

The Relevance of Vocational High School Curriculum with the Requirement of the Heavy Equipment Industries

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Abstract. This study aims to determine the relevance of competencies developed by vocational high schools with the needs of workers in the industrial world. This is to answer the statement from the world of industry that the competencies possessed by vocational secondary education graduates are not in accordance with industry standards. This research is a qualitative research conducted by collecting data, presenting accurate and objective information. Respondents of this research are industrial institutions in the field of heavy equipment, vocational education institutions and government agencies in charge of manpower. Selection of informants / sources of information used is purposive sample technique, which aims to give consideration to select informants who meet the criteria in providing accurate information. The results of this study provide insight and input to vocational secondary education managers about various information in developing vocational secondary education curriculum, major issues include curriculum content relevance, technological advances in the heavy equipment industry, updating of school facilities and collaboration between educational institutions and labor institutions and the industrial world in the development of vocational secondary education.

1. Introduction

One of the most frequently discussed issues is the impact of globalization on the world economy. The globalization process makes the world economy more competitive and challenging. Globalization affects all aspects of people's lives [1] [2]. There are two processes in globalization: compression and awareness, these two processes will create a world without boundaries [3]. In a global context, each country should have a strategy to conduct long-term educational planning [4]. Globalization gives rise to the social and economic order that demands new policies and strategies for the educational process [5]. This change will create new demands on the labor market. The education sector is a key factor in generating skilled labor for the service industry and the economy [3]. Thus the role of vocational education is expected in improving the quality and quantity of human resources [6].

One of the challenges facing Indonesia in the ASEAN Economic Community (MEA) is where the free labor market will occur. This means that the workforce in Indonesia will compete with workers from other ASEAN countries. The main concept of the MEA is to create ASEAN as a single market and unity of production base where free flow of goods, services, factors of production, investment and capital and elimination of tariffs for trade between ASEAN countries are then expected to reduce poverty and



economic disparities among countries, member countries through a number of mutually beneficial cooperation [7].

The main purpose of this study is to identify the extent to which the curriculum of vocational education is able to provide the competence of work required by learners to be able to compete in the world of work whether the vocational education curriculum is aligned with the Indonesian National Work Competency Standards issued by the Ministry of Manpower of the Republic of Indonesia and standard of labor requirements issued by the industrial world. The method for obtaining data is by analyzing the structure and content of the curriculum published by the Ministry of Education and Culture of the Republic of Indonesia, then studying the Indonesian National Work Competency Standards and the required labor competency standards according to the industrial world. From the results of the analysis is expected to describe the ideal curriculum to be applied to vocational education in the field of mechanical heavy equipment so as to meet the needs of skilled workers in accordance with its qualifications.

2. Research Methods

This research is a qualitative research conducted by collecting data, presenting accurate and objective information [8]. The form of qualitative research data is the words and actions, the rest are additions such as documents and others. The form of data or respondents of this research is industrial institutions 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 [9], which aims to provide consideration to select informants who meet the criteria in providing accurate information. Selection of informants is a very important thing that must be done carefully, then the researchers decide 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 until they get saturated (Snowball Sampling) [10].

3. Results and Discussion

The purpose of this research is to know how far the relevance of vocational education curriculum in Indonesia in the context of the needs of the workforce in the heavy equipment industry. The results of this study are expected to answer the complaints from the industry about the competence of vocational education graduates who are unable to compete in the world of work, and can be an input for vocational education institutions to make improvements in educational planning [11].

Over the past decade, vocational education in Indonesia has been subjected to criticism due to the lack of skills and knowledge of vocational education graduates that resulted in them not being able to obtain employment opportunities. Central Bureau of Statistics recorded in February 2017, the number of open unemployment reached 7, 02 million people (5.33%). Of these, 9.27% are graduates of vocational secondary schools [12].

In this new reality, vocational high schools face the challenge of continuing to evaluate programs, content, implementation, in updating the curriculum[13]. Vocational secondary schools need to integrate theoretical material or vocational practice with existing competencies in the industrial world [14]. Vocational education should be able to teach competencies that meet the future needs of graduates by looking at workplace realities and emerging technologies.

