Job profile of welding and machining in the ship industry of Penataran Angkatan Laut Company Indonesia

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Abstract. This study aims to describe the Penataran Angkatan Laut company's modern shipping industry's job profile and its relevance to the Mechanical Engineering Education Study Program curriculum, Faculty of Engineering, Yogyakarta State University 2014. The research is focused on the job profile of a welder level for the field welding and operator level for the machining plane. The research was conducted using a descriptive qualitative model with the research subject of Penataran Angkatan Laut company Indonesia Surabaya, East Java. Data collection techniques used include interviews, documentation, and observation. The data is then analyzed using the percentage method—checking the validity of the data used triangulation of sources and techniques. This study's results indicate that the curriculum is a relevant category in the welding field with a 64.74% value and 91.67%, a very relevant category in machining.

1. Introduction
Yogyakarta State University (YSU) is one of the universities oriented towards the field of teacher education. YSU has several faculties, one of which is the Faculty of Engineering (FE). The Faculty of Engineering is part of creating teaching staff that leads to Vocational High Schools (VHS). The knowledge and skills taught in vocational education must be following specific types of work and according to industry needs [1]. YSU has an essential role in educational institutions considering the teaching staff's quality will determine graduates' quality. It is the party that provides convenience in transferring knowledge [2]. By referring to the curriculum, FE YSU tries to create competent teaching staff following their fields.

Through the curriculum, vocational learning in engineering education study programs must develop educational competencies and engineering competencies at once [3]. In other words, the curriculum must have an adaptive nature that can adapt to existing conditions, especially in the engineering field. The information from the world of work is needed to produce graduates' competencies in line with the world of work [4]. The curriculum can be in line with the needs in the world of work and reduce graduates' competency gaps.

The needs of the world of work for the required labor engineering competencies have an adaptive pattern. Today the development of technology has reached the era of the industrial revolution 4.0. This era was marked by the emergence of automation systems in all fields, especially technology [5]. The basic principle of industry 4.0 is the amalgamation of machines, workflows, and systems, by implementing an intelligent network along the chain and production processes to control each other independently [6]. This is an essential component for industry players for the efficiency of time, labor,
and costs and can minimize errors [7]. The smart industry creates economic effects and must consider the human and social aspects of the new paradigm of the fourth industrial revolution [8].

Indonesia has begun to focus on using this system in industrial activities, including sea transportation. The minister of transportation conveyed this in the Strategic Dialogue of Revolution 4.0 for the Port & Shipping Industry 2019. The government hopes that revolution 4.0 in the shipping industry will accelerate a more efficient and competitive Indonesian logistics system. The Indonesian government conveyed the concept of a world maritime axis in 2014. This policy reveals Indonesia's emphasis on the development of the marine sector in various aspects.

These technological advances occur and directly impact the industry, especially in shifting in work, often referred to as job disruption. According to Chaerul Tanjung, using data from the world economic forum, at least 5 million jobs will be lost within five years at the end of 2020 due to automation [9]. The advancement of technology makes a job replaceable by machines so that humans will get a new type of profession. The job profession that will be born requires different competency criteria from the previous profession. To continue to create workforce graduates who are in line with the industry's ever-changing needs due to technological developments, educational institutions must also adapt to technological developments by referring to information originating from the industry as the production party.

This research was done to present the job profile information at Penataran Angkatan Laut company and relevant to the existing curriculum in the Mechanical Engineering Education Study Program, Faculty of Engineering, Yogyakarta State University. It is hoped that the Mechanical Engineering Education Study Program of Yogyakarta State University as an educational institution can continue to adjust the curriculum with the competencies needed in today's industry to produce educator graduates who have relevant competencies.

2. Methods
This study uses a qualitative approach with a descriptive model. A qualitative approach is considered suitable for unclear, holistic, complex, dynamic, and meaningful problems [10]. This approach's results are presented in the form of in-depth and systematic descriptions of the facts and the relationships between the studied phenomena. The selection of research sites is based on research topics that lead to the modern shipping industry. Besides that, Penataran Angkatan Laut company is a state industry with a State-Owned Enterprise (SOE) status and is the largest shipping industry in Indonesia.

The research subjects in this study used in obtaining data were the head of the workshop, the propulsion assistant, and the operator. The selection of research subjects was carried out by the snowball sampling method. This method is considered capable of determining the research subject following the work domain that is mastered to provide the required information.

