The achievement of competency standards for machining graduates

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Abstract. This study aims to determine the achievement of competency standards of graduates in the fields of lathe machining, milling machining, grinding machining, CNC machining at Piri 1 Yogyakarta Vocational High School. This study uses a descriptive method with a quantitative approach. The subjects of this study were teachers and students of class XII of the engineering technique of Piri 1 Yogyakarta Vocational High School. The data collection technique used a questionnaire and documentation. The data analysis technique used is descriptive statistical analysis. Based on the results of the research, it is known that the achievement of the competency standards of lathe machining graduates is in the excellent category with an average value of 82.51 and the results of the questionnaire show the excellent category. The achievement of competency standards for milling machining graduates was in the excellent category with an average score of 84.74 and the results of the questionnaire showed an excellent category. The achievement of the competency standard of grinding machining graduates is in the excellent category with an average score of 80.42, and the results of the questionnaire show an excellent category. The achievement of competency standards for CNC machining graduates is in the excellent category with an average score of 77.81, and the results of the questionnaire show an excellent category.

1. Introduction

Competence is something that is needed in the world of work and is a must-have for everyone. Competence can also be interpreted as all forms of motives, attitudes, skills, knowledge, behaviour, or other personal characteristics that are important to carry out work or distinguish between average performance and superior performance [1]. Therefore, competence is very suitable to be the main objective of vocational high school, where each graduate must master specific competencies. It is hoped that he will be able to develop the knowledge and expertise he has acquired for the welfare of himself, society, and the nation. Competency definition and competency measurement issues are explored as are a range of other issues concerning the value of competencies in a workplace learning context [2].

The human resources of a country are said to be of quality if that person with their abilities can adapt to conditions where technology is increasingly sophisticated and can compete with others in certain areas of expertise and have extensive knowledge. Seeing the quality of resources owned by the Indonesian people, the government still has quite many workers who are not ready to compete because their abilities are still less than the set competency standards. Indonesia would have a shortage of skilled workers until 2030. The disemployment effect of inflation-indexed minimum wage increases is around 3 times the magnitude of the disemployment effect associated with nominal minimum wage increases [3]. To anticipate this problem, it is necessary to change the human mindset in facing global competition.

Vocational high school is one of the formal education programs from the government to advance the nation's children who prepare their students to enter the world of work armed with specific knowledge and expertise. In the vocational high school case, for example, curriculum, teaching methods and assessment are more focused on doing rather than thinking. In other words, in vocational...
high schools, the purpose is to teach “how to do” and linking doing with thinking is mostly underemphasized[4]. Students work in a production unit there is an awareness of greater responsibility because the work they do is related to customer satisfaction[5]. Vocational high school graduates who should be prepared to work in specific fields of expertise have many problems at work after graduation. The number of unemployed is equivalent to 5.01% of the total workforce of 136.18 million people, the highest is still vocational graduates. Therefore, there must be an adjustment of the competencies possessed by graduates with school competency standards following the needs of today’s industrial world. The standard used to improve or align the competence of vocational high school graduates with the needs of companies and the job market in Indonesia is the Indonesian National Qualifications Framework (INQF). In the INQF, competency in mechanical engineering expertise, the Indonesian national qualification standard for vocational high school graduates is level II.

A researcher stated that in recruiting workers in the industry, there are two aspects of skills that are considered [6]. These aspects are hard skills and soft skills. Hard skills are technical skills, while soft skills are soft skills used in dealing and collaborating with other people. Therefore, in every lesson, students develop values related to soft skills and hard skills.