Vocational education institutions should be able to prepare learners who are able to compete in the world of work, therefore the relationship and relevance of vocational education institutions with the industrial world becomes a very important [15]. Improving the quality of education is done by improving the quality of relevance to the world of work. Relevance in the world of education is the suitability between the process and the material given in education to the needs of the market [16]. The classical

problem for vocational education in Indonesia is that the link and match between the output of vocational education and industry as a graduate user of vocational education has not been achieved, one of the problems is on the quality of vocational education graduates who are not in accordance with the competence standards established by the world of work [17].

The program of heavy equipment engineering expertise as one of the existing fields in vocational education is expected to answer the needs of skilled workers as heavy equipment mechanics. The geographical condition of Indonesia as a country with many natural resources has an effect on the number of industries in the field of mining, be it petroleum, gas and other minerals [18]. Infrastructure preparation can not be separated from the construction services, especially to open the land and build roads that connect economic channels in various regions. The realization of the construction services will encourage the utilization of heavy equipment which further brings the consequences of preparing human resources in accordance with their expertise [19]. Consequently, equipment resources are also needed 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 Indoanalysis shows that the market share of heavy equipment based on industry sector 2000-2016 shows: forestry sector 15%, construction 50%, Agroindustry 15%, and Mining 20% (IndoAnalysis.com, 2016). With so many industries will be directly proportional to the needs of workers in the field of heavy equipment mechanics as one part of the work in exploring the natural resources. In accordance with the purpose of vocational education in Indonesia, which equip students with certain skills to enter the workforce, the development of vocational education should always refer to the needs of the labor market [20]. Similarly, in the field of heavy equipment mechanics, the success of vocational education in the field of heavy equipment mechanics can be reflected from the number of graduates absorbed by the industrial world engaged in mining and heavy equipment. To achieve this, the suitability of graduates' competency from the heavy equipment mechanics program to the needs of the world of work is of paramount importance.

The curriculum is an integral part and plays a central role in the process of implementation of education, the curriculum directs all educational activities for the achievement of educational goals [21]. In accordance with the purpose of vocational education to produce graduates who have the skills according to the needs of the world of work, the necessary curriculum relevant to the needs of the world of work. Therefore, it is necessary to evaluate and improve the sustainable curriculum as a necessity for the national education system to be relevant and competitive [22]. In order to produce competitive graduates who are able to compete in the world of work, vocational education institutions must have the structure and content of the curriculum in harmony and in line with the Indonesian National Work Competency Standards published by the Ministry of Manpower of the Republic of Indonesia as well as the standard of mechanical work competence of heavy equipment based on industry needs.

3.1. Structure and content of vocational high school curriculum

The preparation of vocational high school curriculum in the field of heavy equipment mechanics is done by referring to the curriculum structure issued by the Directorate General of Secondary Education Ministry of Education and Culture of the Republic of Indonesia. Based on the analysis of the structure of the curriculum, the vocational education in the field of heavy equipment mechanics aims to equip learners with the skills, knowledge and attitudes to be competent in 1) Carrying out basic machinery engine work. 2) Carrying out basic electrical work of the machine. 3) Perform basic heavy equipment power train work. 4) Perform basic work under heavy equipment carriage. 5) perform basic heavy equipment hydraulic work. 6) Implement preventive maintenance work [20].

3.2. Indonesian national competency standards

Law No. 18/1999, on: Construction Services and its implementing regulations mandate that workers undertaking construction planning, implementation and supervision must have a certificate of expertise or skill. The requirement to have a certificate of skill and or skill reflects the demands of truly reliable quality of workforce. Such conditions require a concrete step in preparing the device (standard standards) required to measure the quality of construction service labor [23].

Indonesian National Work Competency Standards (SKKNI) is a formulation of work skills that includes aspects of knowledge, skills and / or expertise and work attitude relevant to the implementation of duties and terms of office stipulated by the provisions of applicable legislation. With the compilation and enforcement of the Indonesian National Work Competency Standards in Mechanical Sector of Construction Services for Heavy Equipment Mechanics, all stakeholders can use them to develop the quality of mechanical power of heavy equipment [24]. Figure 1 illustrates the level of competence that a machine mechanic must have at the junior and senior level. General competence and special competence must be mastered to become a machine mechanic.

