Developing project-based learning model using jobsheet in vocational high school

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Abstract. The purposes of this study were: (1) to develop a PjBL Model using CAD 3D Jobsheet, (2) to reveal the suitability of the developed model, and (3) to measure the effectiveness of the developed model. This study was RnD based on Richey and Klein (2010). The stages of product development consisted of analysis, design, development, and evaluation. The internal trials included the evaluation results of the product and instrument validation while the external trials included the result of students’ effectiveness on learning CAD and students’ responses on the jobsheet. The instruments used were an essay test, questionnaire, interview sheet, observation sheet using rating scale, and anecdotal records. The data were analyzed both qualitatively and quantitatively. The results of this study revealed that (1) the characteristic of the developed learning model included that the job that was made in the assembling structure comprised several parts, making it easier to divide the tasks, emphasizing on the character value, and having different levels of difficulty; (2) the developed learning model was feasible to use; (3) the learning effectiveness using the developed learning model on knowledge, skill, and creative thinking aspects was considered good. Furthermore, students’ responses to the developed learning model were regarded excellent.

1. Introduction

Workshop/laboratory practices turn to be special features for Vocational high school students. To support that practice, there has been the [1] stating that there is a decrease in the number of adaptive and normative learning hours and there is an increase in the number of productive learning hours which have been adjusted to the current trend in industry.

By the time, there have been several problems occurred in productive learning of VHS. For that reason, the researcher conducted a survey to find out the real problems happened in VHS at SMKN 1 Sedayu. For the sake of an exact objective, the researcher asked directly to students in relation to some problems faced by them. That was done by asking eleventh grade students some practical subjects they have by using questionnaire. The result of the survey showed CAD 3D turned to be the most difficult practical subject for the students.

Pre-survey using questionnaire was then followed to find out more about the difficulty on CAD 3D subject. Several factors causing the difficulty in that subject were given in the questionnaire. The result of the pre-survey in a form of factor voting revealed that unclear jobsheet became the main reason for the difficulty students faced. It was followed by the method used by the teachers which were not interesting as the second reason.
An interview was also administered to investigate the medium used in CAD 3D drawing technique learning. The result showed that teachers found it difficult to develop appropriate jobsheet based on its principles. Naturally, jobsheet is practical instructions to follow. Since they were not clear, the students were lazy to follow them and tended to ask their friends. This made the students difficult to develop their creativity.

In line with Curriculum 2013, the teachers are expected to conduct creative, active, and pleased learning process. The learning process is also based on competency optimizing learning process and authentic assessment for the sake of gaining attitude, knowledge, and skill competencies well. It is also expected that Scientific Approach is able to connect learning process between teachers and students. The students are required to be able to observe, ask, try/collect data, organize/associate, and communicate. On the other hand, teachers are only as facilitators.

In addition to questionnaire and interview, observation was also done to obtain real data about problems occurred at school. It was administered in the learning process of CAD 3D drawing subject. It was revealed that the teachers had not applied Curriculum 2013 as a whole because the learning process had not been done as it was supposed to be in Curriculum 2013, for instance, the teachers still used conventional learning (teacher-centered). When the teachers were interviewed, they explained that they got difficulty in developing learning media which were suitable to the principles in Curriculum 2013. Inadequate training on Curriculum 2013 provided by government turned to be the fundamental reason why that problem could occur. Furthermore, the teachers got confused on developing assessment instruments as it was based on Curriculum 2013.

Learning model used as in Curriculum 2013 had to be able to encourage the students to achieve competence on knowledge, skill, and attitude. One of suggested learning model in Curriculum 2013 is Project-Based Learning (PjBL). The conformity between PjBL and Curriculum 2013 is on the capability to optimize Scientific approach in it. The learning itself is not merely concerned on teacher-centered but it is on student-centered [2].

In line with the explanation explained previously, PjBL is completely appropriate to be applied in Vocational high schools especially on practical subjects. The students are expected to be able to develop their own ways of working in PjBL. Practically, the learning activity in PjBL can be done individually or in groups and administered in certain period of time collaboratively, resulting a product that can be presented later. Learning through PjBL which has had a big impact has been applied in several schools in Indonesia. Learning media, such as jobsheet is urgently needed for practical subject. Furthermore, PjBL is an exact choice and it is recommended by Curriculum 2013 to improve students’ creativity. Actually Jobsheet based on PjBL can be developed by making clear certain parts on jobsheet, such as project title, product specification, assessment, and time allotment.

Drawing practice technique turns to be the basic skill students must master. One of taught skills is CAD 3D drawing technique. The students are taught theories about drawing techniques until the drawing practice of a component. CAD 3D drawing technique in SMKN 1 Sedayu Bantul was conducted to eleventh grade students. It is really applicable to use PjBL for CAD 3D drawing technique. On the one hand, the correct use of jobsheet will give broader opportunity for students to sharpen their skill and creativity. By applying this learning model using jobsheet for CAD 3D drawing technique, the students can be stimulated to develop creativity and as a result the increase of their learning achievement can be explored.

