Effectiveness of Project-Based Learning Model on E-Learning Assisted Residential Installation Job Sheet

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ABSTRACT

Learning residential installations found that the problems of student practice were not in accordance with the existing job sheet. The difficulty of students in carrying out the work steps on the existing worksheet. This study aims to develop a valid, practical, and effective project-based housing installation worksheet so that the function of the job sheet as a guide in practice can be maximized. This type of research is research & development. The development procedure used in this research is the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The result of this research and development is that the use of a project-based housing installation job sheet shows that there is an increase in learning outcomes. So, in conclusion, learning using this worksheet is effective in improving student learning outcomes.

Keywords: Job Sheet, Residential Installation, Project based Learning, E-Learning.

1. INTRODUCTION

The residential installation course provides an understanding and ability in; planning of residential lighting installations, high-rise buildings and special lighting installations which include drawing single diagrams and wiring diagrams, lighting installations, power calculations, component selection (installing single switch installations, exchange switches, cross switches, series switches, impulse switches). Installing domestic electrical installations (pipe-junction box, external panel equipment, PHB wiring, connection and installation testing, trouble shouting). Measurement of light illumination and electrical installation security systems [1].

This course consists of 2 credits of theory and 3 credits of practice. The results of the initial observations showed that students' interest, motivation and learning outcomes were still low. The low is because the existing job sheets cannot be understood by students in doing practice. The contents of the job sheet are limited because they still use manuals and even then, they are used when giving the material, so students cannot directly carry out the practice if it is not explained beforehand. The

job sheet at least consists of the title of what basic competencies will be achieved, completion time, equipment or materials needed to complete the task, brief information, work steps, tasks to be done and reports to be done. [2]. So that the old job sheet needs to be repaired or developed.

The development of the project-based residential installation job sheet will be developed with the help of e-learning as a medium for distributing the job sheet that has been developed later. Students can download job sheets and have discussions about jobs that will be done anywhere and anytime without being limited by space and time [3][4]. Job sheets are used by students when carrying out practical work or practicum so that it is easier for students to do what they are doing in accordance with the instructions that have been determined in learning. The benefits that practitioners get when using the job sheet during practical work or practicum are to make them more understanding, understand, and able to do their work correctly in accordance with the instructions in the job sheet [5][6][7].

A job sheet is a book written with the aim that students can study independently without or with the

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guidance of a lecturer [8]. A job sheet contains at least the learning instructions, the competencies to be achieved, the contents of introductory practice materials, and supporting information. A job sheet will be meaningful if students can easily use it. Learning with job sheets allows a student who has a high speed in learning to complete faster than other students [9][10][11].

Several previous studies that discussed the development of job sheets as learning media include Muhammad Fitron Noktaviyanda in 2011 from the State University of Semarang who conducted research on improving learning outcomes through the application of job sheet learning media on the automotive electrical system display panel. The results of the study showed an increase in student learning outcomes whose learning using a worksheet was 13.88 or 23.85% of the initial ability. Chairul Nazalul Anshar in 2015 from Padang State University conducted research on the development of product-based job sheets in the practice of electronic circuit training courses in the electrical engineering study program, Faculty of Engineering, Universitas Negeri Padang. The results of the research show that the product-based job sheets are valid, practical, and effectively used in practical learning in the Electronic Circuit Practice training course, Industrial Electrical Engineering Study Program, Faculty of Engineering, Universitas Negeri Padang. Valid, practical and effective job sheets can increase students' interest, motivation and learning outcomes [2][5][6][8][10][12].

Project based learning is a systematic learning model, involving students to learn through a long and structured inquiry process towards carefully designed tasks and products as well as authentic and complex questions. [13][14][15]. E-Learning is learning that uses the services of electronic devices, especially computers and mobile phones. E-learning is often referred to as an online course [16][17]. In this research and development, e-learning is used as a medium for students to learn independently with the instructions on the job sheet packaged in e-learning.

2. METHOD

Research & development (R&D) is type of research. The ADDIE model was chosen for the following reasons. This model is very simple when compared to other models. This model is easy to learn. The structure is systematic from the first stage to the fifth stage. Cannot be sorted randomly because it has the characteristics of a procedural model. The

following describes the flow of research and development using the ADDIE model.

2.1. Analysis

The analysis includes needs analysis in the development of project-based job sheets. Needs analysis has several stages, namely curriculum analysis and student analysis.

2.2. Design

This stage verifies the form of problem solving that will be carried out and determines the appropriate test method. This stage includes the translation of learning needs and objectives into the purpose of making a specific job sheet. This stage designs a project-based job sheet in accordance with the need's analysis carried out. In addition, at this stage, instruments are also designed to carry out product validation instruments, practicality instruments, effectiveness instruments and instrument validation instruments.

2.3. Development

This development stage generates and validates project-based job sheets. The validation process is accompanied by discussions or direct interviews with experts regarding improvements that must be made. Project-based job sheet designs are first consulted with experts or experts. Then, the design is assessed by competent people (validators) who have understood the principles of project-based job sheet development.