Student competence development is carried out through learning provided by the teacher. The application kinds of learning methods can improve student learning achievement in machining [7-9]. Learning method also can increase the activity of student learning in the learning process [10]. According to Law no. 14 of 2005 article 1, teachers are professional educators with the main task of educating, teaching, guiding, training, and evaluating students in early childhood education through formal education, primary education, and secondary education. Vocational high school is required to form students who have excellent soft skills and hard skills, by improving the quality of the learning process, especially in practice [11]. Learning should focus on the process of teaching, not simply transfer of knowledge. Learning social interaction practices to learners. Learning process needs to consider some aspects of process needs to consider some aspects of character building or soft-skills, such as character building or soft-skills, such as cooperation, respecting opinions, sense of cooperation, respecting belonging, responsibility, honesty, and opinions, sense of belonging, responsibility, honesty, and willingness to sacrifice[7]. So that the mastery of competencies achieved by students through the learning process can be seen whether these students have reached the competency standards of graduates or not, by knowing the competence of each student, the teacher must improve the quality of learning to make students master machining competencies well[12], [13].

Yogyakarta Special Region is one of the provinces in Indonesia with quite a lot of large and medium industries. So that vocational high school graduates in the region can work there as competent workers with specific skills. Piri 1 Yogyakarta Vocational High School is one of the vocational schools in Yogyakarta City with several expertise programs, one of which is engineering. Based on the Guided Field Practice (PLT) activities that have been implemented, several problems were found regarding improving student competence in the field of machining. This problem is because the teacher does not yet know the achievement of student competency standards in lathe machining, milling machining, grinding machining, and CNC machining. The nature of teaching about teaching demands skills, expertise and knowledge that should not be taken for granted[14]. The effort to improve the quality of learning is done by improving the quality of the learning process. It is supported by the goal standard which is higher than those at regular program[15]. Pedagogic competence of vocational high school teachers must teach the making of work preparation to help students understand the job before practicing[16][17]. The development of teacher training and assessment packages also assists in competency mastery[18]. Meanwhile, to see or compare the achievement of student graduates 'competency standards, there is no exact formula or research results used to describe the achievement of student graduates' competency standards in lathe machining, milling machining, grinding machining, and CNC machining.

Based on the description of these problems, it is necessary to research to know the achievement of competency standards for graduates in the field of engineering. By knowing the achievement of graduate competency standards in machining, the teacher's competitive feeling in increasing student
competence will increase. One of the improvements in the quality of learning in order to achieve acceptable graduate competency standards.

2. METHODOLOGY

2.1 Research Design

This study uses a descriptive method with a quantitative approach. The descriptive problem is a problem formulation that deals with the question of an independent variable, either only on one or more variables. So in this study, the comparison of the variables was not made in other samples and looked for the relationship between these variables and other variables.

2.2 Time and Place of Research

The research was conducted at VOCATIONAL HIGH SCHOOL PIRI 1 Yogyakarta, which is located on Jalan Kemuning no. 14 Baciro, City of Yogyakarta, Special Region of Yogyakarta. The time for conducting research at VOCATIONAL HIGH SCHOOL PIRI 1 Yogyakarta starts from the 6th to the d. 27 November 2019.

2.3 Research Subjects and Objects

This study uses respondents as data sources. The subjects of this study were teachers and students of class XII of the engineering expertise program. At the same time, the object of this research is the mastery of competency standards in lathe machining, milling machining, grinding machining, and CNC machining.

2.4 Procedure

Before starting the research, you must look for problems in the field, formulate problems, goals, and benefits of something before taking action, intended to protect the possibility of whether or not research activities can be continued. It is also intended to find the information needed so that the position of the problem is more precise. Formulate the research methods used and the types of data obtained and the techniques used as data analysis.

2.5 Data, Instruments, and Data Collection Techniques

The data used are primary and secondary. Primary data were obtained using a questionnaire intended for teachers and students. Meanwhile, secondary data is obtained through documentation, namely from student learning outcomes, theory, and practice. Questionnaires are used by giving a number of written questions to respondents to choose answers in accordance with the things students know or real conditions that occur in the field. The arrangement of the instruments used the syllabus and SKKD that apply to learn machining techniques at Piri 1 Yogyakarta Vocational High School. Furthermore, the questionnaire data and student scores can later be used to determine the extent to which the achievement of the competency standards of graduates in the fields of lathe machining, milling machining, grinding machining, and CNC machining at Piri 1 Yogyakarta Vocational High School.

