some materials are also submitted materials: intermediate engine, powertrain, hydraulic, ET Tool, electronic engine, troubleshooting, and AFA 1 (Applied Failure Analysis). When viewed from material required by some industries, most of the material presented has similarities [21].

Vocational graduates based on the Indonesian National Qualification Framework (KKNI) are at level II, where competence demands are capable of performing a specific task, using commonly used tools, information, and working procedures. Able to demonstrate performance with measurable quality under the direct supervision of his superiors. Having basic operational knowledge and factual knowledge of specific work areas, so as to be able to choose available solutions to common problems and be responsible for self-employment and be given the responsibility of guiding others.

Competence of graduate work in accordance with industry standards will be achieved if the school is able to innovate with various programs, especially implementing link and match program between school and industry maximally. Another form of current link and match programming between vocational education and the industrial world is the school program, indicating that the industrial world, especially the heavy equipment industry, is concerned about vocational education.

The solution to accommodate SKKNI unit of mechanical equipment mechanics include: 1) Developing school curriculum at the beginning of the school year to accommodate the availability of the material.2) Insert material that has not been accommodated to the relevant subjects. 3) Arrange the prakerin manual, where there are materials that have not been accommodated. Schools are asking the industry where prakerin exists to teach students about the competency unit material that has not been accommodated in the curriculum. 4) Cooperate with industry for guest teacher program.

4. Conclusion
SKKNI establishes two job positions for heavy equipment mechanics, namely: 1) heavy machinery engine, and 2) heavy equipment hydraulic mechanic. Technical vocational graduates work competency based SKKNI heavy equipment and heavy equipment Professional Certification Institute is located on the working positions for level II engine mechanic heavy equipment. Heavy-duty hydraulic mechanical work is located on the hydraulic mechanical junior heavy equipment (Level II / Junior Executive).

The vocational education curriculum of heavy equipment mechanics in general is still not relevant to the needs of the industrial world. Competency needed industry there are still given in the learning process job competence possessed vocational education graduates can not meet the industry work competency standards. The general competence unit of SKKNI, K3-LH, implementing communication in the workplace, and applying workplace cooperation is not yet available on the SMK of heavy equipment engineering curriculum. SKKNI core mechanical component of heavy equipment is to make a report of work available only on Heavy Equipment Hydraulic subjects. Engine subjects and heavy equipment units accommodate SKKNI mechanical engine of heavy equipment of 44.4%. The subjects of powertrain and undercarriage of heavy equipment accommodate SKKNI mechanical engine of heavy equipment of 33.3%. The subjects of electrical system and machine control accommodate work
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