Learning evaluation using work preparation in turning machine process lessons

CT Harjanto*, B Kartowagiran, and A E Maryanto
Department of Mechanical Engineering Education, Universitas Negeri Yogyakarta, Indonesia

*chrisnaharjanto@uny.ac.id

Abstract. This study aims to implement learning by using work preparation in the subject of turning machining in the Mechanical Engineering Major of Muhammadiyah 1 Bantul vocational high school. This research is an evaluation research. The results showed the ability of students to understand work preparation was in the high category, with a percentage in the high category 29.11%, and a very high category 24.05%. Achievement of the practice of students who completed the work preparation was in the very high category, with the percentage of achievement at job 1 of 94.36% and job 2 of 70.42 percent, so that the overall job was 82.39%. The ability of students to apply work preparation is in the high category with an average percentage of 72.67%. The completeness of the work preparation format made by the teacher is incomplete because 10 of the 18 elements that must be present in the work preparation format are not fulfilled.

1. Introduction
Vocational education is an education subsystem that specifically helps students in preparing themselves for employment. Therefore students need media to help mastering competencies effectively and efficiently. Students must be able to make work procedures so that the work done is structured. Based on observations at the Muhammadiyah 1 Bantul Vocational High School and interviews with Mechanical Engineering teachers and students at the school, information was obtained that there was a lack of student interest in completing and implementing work preparation when machining practices, so that before practice students only imagination of how the workpiece was done or just follow a friend who finishes work first. Class XI mechanical engineering students before working on the workpiece does not determine how many turns the main shaft first, the determination of parameters is done during practice, so that when faced with problems students do not know how to overcome them. This causes the estimated time needed to complete work ineffectively. Students reasoned that they did not make work preparations in advance because they were chasing time to finish the next job so as not to pile up at the end of the semester, even though doing work without careful planning can cause fatal errors that cause students to have to repair or even have to repeat from scratch because of workpiece work mistakes cannot be tolerated or repaired.

Learning styles can also influence students in doing work preparation. This is because the way students process the information is different from each other [1]. Learning styles relate to the way children learn, as well as the preferred way of learning [2]. Students in general will find it difficult to process information in a way that feels uncomfortable to them. Students have their own needs, learn in different ways, and process information in different ways [3]. The success of teaching-learning process is not only determined by how the teachers teach but also, most importantly and principally is...
determined by how the students learn [4]. Teachers must be able to match the teaching strategies with the students' learning styles for effective learning [5].

To maximize the learning process it is necessary to have an appropriate evaluation so that the competencies desired by the teacher are able to be well received by students, this evaluation function is not only addressed to students, but includes evaluations for the benefit of the teacher, so the teacher can know the extent to which the student can receive information delivered, which can then be given appropriate treatment to students and know the difficulties faced by students. Therefore in this study an evaluation of the work preparation learning process on the subject of turning machining in the Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School, as a substance for evaluation of learning for students, teachers, and institutions (Schools).

Based on the background of problems related to learning the turning machining process in Muhammadiyah 1 Bantul Vocational High School the lack of effectiveness of students to make a work preparation before doing the turning practice, this causes students to lack understanding in determining parameters or aids to be used in turning process so that if a step error occurs, it tends not to be able to anticipate the next step. The use of work preparation can determine the exact sequence of work steps, therefore making it must be done precisely and in detail by students, intended to achieve more efficient practice results [6]. Making work preparation makes students actively solve their problems, they are required to know and learn theories needed in machining practices, such as mastery of cutting tools, understanding cutting parameters, correct and safe workpiece settings, safe and correct work steps, and other problems [7]. The existence of this evaluation is expected to be found strengths and weaknesses, so that the shortcomings that still exist can be used as a consideration to further advance the quality of learning programs.