2.6 Data Analysis Technique

The data analysis technique used descriptive analysis, namely interpreting and describing the data from each of the components studied. The data analysis in question includes testing the mean, ideal average, and standard deviation (standard deviation). The description of the student score data used a student grade categorization table, and the questionnaire data description used a data trend table for categorizing student scores using table 1 and as for the description of the questionnaire data, using the data trend table. Based on the acquisition scores, which are grouped into four, the categories used are four categories as in table 2.
### Table 1. Categorization of Student Values.

| Score Interval | Conversion Results | Predicate | Criteria          |
|----------------|--------------------|-----------|-------------------|
| 96 – 100       | 4,00               | A         | Very excellent    |
| 91 – 95        | 3,37               | A-        | Excellent         |
| 86 – 90        | 3,33               | B+        |                    |
| 81 – 85        | 3,00               | B         | Excellent         |
| 75 – 80        | 2,67               | B-        |                    |
| 70 – 74        | 2,23               | C+        |                    |
| 65 – 69        | 2,00               | C         | Enough            |
| 60 – 64        | 1,67               | C-        |                    |
| 55 – 59        | 1,33               | D+        |                    |
| < 54           | 1,00               | D         | Less              |

The category formula, as in table 2, is arranged through the following steps, namely, determining the lowest score and the highest ideal score. First, calculate the ideal average / ideal mean ($\bar{M}_i$), which is $= 1/2$ (highest score + lowest score). Second, calculate the ideal standard deviation (SD$_i$) that equals 1/6 (highest score - lowest score).

### Table 2. Questionnaire Data Trend Table.

| Interval                  | Category                  |
|---------------------------|---------------------------|
| $\bar{M}_i + 1,5SD_i$     | Very Excellent            |
| $\bar{M}_i$               | Excellent                  |
| $\bar{M}_i - 1,5SD_i$     | Pretty excellent          |
| $\bar{M}_i - 3SD_i$       | Not Excellent              |

3 Results and Discussion

The results of the descriptive analysis on the achievement of the competency standards of lathe machining graduates obtained data on student scores with an average of 82.51. This value-based in Table 1 is included in the excellent category. When viewed from the minimum completeness criteria (MCC) of 75, the average student score has exceeded the minimum standard (> 75). As for the results of the questionnaire, it is necessary to know the average score ($\bar{x}$) and then entered in Table 3. From the questionnaire, the average score obtained is 42. So that it can be seen that the level of achievement of the standard competency of lathe machining graduates from the teacher's point of view is included in the excellent category. Then for the achievement of lathe machining graduate competency standards from the student's point of view, it is in the excellent category. With an average score of 38.3. The students' scores with the second questionnaire show an excellent category so that the achievement of the competency standards of lathe machining graduates at Piri 1 Yogyakarta Vocational High School is in an excellent category.
Table 3. Category of Achievement of Lathe Machining Competency Standards.

| Interval   | Category       |
|------------|----------------|
| 52        | > x ≥ 42.25    | Very Excellent |
| 42.25      | < x ≤ 32.5     | Excellent      |
| 32.5       | < x ≤ 22.75    | Pretty Excellent |
| 22.75      | < x ≤ 13       | Not Excellent  |

Furthermore, the results of the descriptive analysis on the achievement of competency standards for milling machining graduates obtained student grade data with an average of 84.74. This value-based in Table 1 is included in the excellent category. When viewed from the MCC of 75, the average student score has exceeded the minimum standard (> 75). As for the results of the questionnaire, it is necessary to know the average score (\( \bar{x} \)) and then entered in Table 4. From the questionnaire, the average score obtained is 39.6. So that it can be seen that the level of achievement of competency standards of milling machining graduates from the teacher's point of view is in a very excellent category. Then for the achievement of competency standards of milling machining graduates from the student's point of view, it is in the excellent category. With an average score of 35.04. The students' scores with the second questionnaire showed an excellent category so that the achievement of the competency standards of milling machining graduates at Piri 1 Yogyakarta Vocational High School was in an excellent category.