The explanation above provided description to the researcher to analyze the problem into one study. The alternative solution on this research was developing PjBL Model by using jobsheet competency of CAD 3D drawing technique. That development is used as the media for practice and for helping teachers in achieving learning objectives.

2. Method

This study referred to Research and Development Study. According to Richey and Klein, there are four research stages. They are (1) Analysis; (2) Design; (3) Development; (4) Evaluation. The development
procedures in this research refer to the Design and Development Research Model that has been developed by Richey and Klein. This model is divided into two models, that is, Product and Tool Research and Model Research [3]. Model Research was used in this study. In accordance with [3], the research development procedures using Model Research Approach have three stages (shows in figure 1), they are (1) Model Development; (2) Model Validation: (Model Use).

![Figure 1. Model Research](image)

This study was conducted in VHS 1 Sedayu Bantul. Trials had been done in two steps within 8 meetings. The first step was limited trial. It was done in two meeting for 4x45 minutes each meeting and there were four students. Then, broader trials were done in five meetings for 3x45 minutes each meeting. The students were divided into three groups with three members each from Mechanical Engineering study program who were in the eleventh grade and they were chosen randomly. To collect the data, questionnaire, interview, field observation, and documentation were used. Then, the instruments used were questionnaire, interview sheet, collected documents, essay test, observation sheet in a form of rating scale, and anecdotal records. The development of jobsheet product and the lesson plan of PjBL Model used qualitative and quantitative analysis. Qualitative analysis was from interview result of need analysis and product design to teachers, learning activity assessment, thinking creativity and presentation using questionnaire while skill assessment using self assessment. Then, quantitative analysis was from need analysis assessment, knowledge aspect assessment, learning activity, presentation, thinking creativity, and skill. Moreover, ICC was used for content validity and reliability analysis.

3. Results and Discussion

The product development of Jobsheet and Lesson Plan with PjBL Model was done by using Development Model by [3]. The initial product development was conducted by doing observation at school. The chosen school was SMKN 1 Sedayu Bantul. It was based on several considerations, that is, 1) there was Mechanical Engineering study program in SMKN 1 Sedayu Bantul; 2) Curriculum 2013 had been applied in that school; 3) The practice facilities in that school were considered adequate. That initial observation was done to obtain data, the most difficult subject faced by the students. The result showed the most difficult subject was CAD 3D drawing practice. The second observation was conducted to get the factor causing the difficulty students faced on that subject. The result indicated that it was due to the jobsheet used was unclear. The third observation was done to expand the previous results. It was done by interviewing teachers responsible for CAD 3D subject and it was found that conventional learning method (teacher centered learning) was still used in CAD 3D subject. Besides, the learning
media used was taken from the media based on The School-Based Curriculum. The developed model was PjBL Model using Jobsheet. However, practically, jobsheet could not be done separately. It required Lesson Plan with PjBL Model that could be used to support the developed PjBL. In accordance with the standardized main and standard competence, there were six meetings required in which five meetings were used to practice and one meeting was used for final evaluation. The development of Lesson Plan with PjBL was based on the existed syntax which was started by asking essential questions, designing a plan for the project, creating a schedule, monitoring the development of students’ project, assessing the outcome, and evaluating students’ learning experience. The product that had been made was then validated by the experts (expert judgement). Each of Jobsheet and Lesson Plan with PjBL was validated by learning expert, media expert, and specific subject teacher. Generally, the result of validation by the experts revealed that there was only a minor revision and overall they were qualified to use. The validation explanation of each product was explained in details as follows. The validation result by the instrument expert revealed that the prepared instruments to use by experts were generally qualified and ready to use with a minor revision. The realibility result measured by ICC was 0.659 and it was categorized good agreement and reliable. The validation result by the product expert showed that the Jobsheet and the prepared Lesson Plan to use by experts were generally qualified and ready to use with a minor revision. The realibility result measured by ICC was 0.755 and it was categorized good agreement and reliable.

The limited trial was done to analyze the products of Jobsheet and the Lesson Plan of PjBL Model that had been developed. This trial was administered to four students and one modeled teacher. This trial was aimed at analyzing the overall products of Jobsheet and the Lesson Plan of PjBL Model comprising content/substance, systematics, and grammar. Thus, it was expected that in the implementation, there were no any mistakes and obstacles encountered. The result of limited trial indicated that Jobsheet and the Lesson Plan of PjBL Model had been well. There were only few notes found in mistyping several words. Due to that reason, the products of Jobsheet and the Lesson Plan of PjBL Model were classified good and they were eligible to use.

The second limited trial was done by implementing the products. It was conducted by dividing the students into two small groups with two students each group. Every group was assigned to do the project that had been given. While doing the project, the observers observed those students. The things being observed were learning activity and thinking creativity. At the end of the learning activity, each group presented the improvement of their project. Simultaneously, the observers observed their presentation. The result of the second limited trial could be clarified on Figure 2.