Job Competence : Engineering of Heavy Equipment Hydraulic				Job Competence : Heavy Equipment Engine Engineering		
No	Unit Code	Competency Unit		No	Unit Code	Competency Unit
		Heavy Equipment Hydraulic Junior Engineering	Heavy Equipment Hydraulic Senior Engineering			
General Competency				General Competency		
1	MEK.PW1 2.231.00	Implement safety and health as well as the environment	Implement safety and health as well as the environment	1	INA.5220.2 22.x x.01.08	Implement safety and health as well as the environment
2	MEK.PW1 2.232.00	Implementing communication and teamwork at workplace	Implementing communication and teamwork at workplace	2	INA.5220.2 22.x x.02.08	Implementing communication at workplace
Specific Competency					INA.5220.2 22.x x.03.08	Implementing teamwork at workplace
	MEK.PW2 2.231.00	Identifying components at the heavy equipment hydraulic system	Identifying components at the heavy equipment hydraulic system	Specific Competency		
	MEK.PW2 2.232.00	Implementing maintenance at the heavy equipment hydraulic system	Implementing maintenance at the heavy equipment hydraulic system		INA.5220.2 22.x x.04.08	Identifying main components of the engine
	MEK.PW2 2.233.00		Repairing components at the heavy equipment hydraulic system		INA.5220.2 22.x x.05.08	Implementing the maintenance of engine
	MEK.PW2 2.234.00		Overcome troubleshooting at the heavy equipment hydraulic system		INA.5220.2 22.x x.06.08	Implementing the minor repair of engine
	MEK.PW2 2.235.00		Created job report		INA.5220.2 22.x x.07.08	Implementing the major repair of engine
					INA.5220.2 22.x x.08.08	Analyzing and overcome troubleshooting at the engine
					INA.5220.2 22.x x.09.08	Created job report

Figure 1. Units of competence in heavy equipment engineer qualifications or occupations according to SKKNI (Kepmennakertrans RI No. KEP.88/MEN/V/2010).

3.3. Heavy machinery competency standards based on industrial requirements

According to the industry engaged in heavy equipment, teaching materials delivered in training activities for mechanics adapted to the level of the mechanics. For the ideal mechanic according to minimum work requirements is a mechanical level III [19]. Overall, teaching materials that must be mastered by machine mechanics based on mechanical level are the following:

- Mechanical Level: Helper, material to be mastered: Basic Mechanic
- Mechanical Level: I, materials to be mastered: Minimum: a) Basic mechanic, b) Basic engine. Additional: a) Basic hydraulic system, b) Basic powertrain system, c) Basic vehicle control, d) Basic electrical system.

- Mechanical Level: II, the material must be mastered: a) Basic mechanic, b) Basic engine, c) Basic hydraulic system, d) Basic powertrain system, e) Basic vehicle control, f) Basic electrical system.
- Mechanical level : III, the material must be mastered: a) Basic Mechanic, b) Basic engine, c) Basic hydraulic system, d) Basic powertrain system, e) Basic vehicle control, f) Basic electrical system, g) Intermediate engine system, h) Intermediate hydraulic system, i) Intermediate powertrain system.
- Mechanical Level: Specialist, material to be mastered: All Level III materials, plus, a) Product training (at least one type of machine), b) Electronic machine control (engine ecm, transmission ecm, etc.) [19].

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, jacking, 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 [19].

4. Conclusion

The ultimate goal of this research is to provide information, improve and develop vocational education system to be more relevant in the context of preparing graduates to be competent workforce in accordance with the needs of the industrial world. The development of vocational education programs requires clear justification or justification. Justification for vocational education programs is the real need for manpower in employment or in the business and industry. From the results of the discussion, found that the curriculum of vocational education in the field of mechanical equipment is still not relevant to the needs of the industrial world, there are still many competencies that have not been given to the learning process. So that the work competence of vocational education graduates have not been able to meet the standards of work competence set by the industry. Collaboration between the world of education, government institutions and industrial institutions is very important and indispensable in the process of curriculum preparation of vocational education, so that the resulting curriculum design is appropriate and proportional to the needs of the world of work. The vocational school curriculum should be more flexible so that it can keep up with the world of work.

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