An Analysis of Students’ Learning Difficulties in Image Projection Subject

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Abstract. This study aimed to investigate the factors causing learning difficulties experienced by students in Image Projection subject and describe the level of their learning difficulties viewed from the factors of students, teachers, environment, facilities, and subject matters. This was a descriptive study employing a quantitative approach. The data were collected from 50 students of Grade X, Machining Engineering study program, Muhammadiyah 3 Vocational High School, Yogyakarta, through questionnaires and interviews. The findings showed that the students’ learning difficulties were caused by various factors, including the students themselves (34.01), the teacher (29.44), environment (25.30), facilities (34.39), and subject matters (24.98). To overcome those constraints, some students (19.76) chose to join a tutorial.

Keywords: Learning difficulties; Image projection; Machining techniques.

1. Introduction

Education is the most important aspect of human empowerment. Through education, the development of students’ potential, personalities, intelligence, skills, and noble characters can be formed and directed. Teachers as instructors play roles in providing new knowledge for the students. Consequently, they are always required to find new models or media in delivering the learning materials. This aims to make the students more motivated to improve the quality of their learning process and to generate enormous learning enthusiasm. The success of the learning process depends on the teachers’ teaching system. The learning process must attract the students’ interest and make them as the learning center. The learning process will be successful if the model used by the teacher is appropriate and involves the students in various tasks that can improve their competences.

Vocational High School (SMK) is one of the formal education institutions that are systematically established to develop work skills and sciences that can be implemented in various subjects. In addition, vocational schools are required to shape the students’ characters to be ready to work or to continue their education to a higher level.

Based on the results of observations during the Guided Field Practice (GFP) and interviews with the teachers of Image Projection subject in SMK Muhammadiyah 3 Yogyakarta, it was found that the Grade X students’ scores for this subject were low: mostly 65 with a mean score of 71, that was certainly under the Minimum Completeness Criteria (MCC) of 75. According to Sugihartono[1],
learning difficulty is a symptom that is characterized by low learning achievement, under the established norm.

To meet the MCC, a remedial is needed. The main problem faced by the students was the difficulty in understanding the materials, especially the theoretical ones. Some students did not pay attention to the teacher's explanation, and some were busy talking with other friends during the lesson. The students seemed not interested in participating in the learning process. In addition, the available learning facilities were not used extensively.

Djamarah[2] asserts that learning difficulty is a condition in which a student cannot learn well because of threats and disruptions in the learning process, derived from the student's external and internal factors. Hambali[3] Yudianto[4], Setiya[5], and Sukaswanto[6] find that the factors affecting the students’ learning difficulties include those coming from the students themselves, teachers, facilities, and subject matters.

In line with those studies, it is necessary to identify the factors that influence the students’ learning difficulties in SMK Muhammadiyah 3 Yogyakarta. The results of this study are expected to provide benefits for the school to find out the factors that influence the learning difficulties of the students.

2. Method
2.1. Research Design
This study employed the quantitative descriptive method. The purpose of this study was to find out or describe the students’ learning difficulties in Image Projection subject.

2.2. Research Setting
This study was carried out in SMK Muhammadiyah 3, located at No. 62 Pramuka Street, Giwangan, Umbulharjo, Yogyakarta. The study began in February 2018 in the 2017/2018 academic year.

2.3. Research Subject
The subjects of this study were 50 Grade X students from Machining Engineering (ME) 1 and 2 classes who had learning difficulties in Image Projection subject.

2.4. Data Collection Technique
The data were collected using questionnaires and interviews. The instrument items in the questionnaires were developed in both positive and negative statements. These items were to investigate the factors affecting the learning difficulties of the students from ME 1 and 2.

An interview can be carried out when the research subjects are small in number or when the researchers want to have a preliminary study to find out the problems to be investigated and any details about the research subjects [7]. In this study, the researchers interviewed 6 students who had low, average, and high score from both classes.

2.5. Data Analysis Technique
The data of this study were analyzed using quantitative descriptive analysis. Each statement in the questionnaires had 4 alternatives as presented in Table 1.

| Table 1. Alternative Answers and the Scoring System | Score per Statement |
|---------------------------------------------------|---------------------|
| Alternative Answers                               | Positive | Negative |


In details, the scoring scales for the positive statements are as follows: 4 - Strongly Agree (SA) includes: very easy to understand, very appropriate, and very clear; 3 - Agree (A) includes: easy to understand, clear, and appropriate; 2 - Disagree (D) includes: not easily understood, unclear, and inappropriate; 1 - Strongly Disagree (SD) includes: hard to understand, very unclear, and very inappropriate.