Evaluation is a systematic activity to assess the design, implementation, effectiveness, and impact of a program [8]. Evaluation is a process of planning, obtaining, and providing information that is very necessary in making alternative decisions [9]. Evaluation aims to determine or make decisions to what extent teaching objectives have been achieved or not, besides evaluations also aim to analyze the level of efficiency of program implementation [10].

Evaluation is part of a series of learning in addition to planning and implementing learning [11]. The evaluation function varies in the teaching and learning process, namely as a tool to find out whether students have mastered the knowledge, values, and skills that have been given by a teacher [12]. Knowing aspects of student weaknesses in teaching and learning activities. To know the level of student achievement in learning activities. As a means of feedback for a teacher, which is sourced from students. As a tool to determine student learning development [13]. As the main material reports on student learning outcomes to parents of students.

Good measurements will produce good evaluation results [2]. To measure properly or precisely, a measuring instrument must be used that is good or meets the requirements [14]. As for measuring or evaluating educational activities especially learning outcomes in general can be divided into two types, there are tests and non-tests. If what is used as a measuring tool is a test, then the individual being evaluated is confronted with a situation that has been standardized in such a way that all individuals who are tested receive the same treatment. With this standardized situation the testee will receive the same order or task, so that each individual who is tested will get a certain score as a depiction of the results they carried out.

The use of evaluation when meeting an unstandard situation is a situation that cannot be regulated and controlled in accordance with the objectives. This can use non-tests, non-tests of situations left to run as they are, without being influenced by the tester. Educational activities that can be evaluated with non-tests for example about crafts, fluency in speaking in front of the class, activities in discussion and others. Tools that can be used to evaluate include interview guidelines, observation guidelines, documentation, and questionnaires.
2. Methods

This research is a product evaluation with a quantitative approach. Product evaluation is an evaluation that is directed to see the program results achieved as a basis for determining the final decision, improved, modified, improved, or stopped [15]. The study was conducted in the turning machining workshop of Muhammadiyah 1 Bantul Vocational High School on subjects in the turning machining process. The study was conducted in October-November 2018.

The subjects of this study were 86 students of class XI in the Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School. The number of research samples was 71 students. As for the objects in this study are students' understanding of work preparation and achievement of work preparation tasks at the first meeting, application of work preparation at the second meeting.

The procedure of this research is to compile a theoretical basis based on the problems faced in the Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School. Develop research instruments based on theoretical foundations and research objectives. Test the validity of the instrument with the expert judgment method, then the data collection is done 2 times. The first meeting is for the instrument of understanding students' work preparation and achievement of the work preparation tasks, the second meeting for the observation instrument for the application of work preparation. Furthermore, the data obtained are grouped and analyzed and then concluded.

Data were collected with a test sheet to determine students' understanding of the work preparation checklist sheet to find out the percentage of students' level of work preparation achievement, and observation sheets to find out the application of students' work preparation. Students fill out the test sheet by answering the multiple choice questions provided. The measurement scale used in this study uses the Guttman scale. According to the Guttman Scale is a scale that wants a strict type of answer, such as true-false, yes-no, ever-never, positive-negative, high-low, good-bad, and so on [16]. Scoring on the Guttman scale has two kinds of scores, namely score 1 and score 0. For the filled column that is "yes" has a score of 1 while for an empty column that is "no" has a score of 0.

This research uses descriptive statistical data analysis techniques. This technique is used to calculate the mean (M), median (Me), mode (Mo), and standard deviation (SD). The data obtained is then entered into the assessment categories of each instrument. Table 1 shows the assessment categories of the checklist and observation sheets while Table 2 shows the assessment categories of the test sheets.