The data in this study were in the form of descriptive sentences obtained from predetermined data collection techniques. Data collection was carried out by data collection techniques, including semistructured interviews, passive participation observation, and documentation. Interviews are used to obtain information data in types of work, work facilities, and labor. Observation of passive participation is carried out by collecting information data in work and means of work. Documentation is used in obtaining information data in the form of types of work and labor. The instruments used in this study include interview guides, observation guides, and documentation checklists.

In this study, the data analysis technique used Miles and Huberman's analysis to answer descriptively about the job profile of Penataran Angkatan Laut company. This technique has four stages, including data collection, data reduction, data presentation, and conclusion. Data analysis techniques in answering relevance are percentage analysis [11]. Data analysis adds up the data's suitability from the type of work in the company with the study program curriculum compared to the types of available work and the percentage. The conclusion is then obtained in the form of five categories in the form of a Likert scale, as shown in table 1.
3. Results and Discussion

The welding process of building a ship at Penataran Angkatan Laut company is generally done with a manual-based working process. The manual-based process is welding, which uses a manual-based welding machine and requires skill competence. In the analysis of the research data, these reasons include the quantity factors and job characteristics. The above statement indicates that automation machines will be more efficient when used in mass production industries and have similar characteristics.

Penataran Angkatan Laut company uses various types of welds in performing existing welding jobs. Types of welds used include SMAW, FCAW, SAW, TIG, and MIG. The specification of the difficulty level of the welding job is described in terms of several parameters. Welding levels used in the process include levels 1-6 with joints that include T join, Corner joint, Edge joint, and Butt join. The material used in making flat ship construction is made of steel in plate sheets and T profiles with various thickness and size specifications. Besides steel, another material used is aluminum.

The results check carried out to provide certainty for the products made by Penataran Angkatan Laut company. Weld examination methods are performed using various methods, including visual, ultrasonic, and radiography. The visual method is carried out by the welder, the head of the workshop, and the quality control division often referred to as the internal party. In contrast, the ultrasonic and radiographic examination is carried out by other institutions or called external parties.

Management of tool resources is a priority in the production process. The tool is one of the determinants of the process's success so that its availability has an important role. Welding work equipment used in shipbuilding all use a manual-based type of welding performed by a welder. Auxiliary equipment includes a hand grinder, a vacuum cleaner, and an air chopper. In addition to work equipment and auxiliary equipment, there are also work equipment, which in this study refers to Personal Protective Equipment (PPE) used in the existing process. The personal protective equipment used includes helmets, aprons, masks, gloves, work shoes, welding masks, wear packs, and sleeves. Personal protective equipment regulation follows the minister of human resources transmigration of the Republic of Indonesia number PER.08/MEN/VII/2010 concerning protective equipment. Self as regulated in Article 2, paragraph 1.

The quality of the workforce is a valuable asset in a company. The recruitment criteria and the management of human resources at Penataran Angkatan Laut company have emphasized a competent workforce. Educational background as a prerequisite to becoming a welder at Penataran Angkatan Laut company is a high school / vocational level competent in welding. However, the recruitment still prioritizes a vocational background majoring in ship welding engineering—the skill aspect by having a competency certificate.

Workers must hold a certificate in the welding field when they have entered as part of a welder at Penataran Angkatan Laut company. A certificate is a valid acknowledgment related to the skills and knowledge competencies. With this ownership, the industry can gain consumers' trust regarding the products produced from the industry. Also, Penataran Angkatan Laut company pays significant attention to aspects of the welders' attitude measured by psycho test recruitment. The description above shows

| Table 1. Rating scale [12]. |
|----------------------------|
| Category       | Percentage |
|----------------|------------|
| Relevant       | 80-100%    |
| Relevant       | 60-79%     |
| Quite relevant | 40-59%     |
| Less relevant  | 20-39%     |
| Irrelevant     | 0-19%      |
that Penataran Angkatan Laut company emphasizes three main aspects: skills, knowledge, and attitudes in managing human resources.

There are several points of relevance shown related to the type of work and welding facilities available at Penataran Angkatan Laut company with the curriculum of the Mechanical Engineering Education Study Program, Faculty of Engineering, Yogyakarta State University.

Table 2. The relevance of welding job profiles.

| Sub job profile        | Percentage |
|------------------------|------------|
| Welding type           | 80%        |
| Welding level          | 45.45%     |
| Connection type        | 50%        |
| Material               | 100%       |
| Welding test results   | 66.67%     |
| Auxiliary equipment    | 33.34%     |
| Personal protective equipment | 77.78% |
| **Average**            | **64.74%** |

The relevance of welding job profiles is summarized in table 2. The relevance rate is 64.74% and is included in the relevant category. Several parameters show a low number of relevant jobs, but this is reasonable because welding work is a job that is aimed directly at educational institutions majoring in welding engineering. Apart from this, there are fundamental differences between welding jobs in education and industry. The difference is seen from the quantity of work and the time efficiency so that the welding level, connection type, and auxiliary equipment get a percentage of ≤50%.