Meanwhile, the scoring scales for the negative statements are as follows: 1 - Strongly Agree (SA) includes: very easy to understand, very appropriate, and very clear; 2 - Agree (A) includes: easy to understand, clear, and appropriate; 3 - Disagree (D) includes: not easily understood, unclear, and inappropriate; 2 - Strongly Disagree (SD) includes: hard to understand, very unclear, and very inappropriate.

After summing up and grouping all answers, the researchers converted them into percentage by dividing the gain score by the maximum score, then multiplying the result by 100% [8] as illustrated in equation (1).

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\text{Percentage} = \frac{\text{Gain Score}}{\text{Maximum Score}} \times 100\%
\]

The yielded percentages were then translated into 4 criteria as proposed by Arikunto [9] as follows:

**Table 2. Percentage Categories**

| No | Percentage | Categories            | Description          |
|----|------------|-----------------------|----------------------|
| 1  | 76-100     | Very Good (VG)        | Uninfluential        |
| 2  | 51-75      | Good (G)              | Less Influential     |
| 3  | 26-50      | Fairly Good (FG)      | Influential          |
| 4  | 0-26       | Not Good (NG)         | Highly Influential   |

The factors with a percentage of 0 – 26 and 26 – 50 were those causing difficulties in the students’ learning process.

**3. Results and Discussion**

The factor causing learning difficulties that was from the students themselves consisted of 4 indicators: enthusiasm, attitude, interest, and ability.

**Table 3. Learning difficulties viewed from the student factor**

| Indicator | Min | Max | Mean | Percentage |
|-----------|-----|-----|------|------------|
As seen in Table 3, the indicators in the student factor ranged from 12.50 to 58.33 with a mean score of 39.33. As the mean score was in the 26 – 50 interval, this factor could be said as one of the factors causing learning difficulties for the students.

Ranked from the least to the most influential, the indicators showing the students’ learning difficulties were ability (28.50), interest (28.95), enthusiasm (39.25), and attitude (39.33). All indicators were in the 26 – 50 interval, meaning that they were all influential in causing the students’ learning difficulties.

The students’ abilities referred to in this study were both their ability in preparing themselves to learn before the learning activities began and their habits in setting their coursebooks or practicum equipment that would be used in the learning process. Attitudes also played role in the occurrence of learning difficulties. The students’ attitudes on learning, good or bad, would affect the learning process and the outcomes. Viewed from the students’ enthusiasm in learning, those with high enthusiasm showed good attitude when learning and did the tasks assigned by the teacher enthusiastically. The level of the students’ learning enthusiasm was affected by interest. Further, interest would also affect the difficulties the students encountered. The stronger their interest was, the easier they understood the subject. In contrary, when there was no interest in the subject, the students would have difficulties in the learning process.

In general, all indicators in the student factor with a mean score of 34.01 were in the 26 – 50 interval, meaning that the students’ enthusiasm, attitudes, interest, and abilities affected the students’ learning difficulties.

### Table 4. Learning difficulties viewed from the teacher factor

| Indicator     | Min   | Max   | Mean  | Percentage |
|---------------|-------|-------|-------|------------|
| Ability       | 16.67 | 33.33 | 26.83 | 53.66%     |
| Attitude      | 25    | 50    | 34.50 | 69%        |
| Teaching Method | 15    | 35    | 27    | 54%        |

Table 4 shows that the indicators in the teacher factor, namely the teacher’s ability, teaching method, and attitudes, scored 15 to 50 with a mean score of 26.83, 27, and 34.50 respectively. These mean scores were in the 26 – 50 interval, meaning that all of these indicators were the factors causing learning difficulties for the students.

To make the students enjoy the learning process, teachers were urged to make some changes in their teaching method or style. The use of various teaching methods was expected to raise the students’ motivation in learning.
Overall, all indicators in the teacher factor with a mean score of 29.44 were in the 26–50 interval, meaning that the teacher’s abilities, teaching method, and attitudes were viewed as influential in the students’ learning difficulties.

Table 5. Learning difficulties viewed from the facility factor

| Indicator       | Min  | Max  | Mean | Percentage |
|-----------------|------|------|------|------------|
| Classroom       | 7.14 | 25   | 16.66| 33.32%     |
| Coursebook      | 25   | 100  | 48.00| 96%        |
| Practicum Equipment | 21.88 | 50  | 38.31| 76.62%     |

Table 5 indicates that the facilities provided at schools, with a score of 7.14 to 100 and a mean score of 16.66 to 48.00, influenced the students’ learning difficulties.

