Development Of Student Handbook In Learning Electrical Lighting Installation In Vocational School Of Electrical Engineering Department Based On Curriculum Of 2013
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Abstract: This study originated from a preliminary study at Vocational High School 5 Padang which found a number of facts which concluded that Installation Learning was not yet optimally measured by validation, effectiveness and practicality. This study uses Research and Development (R & D) with the procedure Borg and Gall which aims to create student Guide Book for Contextual Project Based Learning. Qualitative data was collected through observation and interviews, while quantitative data was collected through questionnaires, both data collection tools were validated by experts in FGD (Focus Group Discussion) attended by promoters, professors and senior lecturers of the Postgraduate Program of the Faculty of Engineering on Vocational Field Representation. Research, Development and Optional Refraction, from the FGD obtained research data collection instruments, a set of experiments was carried out to test whether the developed Student Guide Book was valid, effective and practical in the learning of electric lighting installations. A number of students were included in this study with an experimental class and a control class formed. In the experimental class the treatment was given using the student Guide Book of Contextual Project Based Learning while in the control class it was not, with the conclusion that using CPjBL the learning outcomes were superior to conventional ones. The learning outcomes of the two classes were compared with the T-test, the results of data processing showed that there were significant differences between the experimental class and the control class. Based on the results of T-test data processing, it is concluded that students with the treatment of student Guide Book of Contextual Project Based Learning in Learning of Electric Lighting Installation is better than the control class that is not given the treatment. The implications of this study need to be an alternative development of learning in Installation subjects in electric lighting and renewal in the student manual, then in improving Installation learning in electric lighting and other lessons, innovation in learning is needed, so the CPjBL student manual is more practical than the conventional one.

Keywords: Research and Development, CPjBL of Home Electric Lighting Installation.

1 INTRODUCTION

Learning is an aspect of complex human activities, which cannot be fully explained (Trianto, 2009). Simple learning can be interpreted as a product of ongoing interaction between development and life experiences. Learning in complex meanings is a conscious effort from a teacher to teach students (directing the interaction of students with other learning resources) in the framework to achieve the expected goals.[1] Learning design can be used as a starting point for efforts to improve the quality of learning; one of the initial activities in improving learning is to design teaching materials that refer to a development model to facilitate the learning process.[2][3] The important thing in designing teaching materials is that the organization of the content of teaching materials must be based on the characteristics of the structure of the subject matter, so that it can increase learning gain and retention rather than just following the order of the textbook content (Degeng, 1989).[4] Reigeluth (1992) also suggests that the design of teaching materials should modify one of the blue print standards that best suits the specific needs of learning. Majid (2007) argues that teaching materials are all forms of materials, information, tools and texts that are used to help teachers or instructors in carrying out teaching and learning activities. The material in question can be in the form of written or unwritten material.[5] Teaching material or curriculum material is the content or content of the curriculum that must be understood by students in an effort to achieve curriculum objectives. Teaching materials can be textbooks, worksheets, handouts, modules and so on.[6] The student manual refers to two concepts. First, the subject matter that is the content of the curriculum is a concept used to achieve learning objectives. Second, subject matter which consists of a unified subject matter and materials arranged to achieve learning objectives.[7][8] According to the Minister of Education and Culture Number 70 concerning the Basic Framework and Curriculum Structure of the Vocational High School, the 2013 curriculum is a development of the following mindset[9]:

1. Teacher-centered learning patterns become learner-centered learning. Students must have choices for the material being studied to have the same competencies;
2. One-way learning patterns (teacher-student interaction) into interactive learning (interactive teacher-learners-community-natural environment, other sources / media);
3. Isolated learning patterns become network learning (learners can learn from anyone and from anywhere that can be contacted and obtained through the internet);
4. Passive learning patterns become active-seeking learning (learning in active students is looking for learning resources that are increasingly reinforced by science approach learning models);
5. Personal learning patterns into group learning (team-based);
6. From the learning pattern of a single tool to multimedia-based learning;
7. Mass-based learning patterns are the needs of customers (users) by strengthening the development of the special potential of each student;
8. From the learning pattern of single science (mono discipline) to multi-disciplinary learning; and

The 2013 curriculum demands a change in classroom teaching methods from the Teacher Center to the Student Center. In this method, students are required to be independent in exploring knowledge and the teacher only acts as a facilitator.[11] One teaching material that can be used to help the learning process is the module. Modules are
printed teaching materials designed to be learned independently by students (Ditjen of PMPTK, 2008). The module has self instruction that allows students to learn independently using modules and the teacher is no longer the only source of learning for students so the learning system can be switched from teacher center to student center. According to Tjipito (1991), there are several advantages that can be obtained if learning uses modules, including:

1. Motivation of students is enhanced because every time students work on lesson assignments it is clearly limited and that matches their abilities.
2. After the lesson is finished the teacher and students know correctly which students are successful and which ones are less successful.
3. Students achieve results that match their abilities.
4. Credit of learning is more evenly distributed throughout the semester.
5. Education is more efficient.