| Table 1. Assessment checklist and observation sheet category |
|-------------------------------------------------------------|
| **Percentage** | **Category** |
|-----------------|--------------|
| 81 ≤ X ≥ 100    | Very High    |
| 61 ≤ X ≥ 81     | High         |
| 41 ≤ X ≥ 61     | Medium       |
| 21 ≤ X ≥ 41     | Low          |
| 0 ≤ X ≥ 21      | Very Low     |

| Table 2. Assessment test sheets category |
|------------------------------------------|
| **Criteria** | **Category** |
|-----------------|--------------|
| X ≥ Mi + 1,5 SDi | Very High  |
| Mi ≤ X ≤ Mi + 1,5 SDi | High       |
| Mi - 1,5 SDi ≤ X ≤ Mi | Low        |
| X < (Mi - 1,5 SDi) | Very Low    |

Where:

Mi = Ideal means achieved by the instrument
SDi = Ideal standard deviation achieved by the instrument
X = Average value
3. Results and Discussion
Data processing in this study uses Microsoft Excel 2013 software. Data description includes the mean (M), median (Me), Mode (Mo), standard deviation (SD), highest score, lowest score, histogram, and table. Following are the results of research on students' ability to understand work preparation, percentage of work preparation achievement, and application of work preparation in class XI turning machining subjects in mechanical engineering department of Muhammadiyah 1 Bantul Vocational High School.

Table 3 shows the ability of students to understand work preparation in the 10th grade turning machining subject in machining techniques. The ability to understand this work preparation includes knowledge relating to the elements that exist in the work preparation which is based on the basic competencies of class XI mechanical engineering in turning machining subjects. Researchers used instruments in the form of multiple choice questions with a total of 15 items, based on the scores obtained from respondents obtained the results in Table 3.

Table 3. Data analysis test scores for students' ability to understand work preparation.

| Statistics          | Results |
|---------------------|---------|
| Mean                | 70,80   |
| Median              | 73,33   |
| Modus               | 86,67   |
| Standar Deviasi (SD)| 14,23   |
| Highest score       | 93,33   |
| Lowest score        | 46,67   |

Table 4 shows that the ability of students to understand work preparation is in the high category, 23 students or 29.11% get scores at intervals of 72.39 - 85.25 (high category), 19 students or 24.05% (very high category), 21 students or 26.58% (low category), and 8 students or 10.13% (very low category). If seen from the average score of students that can be seen in the table of 70.80, the average score is at (Mi ≤ X ≤ Mi + 1,5 SDi) or 50-75, in the high category.

Table 4. Description of research results understanding work preparation

| Interval      | f  | Percentage | Category    |
|---------------|----|------------|-------------|
| 81.67 - 94.67 | 19 | 24.05      | Very High   |
| 67.67 - 80.67 | 23 | 29.11      | High        |
| 53.67 - 66.67 | 21 | 26.58      | Medium      |
| 0 – 53.67     | 8  | 10.13      | Low         |

Table 5 shows that the highest students' understanding of straight turning competence is 100% or in the very high category, HSE (Health Safety & Environment) competence is 98.59% in the very high category, the competency of understanding work preparation is 92.96% in the very high category, at taper turning competence is 84.51% in the very high category, turning tool competence is 68.5% in the high category, knurling turning competence is 73.24% in the high category, the turning parameter competence is 45.54% in the category enough, the competence of thread turning is 40.85% in the low category. This means that the ability of students to understand work preparation is good except for the competence of parameters and taper turning.
Table 5. students’ understanding of work preparation for each competency

| Competency      | Percentage (%) |
|-----------------|----------------|
| WP Definition   | 92,96          |
| Cutting tools   | 52,33          |
| Tool Equipment  | 68,5           |
| Straight Turning| 100            |
| Taper Turning   | 84,51          |
| Thread Turning  | 40,85          |
| Knurling        | 73,24          |
| Parameters      | 45,54          |
| HSE             | 98,59          |

The level of achievement of this work preparation task is obtained from the work preparation tasks that must be done by students including job 1 and job 2. The researcher uses a checklist sheet instrument where each student who has completed the work preparation will be given a checklist (√). The results of the checklist sheet instrument can be seen in Figure 1.