Machining supports work at Penataran Angkatan Laut company, which means that it has a relatively small portion of activities compared to welding work. Machinery is considered a supporting activity because Penataran Angkatan Laut company is an industry that does not lead to the manufacturing sector, but focuses on construction activities. The type of machining process used is classified into two types according to how it works. The lathe process is a process whose main characteristic is to produce cylindrical products. The lathe machining process used includes straight lathe, inner lathe, and facing lathe.

The scraping process is a machining process used to manufacture products with its main character having a straight plane. The scraping process used is flat sapping. The work process on machining of the gurd uses only the hole-making process. Grinding machining is carried out to grind products that require reduction or modification with a small and simple volume. The grinding process includes grinding the tool and grinding the outer surface. Furthermore, the process of hand tool work includes filing, tapping, sawing.

Facilities for machining work include work equipment, work equipment, and auxiliary equipment. The machining process work equipment used in Penataran Angkatan Laut company still uses manual-based machine tools, requiring its operation skills. In this case, the auxiliary equipment is viewed from the measuring instrument used in the machining process. Measuring instruments used in supporting the machining process include a micrometer and slide ruler. Overview of work equipment is Personal Protective Equipment used in existing processes. The personal protective equipment used includes helmets, goggles, gloves, work shoes, and wear packs.

Educational background as a prerequisite to becoming a machine operator at Penataran Angkatan Laut company is a high school / vocational high school level competition in machinery. However, in its recruitment, it still prioritizes a vocational background majoring in mechanical engineering. Base on the operator's skill aspect, this aspect's measurement is carried out with proof of certificate. Operators must hold a certificate in the welding field when they have entered the workforce at Penataran Angkatan Laut company. Also, Penataran Angkatan Laut company pays significant attention to aspects of the welders' attitude measured by psycho test recruitment. There are several points of relevance shown related to the type of work and machining facilities available at Penataran Angkatan Laut company with the
curriculum of the Mechanical Engineering Education Study Program, Faculty of Engineering, Yogyakarta State University.

Table 3. The relevance of machining job profiles.

| Sub job profile          | Percentage |
|--------------------------|------------|
| Machining type           | 75%        |
| Lathe machining          | 100%       |
| Machining of the gurd    | 100%       |
| Grinding machining       | 100%       |
| Hand tools               | 100%       |
| material                 | 100%       |
| Machine type             | 83.34%     |
| Auxiliary equipment      | 100%       |
| Personal protective equip | 66.67%     |
| Average                  | 91.67%     |

The relevance of machining job profiles is summarized in table 3. The relevance rate is 91.67% and is included in the very relevant category. The relevance figure looks quite large in each job sub-profile because machining work is a supporting job in ship production at Penataran Angkatan Laut company Indonesia, so machining work has a relatively simple process. Also, machining work is a job directed directly to educational institutions majoring in engineering. There is considerable relevance with the Mechanical Engineering Education Study Program, Faculty of Engineering, Yogyakarta State University.

4. Conclusion
Based on the discussion, several points and the percentage of relevance shown related to the existing welding work at Penataran Angkatan Laut company with the revised 2014 edition of the Mechanical Engineering Education Study Program curriculum. The relevance is shown in the welding type of 80%, the welding level of 45.45%, the connection type of 50%, the 100% material, the welding result test of 66.67 auxiliary equipment 33.34%, and the PPE of 77.78%. With these results, the percentage of the welding job profile's relevance at Penataran Angkatan Laut company with the Mechanical Engineering Education Study Program curriculum shows the number 64.74%, which is included in the relevant category. The machining work at Penataran Angkatan Laut company is a supporting job in ship production. Manual-based machining with machining types of lathes, scrap, grinders, drills, and hand tools requires specific skill competencies in machining and a competent workforce.

There are several points and the number of relevant numbers shown related to the existing machining work at Penataran Angkatan Laut company with the revised 2014 edition of the Mechanical Engineering Education Study Program curriculum. The relevance is shown the type of machining by 75%, machining of the lathe 100%, machining of the drill 100%, grinding 100%, hand tools 100%, material 100%, work equipment 83.33%, supporting equipment by 100%, and PPE of 66.67%. With these results, the percentage relevance of the machining work profile at Penataran Angkatan Laut company with the Mechanical Engineering Education Study Program curriculum shows the number 91.67%, which is included in the very relevant category.

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