Table 4. Category of Milling Machine Competency Standard Achievement.

| Interval   | Category       |
|------------|----------------|
| 52        | > x ≥ 42.25    | Very Excellent |
| 42.25      | < x ≤ 32.5     | Excellent      |
| 32.5       | < x ≤ 22.75    | Pretty Excellent |
| 22.75      | < x ≤ 13       | Not Excellent  |

Then, the results of the descriptive analysis on the achievement of the competency standards of grinding machining graduates obtained data on student scores with an average of 80.42. This value-based in Table 1 is included in the excellent category. When viewed from the MCC of 75, the average student score has exceeded the minimum standard (> 75). As for the results of the questionnaire, it is necessary to know the average score (\( \bar{x} \)) and then entered in Table 5. From the questionnaire, the average score obtained is 41.6. So it can be seen that the level of achievement of the competency standard of grinding machining graduates from the teacher's point of view is in the excellent category. Then for the achievement of the competency standard of grinding machining graduates from the student's point of view, it is in the excellent category. With an average score of 41.13. The students' scores with the second questionnaire showed an excellent category so that the achievement of the competency standards of grinding machining graduates at PIRI 1 Yogyakarta Vocational High School was in an excellent category.
Table 5. Category of Achievement of Grinding Machining Competency Standards.

| Interval  | Category             |
|----------|----------------------|
| 42.25    | ≤ x ≤ 52             | Very Excellent |
| 32.5     | ≤ x ≤ 42.25          | Excellent      |
| 22.75    | ≤ x ≤ 32.5           | Pretty Excellent |
| 13       | ≤ x ≤ 22.75          | Not Excellent  |

Furthermore, the results of the descriptive analysis on the achievement of competency standards for graduates of CNC machining obtained student grade data with an average of 77.81. This value-based in Table 6 is included in the excellent category. When viewed from the MCC of 75, the average student score has exceeded the minimum standard (> 75). As for the results of the questionnaire, it is necessary to know the average score (\(\bar{x}\)) then entered in Table 4. From the questionnaire, the average score obtained is 50. So it can be seen that the level of achievement of the competency standards of graduates of CNC machining from the teacher's point of view is included in the excellent category. Then for the achievement of the competency standards of graduates of CNC machining from the student's point of view, it is in the very excellent category. With an average score of 46.26. The students' scores with the second questionnaire showed very excellent category so that the achievement of the competency standards of CNC machining graduates at Piri 1 Yogyakarta Vocational High School was in an excellent category.

Table 6. CNC Machining Competency Standard Achievement Category.

| Interval  | Category             |
|----------|----------------------|
| 42.25    | ≤ x ≤ 52             | Very Excellent |
| 32.5     | ≤ x ≤ 42.25          | Excellent      |
| 22.75    | ≤ x ≤ 32.5           | Pretty Excellent |
| 13       | ≤ x ≤ 22.75          | Not Excellent  |

4 Conclusion

Based on the research that has been done, it is concluded that first, the achievement of the competency standards of graduates at Piri 1 Yogyakarta Vocational High School in lathe machining is in the excellent category with an average value of 82.51. Second, the achievement of the competency standards of graduates in milling machining is in the excellent category, with an average score of 84.74. Third, the achievement of the competency standards of graduates in grinding machining is in the excellent category, with an average score of 80.42. Fourth, the achievement of graduate competency standards in CNC machining is in the excellent category, with an average score of 77.81.

Acknowledgments

Several suggestions need to be conveyed. Namely, teachers need to pay more attention to students who still score below the MCC so that these students can improve their competence. The quality of learning needs to be improved so that all students can achieve excellent graduate competency standards.
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