![Figure 1. Work Preparation Achievement Graph](image)

Figure 1 shows that the percentage of work preparation achievement on job 1 was 94.37%, that is in the very high category, job 2 was 70.42%, which was in the high category and the overall job average was 82.39%, that was in the very high category. This means that the achievement of the work preparation task is good.

The implementation of this work preparation is based on 5 aspects of action, each aspect that can be fulfilled by students will be given a check mark (√) which has a value of 1 and that which is not met is worth 0. The observations of 71 respondents can be seen in Table 6.

Table 6. Work application implementation data

| Aspect | Frequency | Percentage (%) |
|--------|-----------|----------------|
| 1      | 60        | 84,5           |
| 2      | 41        | 57,7           |
| 3      | 71        | 100            |
| 4      | 71        | 100            |
| 5      | 15        | 21,1           |
| Average|           | 72,7           |

Information:
- Aspect 1: Students do the workpiece settings according to the work preparation.
- Aspect 2: Students can set parameters on the lathe.
- Aspect 3: Students use tools that are suitable for work preparation.
- Aspect 4: Students can use measuring devices well.
- Aspect 5: Students use HSE equipment in full.

Table 6 shows that the observation study applied the work preparation with an average achievement of all indicators of 72.7%, namely in the high category. A total of 60 (84.5%) students set workpieces according to work preparation (very high category), 41 (57.7%) students could set parameters on a lathe (sufficient category), 71 (100%) students used tools appropriate aids (very high category), 71 (100%) students can use measuring devices well (very high), 15 (21.1%) students use complete occupational safety and health equipment (low category). This means that the application of work preparation done by students is good only there are still indicators that still need to be improved, namely the indicators of occupational health and safety.

Table 7 shows the assessment of work preparation, it can be seen if the format contained in the work preparation done by students still has shortcomings, namely the absence of 10 out of 18 work preparation formats that must be fulfilled.

### Table 7. Observation of sheet work preparation research

| Assessment Aspects                        | Y | N |
|------------------------------------------|---|---|
| Format name                              | v |   |
| Competencies / Sub competencies          | v |   |
| Student's name                           |   | v |
| Main / class number                      |   | v |
| Number column                            |   | v |
| Job name and sketch column               |   | v |
| Work steps                               |   | v |
| Machines / tools used                    |   | v |
| Cutting tools used                       |   | v |
| Cutting Speed (Cs)                       |   | v |
| Feeding (F)                              |   | v |
| Spindle rotation (n)                     |   | v |
| Estimated time                           |   | v |
| Security actions                         |   | v |
| Initial student                          |   | v |
| Initial guide                            |   | v |

4. Conclusion

Based on the results of research and discussion that has been delivered, it can be concluded students' ability in understanding work preparation in the turning machining subject of Class XI Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School is in the high category, with the percentage in the high category 29.11%, and in the very high category 24.05%. Achievement of student practice that completes work preparation in turning machining subject of Class XI Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School is in the very high category, with the percentage of achievement at job 1 at 94.36% and job 2 at 70.42% percent, so overall job is 82.39%. The ability of students to apply work preparation in turning machining subject of Class XI Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School is in the high category with an average percentage of 72.67%. The completeness of the work preparation format in turning machining subject of Class XI Mechanical Engineering Major of Muhammadiyah 1 Bantul Vocational High School made by the teacher is incomplete because 10 of the 18 elements that must be present in the work preparation format are not fulfilled.
5. Acknowledgments

Based on the conclusion above, the researcher proposes to improve/complete the work preparation format that students must make before carrying out the practice, such as the inclusion of cutting parameters and the estimated time in the work preparation sheet. The need to increase the parameter setting of the lathe to students, so that students who carry out the practice do not directly use the lathe without knowing how many revolutions are used. More important is the importance of applying HSE to students when the lathe practice process takes place. Students can avoid things that are not desirable. Intensive assistance by the teacher needs to be done when students make work preparation and its application, so that the results obtained are even more optimal.

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