2.4. Implementation

Preparation of the learning environment and student involvement in lectures which consists of preparation of lecturers and students is the implementation stage. Students are given project-based job sheets to determine the practicality and effectiveness of using job sheets.

2.5. Evaluation

Determination of evaluation criteria, determining instruments, and conducting evaluations Assessment before and after implementation and quality of product development and development processes.

The R&D subjects of the project-based job sheet are students and lecturers of residential installations in the electrical engineering department, Faculty of Engineering, Universitas Negeri Padang. The data

analysis technique used is descriptive data analysis technique, describing the validity, practicality and effectiveness of using project-based job sheets.

3. RESULT AND DISCUSSION

This curriculum analysis refers to the synopsis of the residential installation course. The project-based residential installation job sheet consists of eleven topics, namely (1) Single Switch, Contact Box, Series Switch and Lamp; (2) One Group Lighting Installation; (3) Installation (MCB) 2 Group, swap switch, single switch, contact box, incandescent lamp and TL lamp; (4) Installation of single-phase kWh, 3 Group MCBs, exchange switches, series switches, cross switches, contact boxes, as well as incandescent lamps and TL lamps; (5) Installation of single-phase kWh, 3 Group MCBs, exchange switches, single switches, cross switches, contact boxes, as well as incandescent lamps and TL lamps; (6) Installation of 3-phase installations, 3-phase kWh, exchange switches, single switches, contact boxes, and incandescent lamps; (7) Installation, Testing and Measurement of the Grounding System (Grounding); (8) Installing and Identifying Characteristics of High and Low Pressure Sodium Lamps; (9) Installing and Identifying the Characteristics of Mercury and Metal-Halide Lamps (10) Identifying the Stroboscope Effect; (11) Multi-storey and Non-Story Building Installation.

The subjects of this study were students of Electrical Engineering Education in the odd semester of the 2020/2021 academic year. Students who take residential installation courses have an age range of 18-20 years. At that age, students are basically able to analyse and make their own hypotheses on a problem. Where according to Anderson, each category in the revised Bloom's Taxonomy, students at that age are located in the create category where students are able to design, build, plan, produce, discover, renew, perfect, strengthen, beautify, change.

At the design stage, a project-based housing installation job sheet is made. At this stage, a project-based housing installation job sheet is produced in accordance with the guidelines for making a good and standard job sheet. Each Job consists of objectives, basic theory, learning activities, analysis.

Implementation phase aims to get a practical and effective worksheet. Job sheets that have been refined based on expert tests are then tested. Testing the job sheet begins by giving a pre-test. The pre-test data were analysed and then allowed students to use the job sheet. Finally, students were given a post-test. This trial aims to determine the practicality and effectiveness of job sheets

The effectiveness test is seen through student learning outcomes by giving test questions to students before (pre-test) and after (post-test) doing learning using project-based job sheets in the form of multiple-choice tests.

Table 1. Statistic Calculation Results of Pre-test Score

N	Valid	20
	Missing	0
Mean		61,5380
Median		61,5400
Mode		57,69
Std. Deviation		13,72688
Variance		188,427
Minimum		38,46
Maximum		84,62
Sum		1230,76

Based on the distribution of scores in Table 1, it can be seen that the pre-test score with the total data as many as 20 students, the average value of the overall data is 61.53 the mean of the data sorted in 61.54, while the data that appears most often is 57. ,69. Furthermore, the size of the distribution of statistical data is 13.72 and the square of the difference from each data to the average value is 188.42. The highest score is 84.62 and the lowest score is 3.46, and the total score is 1230.76.

Table 2. Statistic calculation results of post-test score

N	Valid	20
	Missing	0
Mean		81,9240
Median		80,7700
Mode		80,77
Std. Deviation		8,09741
Variance		65,568
Minimum		65,38
Maximum		96,15
Sum		1638,48

Based on the distribution of scores in Table 2, it can be seen that the post-test score with the total

number of data is 20 students, the average value of the overall data is 81.92 the mean of the data sorted in 80.77, while the data that appears most often is 80,77. Furthermore, the size of the distribution of statistical data is 8.09 and the square of the difference of each data to the average value is 65.56. The highest score is 96.15 and the lowest score is 65.38, and the total score is 1638.48.

The results of the student posttest were then analyzed using the achievement level formula. The level of achievement obtained is 82% according to the category, namely in the very effective category [18]. This means that the use of project-based job sheets has been effective in improving student learning outcomes.

4. CONCLUSSION

The effectiveness of the developed job sheet for students is seen from the learning outcomes of students who take the test before using the project-based residential installation job sheet and after using the project-based residential installation job sheet, it shows that there is an increase in learning outcomes. So, it can be concluded that learning using job sheets can be said to be effective in improving student learning outcomes.

AUTHORS' CONTRIBUTIONS

The researcher finished writing this article together with the writing team.

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