![Figure 2. The Recapitulation of Second Limited Trial Result](image)
After conducting those limited trials followed by revising, the extended or broader trial was done. The objects were nine eleventh grade students of Mechanical Engineering study program which were divided into three groups. Several jobs done included 1) Straight Gear and Mandrel; 2) Hammer; 3) Tracker magnet; 4) Stalk Tap; 5) Vise. The assessment was done by three observers. They were 1) Fauziah Amalia Devi, M.Pd.; 2) Islami Fatwa, S.Pd., Gr.; 3) Prasetyo Adhi Nurcahyo, S.Pd. The assessments toward the limited trials done by them involved 1) Learning activity; 2) Thinking creativity; 3) Presentation. Then, other assessments involved 1) Students’ responds toward jobsheet; 2) Skill; 3) Knowledge. The result of the broader trial assessment was summarized on the following Table 1 and Figure 3 and Figure 4.

### Table 1. Expectation, Performance and Gap of Each Dimension

| Jobsheet | Learning Activity | Thinking Creativity | Presenting Ability | Skills |
|----------|------------------|---------------------|--------------------|--------|
| 1        | 87.65            | 77.78               | 84.09              | 91.67  |
| 2        | 81.48            | 74.44               | 80.56              | 82     |
| 3        | 78.70            | 75                  | 72.47              | 84.67  |
| 4        | 79.51            | 68.75               | 78.69              | 79.33  |
| 5        | 87.65            | 81.67               | 94.85              | 89.33  |
| Mean     | 83.00            | 75.53               | 80.13              | 85.4   |

Predicate: Very active, Very good, Very good, Very good

The discrimination test of the experiment was done by using T-test. The instrument used to do that test was essay test in the pretest and posttest. The results of T-test showed that T-table was 2.145 and T-value was -294. In line with those results, it was inferred that there was a significant difference on both pretest and the developed product accepted and applied in real learning activity at school. The suggested revision of the product was summed up on Table 2 while the suggested revision of the instrument was summarized on Table 3.

After conducting the broader trial, there were several revisions made. This was done based on the notes students made on their respond sheet and several notes made by the observers and the modeled teacher. The aim of those revisions was to make

### 4. Conclusions and Suggestions

#### 4.1 Conclusion

The research result of developing Jobsheet and Lesson Plan with PjBL Model for CAD 3D practice subject was as follows: (1) The characteristic of PjBL Model using Jobsheet on CAD 3D subject consisted of: Job that was made in the assembling structure which comprised several parts, making it easier to divide the tasks, emphasize on the character value, and have different level of difficulty. (2) The product of PjBL Model using Jobsheet on CAD 3D subject was eligible to use. The suitability of product and research instruments were obtained through validation result by the experts. The results revealed that Jobsheet product was appropriate to use and there was only minor revision on it. In addition, the reliability of the product and instruments were categorized good agreement. (3) The learning effectiveness using Jobsheet and Lesson Plan with PjBL Model produced assessments on knowledge, learning activity, presentation, skill, and creative thinking. Furthermore, students’ responses on PjBL Model Jobsheet were regarded excellent. The result of assessment on all aspects revealed that
the mean score of every aspect was considered good. The last but not least, the students’ responses towards the learning activity using Jobsheet and Lesson Plan with PjBL was revealed very good.

4.2 Suggestion
A Jobsheet products and PjBL model RPP development results can be utilized with considered some suggestions. There are some suggestions for products utilization, such as: (1) A jobsheet products and PjBL model RPP should be applicable in All VHS especially in Mechanical Engineering Programs (2) The implementation of PjBL models in VHS are very well to use because it can increased the students creative thinking and as well as cause to emerge students team work according to the real atmosphere (3) The availability of supporting facilities and infrastructure should be prepared by school. A good infrastructure and facilities from school can make teacher easier for implementing PjBL model

Figure 3. Average Data Recapitulation Meeting 1 to 5

Figure 4. Categorized Data Recapitulation Meeting 1 to 5

Table 2. Suggested Revision of The Product

| Before Revision                                                                 | After Revision                                                                 |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| The practice time was limited, only 40 minutes                                | The practice time was extended into 50 minutes                                |
| It was not stated of what was going to teach in the apperception and motivation | In the apperception, the teacher explained the things directly followed by the explanation of what things needed anticipating by the students |
| The material was explained a lot                                              | The longer material was only explained in the beginning of the meeting. The other materials were delivered briefly. That was done due to the similarities in Main Competence and Basic Competence |

Table 3. Suggested Revision of The Instrument

| Several Criticism from the Observers                                         | Action                                                                                     |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| There was inappropriate spelling of the word *job*                           | The spelling was revised based on The Enhanced Indonesia Spelling System and the appropriate principal of Bahasa |
| The diction used should have been revised to make it easier of Vocational school students to understand | The diction was chosen in line with the observer’s suggestion                                |
| The things for practices had to be available in the workshop                 | Checking the availability of things for practices                                          |
5. References

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