Both the practicum equipment and the coursebook indicator were in the “influential” category as they were in the 26–50 interval. Meanwhile, the classroom indicator with a mean score of 16.86 was in the 0–26 interval, showing that this indicator was highly influential in the students’ learning difficulties.

The facilities used in the learning process were fairly good and supporting. Such equipment as drawing tools, drawing tables, and laboratories were available. The only problems in this aspect were the unavailability of special tables for drawing and the uneven table surface from scratching.

All indicators in the facility factor with a mean score of 34.39 were in the 26–50 interval, indicating that facilities could have affected the students’ learning difficulties. The classroom condition was the least influential indicator, followed by practicum equipment and coursebook as the most influential indicator.

Table 6. Learning difficulties viewed from the environment factor

| Indicator       | Min  | Max  | Mean | Percentage |
|-----------------|------|------|------|------------|
| School Condition| 17.50| 32.50| 25.30| 50.6%      |

Table 6 suggests that environment had affected the students’ learning difficulties with a mean score of 25.60. This score was in the 0–26 interval, showing that this factor was highly influential.

In this context, environment involved all physical aspects in a school, namely the classroom, learning facilities and infrastructure, learning resources, and media. Furthermore, the social environment of the students at school, particularly their relationship with teachers, classmates, and staff, also had significant effect on the students’ learning difficulties. A good environment is the one that supports the learning process. Therefore, every stakeholder involved had to maintain both the physical and social environment of the school for the sake of the students’ learning.

Table 7. Learning difficulties viewed from the subject matter factor

| Indicator       | Min | Max | Mean | Percentage |
|-----------------|-----|-----|------|------------|

As shown in Table 7, the subject matter being learned scored 13.89 to 33.33 with a mean score of 22.28 to 26.79. The mean score for the pictorial and orthogonal projection indicators (24.98) was in the 0 – 26 interval, showing that these two indicators were in “highly influential” category. Meanwhile, the understanding indicator had a mean score of 26.79 that was in the 26 – 50 interval, meaning that this indicator was in the “influential” category.

These results implied that subject matter did affect the learning difficulties encountered by the students. Pictorial projection was the least influential, followed by orthogonal projection and understanding indicator as the most influential one. These two subjects were indeed a complex subject to master, as they require more understanding, accuracy, and creativity.

As shown in Table 8, the students’ efforts to overcome their learning difficulties scored 8.33 to 33.33 with a mean score of 19.76. This mean score was in the 0 – 26 interval, indicating that these efforts were highly influential in the students’ learning difficulties. The most influential effort was through taking a remedial test (28.57), followed by joining a tutorial session after school (17.67). Meanwhile, to assist the students in dealing with those difficulties, the teacher would motivate them to keep learning and being enthusiastic in the learning process. Besides, to minimize the problems, the teacher in the learning process tried to deliver the theories first, followed by a practicum.

4. Conclusions and Recommendations
4.1. Conclusions
In summary, this study on the learning difficulties encountered by Grade X students of Machining Engineering study program in SMK Muhammadiyah 3, Yogyakarta, argues that there are five factors causing the learning difficulties, namely the students themselves, teachers, environments, facilities, and subject matters. The students’ ability in understanding the materials affects their learning difficulties, and so does the teachers’ teaching method, including the media they use. In addition, the facilities provided at school like the table used for drawing may cause problems for the students in the learning process. The learning environments such as the school building, the practicum room, and the classroom atmosphere also prove to be obstacles for the students. The last factor causing these constraints is the subject matter being learned, i.e., pictorial projection. To solve all these problems, most students attend a tutorial after school to deepen their understanding of pictorial projection.

With a mean score of 34.01 (students), 29.44 (teachers), 34.39 (facilities), 25.30 (environment), 24.98 (subject matters), and 19.79 (efforts to overcome the problems), which are all in the intervals of 0 – 26 and 26 – 50, all these factors are confirmed to be the main factors behind the students’ learning difficulties.
4.2. Recommendations

The findings of this study lead to some recommendations for both the students and the teachers. For the students, they are encouraged to pay more attention on the lesson and do their tasks as instructed by the teacher. Meanwhile, the teachers are expected to improve their teaching method so that the materials can be easily understood by the students.

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