The Development of a Flexibility-Project Based Learning Model on Vocational Education: A Need Analysis

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Abstract: This study discusses the needs analysis for developing flexibility-project-based learning models in vocational education to optimize the learning process and outcomes. The purpose of this study was to obtain information about the need for developing a proper learning model that can be applied in the domestic electrical installation learning process for students of electrical engineering vocational education at the third diploma level. The instrument used in this study was a questionnaire consisting of four leading indicators. 27 students who took part in the domestic electrical installation learning process became respondents in this study. The results showed that the need for a flexibility-based learning model project obtained a significant score. Thus, the need for a flexibility-project-based learning model developed in the domestic electrical installation learning process is high.

Keywords: Need Analysis, Learning Model Development, Flexibility-Project Based Learning, Domestic Electrical Installation.

1. Introduction

Industrial revolution 4.0 (IR 4.0) brings its benefits and challenges to human life [1]. The Internet is a key factor for change. The Internet is changing the transformed world into a world full of technology, starting from the economy, development, infrastructure, and facilities and infrastructure [2][26][27][28], including the industrial aspect [3]. An example is Smart Factories in the Internet of Things Paradigm by adopting the Internet of Things (IoT) factories can increase production output, support energy management and increase energy in factories [4] in industry, Smart city uses Internet of things data management, a society based on digital [5], businesses use smart factories to increase production efficiency and save energy to survive in the IR 4.0, not inferior to other business competitors [6]. Smart building development when we enter the room, the lights, air conditioning, and curtains turn on by themselves only using digital technology [7][29][30][31].

On the other hand, the development of industrial revolution 4.0 will not be separated from the workforce created by the world of education, especially in vocational education. Vocational education must produce graduates who can compete in the industrial revolution 4.0 by having useful competence in their field of expertise[8]. Vocational education graduates compete in the world of work with the competencies and skills needed by the industrial revolution 4.0.[9]

Vocational education is an education implementer that is very influential in preparing a skilled workforce who can adapt to the emergence of the 4.0 industrial revolution. To produce these ideal graduates, innovations are needed to implement the learning process [10], [11]. This innovation is expected to optimize the implementation of learning so that it can produce quality and competent graduates. The application of industrial revolution 4.0 in the learning process is a must. One of them is the use of IoT in the learning process. The learning process can be carried out by meeting directly in the classroom and being carried out without being limited by time and place by utilizing the internet network [12], [13]. Besides, the Covid-19 pandemic that began to plague in early 2020 also impacted the implementation of learning that had to be done online so that several learning approaches that could be applied online were widely used to keep the learning process still optimal.

The Flexibility learning approach is a learning approach that is commonly implemented in the on-line learning process during the COVID-19 outbreak. This learning approach is based on six dimensions, namely (a) infrastructure, (b) learning tools, (c) learning resources, (d) teaching and learning methods, (e) services for teachers and students, and (f) cooperation between government, companies, and schools [14].

Vocational education, which is an educational program that prioritizes the competence of students, requires not only a learning approach that can be accessed flexibly but also requires learning strategies that can improve the competence of students according to what is needed by the industrial world and the world of work [10], [15]. One of the learning approaches that are feasible to be applied in the learning process in vocational education is Project Based Learning, where the learning process is carried out by adopting the steps of implementing a project
that represents the world of work [16], [17]. Project-Based Learning has been proven to optimize the learning process in vocational education, specifically for practical learning [18]–[20]. With the analysis of the two learning approaches, research was carried out on developing the Flexibility-Project Based Learning model.

The learning model in its development process requires several stages of development, one of which needs analysis. Needs analysis is carried out to obtain information about the size of the need for development. With this needs analysis, the purpose of developing a development will be more measurable and useful. The purpose of this study is to obtain information about the need for the development of a Flexibility-Project Based Learning model in the domestic electrical installation learning process of electrical engineering vocational education students at the third diploma level (D3).

2. Methods

The research procedure applied in this study was to adopt ADDIE research and development procedures consisting of Analysis, Design, Development, Implementation, and Evaluation [21], [22]. These five steps are taken to get good development results and by what is expected. The needs analysis is in the first stage, namely analysis, intending to gather information about the need to develop a learning model that will be created. The results of this needs analysis will significantly influence the implementation of research at a later stage. Needs analysis is an initial and fundamental stage as a basis for researching at the next step.

The instrument used in this study was a questionnaire given to respondents. The research instrument was prepared using a Likert scale for the four needs indicators tested, namely: (1) Early Learning Activities; (2) Information; (3) Student perception; and (4) Learning Experiences. In this study, the prescription students were 27 students who followed the domestic electrical installation learning process in the Electrical Engineering study program, Department of Electrical Engineering, Faculty of Engineering, at Padang State University. The results of filling out the questionnaire were then analyzed using descriptive analysis techniques to reveal the percentage of learning model development needs as a whole and for each of the indicators tested.

3. Result and Discussion

Needs analysis data is obtained through filling out a questionnaire by students who take part in the domestic electrical installation learning process. Students fill out a needs analysis questionnaire after the Flexibility-Project Based Learning model concept has been developed. The results showed that the percentage of student answers to the analysis of the need for the development of flexibility-project based learning models on average was 78.53%. Where of the four tested needs indicators, each obtained a percentage: (1) early learning activities of 78.96%; (2) information of 77.25; (3) Student Perception of 80.93; and (4) Learning Experiences 76.99%. The needs analysis results for the development of a Flexibility-Project Based Learning model in the domestic electrical installation learning process based on student responses are presented in table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Early Learning Activities</td>
<td>78.96</td>
</tr>
<tr>
<td>2</td>
<td>Information</td>
<td>77.25</td>
</tr>
<tr>
<td>3</td>
<td>Student Perceptions</td>
<td>80.93</td>
</tr>
<tr>
<td>4</td>
<td>Learning Experiences</td>
<td>76.99</td>
</tr>
<tr>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>78.53</strong></td>
</tr>
</tbody>
</table>

Based on table 1, it can be seen that all the indicators tested in the needs analysis based on student responses obtained a significant score, namely above 75%, with an average of all indicators being 78.53%. This indicates that the need to develop a Flexibility-Project Based Learning model in the learning process of domestic electrical installations for electrical engineering vocational education students is high. To clarify each indicator's level of achievement, it can be seen in the chart presented in Figure 1.
The needs analysis results show that the learning model to be developed with the Flexibility-Project Based Learning model is feasible to be developed. The development of this learning model aims to optimize the learning process for domestic electrical installations. This is supported by several previous researchers' research results, which show that a project-based learning approach is applied in a competency-based learning process such as the learning process in vocational education [23]–[25]. Besides, the flexible learning approach is also useful to be applied in a learning process so that there are no time and time limitations in implementing learning.

4. Conclusion

The flexibility-project based learning model is a learning model developed to optimize the domestic electrical installation learning process in vocational education. Vocational education that prioritizes the implementation of a competency-based learning process requires a good and suitable learning model to be applied in the learning process to optimize the performance of learning in achieving learning objectives. The analysis of the need for the development of this learning model indicates that the need for the development of a flexible project-based learning model in the learning process of domestic electrical installations is very high. Thus, based on the results of the overall needs analysis and the descriptions of each of the tested needs indicators, it shows that developing a flexible project-based learning model is needed to optimize the learning of domestic electrical installations in achieving learning objectives.

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