Government Regulation No. 19 of 2005 article 20, affirms that the teacher is expected to be able to develop learning materials that are reinforced by the Minister of National Education Regulation Number 41 of 2007 concerning Standard processes governing learning planning that require educators in educational units to develop Learning Implementation Plans. Based on these regulations, it is expected that teachers can develop learning media as a source of learning. But in the development process, students' character must also be considered. In the development of student manuals, namely by using procedural Borg and Gall (2003: 571) and the center of education motivation policy (2008: 11) grouping this development into five main steps (1). Analyzing the product being developed (2), Developing the initial product (3), Expert validation and revision (4). Small-scale trial and revision (5), Large-scale trials and final products of this model have advantages such as: a) more appropriate to be used as a basis for developing learning devices not a learning system, b) the description appears more complete and systematic, c) in its development involves expert judgment so that before the trial is carried out in the field, the learning device has been revised based on expert judgment and suggestions (Dewi, 2010: 25 in Astuti: 2013). In the Borg and Gall development model, a teacher in developing a student manual book must analyze students, curriculum and material. In the learning process, students have different types or styles of learning. According to Yunsirno (2010: 114) there are three types of learning that are known (based on learning modalities), namely: Visual, Auditory, and Kinesthetic. Dryden (2003: 129-131), also mentions that there are three types of students, including:

a. Auditory students, who learn best through sound
b. Visual students, who learn best when they see pictures of what they learn
c. Haptic students, from Greek words which mean moving together, are often called kinesthetic students.

In the learning process, a teacher can use the method adopted with the characteristics and learning styles of his students, including:

a) Visual Children: (1) Using visual material such as pictures, diagrams and maps, (2) Using colors to help with important things (3) Inviting children to read illustrated books, (4) Multi-use media such as computers and videos, (5) Inviting children to try to illustrate their ideas in the picture.
b) Auditory Children: (1) Encouraging children to participate in discussions both in class and in the family, (2) Encouraging children to read subject matter aloud, (3) Using music to teach children, (4) Discuss ideas with children verbally, (5) Letting the child record the subject matter on a cassette.
c) Haptic / Kinesthetic Children: (1) In learning activities, do not give too much material, (2) Inviting the child to learn while exploring the environment (for example: invite him to read while cycling, using real objects to learn new concepts), (3 ) Using bright colors to highlight important things in reading, (4) Creating a cooperative learning atmosphere.

In addition to learning styles, the teacher must understand the nature of the child before determining the teaching materials and methods used.[12] Vocational students are students who enter the formal operation stage in their development. Winataputra, et al (2007) expressed his opinion that children at the formal operation stage have the ability to coordinate simultaneously or sequentially using their cognitive abilities, namely the capacity to use hypotheses and abstract principles, a teenager will be able to think hypothetically, namely thinking to solve problems by using the relevant hypothesis. Vocational students enter the formal operation stage, namely the stage of abstract thinking. Characteristics of students in formal operations tend to like contrasting colors but not striking. In helping the learning process, a module is needed that can help the abstract thinking process for students to have creative thinking, problem solving, and interaction and help direct it to solving real problems by developing learning modules for electric lighting installation of vocational students in the electricity field.

2. Methodology

This type of research is development research (Research and Development / R & D), namely research used to produce certain products and test the effectiveness of these products. The research method uses the development model of Borg and Gall. The steps of research and development carried out are as follows:

1. Phase Analysis of products to be developed
   a. Curriculum Analysis
   b. Adapted to Curriculum of 2013 which uses a scientific approach that is observing, asking, reasoning, trying and forming networks in order to shape the character of students who are productive, creative and innovative.
   c. Concept Analysis
   d. Concept analysis also includes literature review of chemical materials, basic competencies and core competencies in chemistry lessons based on the curriculum of 2013.
   e. Student Analysis
   f. Analysis was carried out to find out how the characteristics of students, learning styles, the tendency of students to learn, interests or preferences, and the level of ability to learn chemistry.
2. Phase on Developing Initial Products
At this phase, product design is carried out, namely in the form of module design whose contents are adapted to core competencies and basic competencies in the Curriculum of 2013. The module design is also adjusted to the students’ development stages and different student learning styles, namely visual, auditory and kinesthetic.

3. Validation and Revision Phase
a. Module Validation
b. The module validation includes Material validation and Media Validation
c. Module Revision
d. Revisions are made to make improvements so that the module is expected to be more valid before being used in the learning process.

4. Small Scale Trial.
This trial was conducted to determine the level of practicality and effectiveness of the student manual. At this stage, improvements are also made which will be used as a basis for determining the feasibility of the product.

5. Large Scale Field Trial and Final Products.
The test was carried out to determine the practicality and effectiveness of the products produced. Product testing is carried out by means of the Post Test Only Control Group Design. The first group was treated while the second group was not. The first group was given treatment by the researcher then carried out measurements; while the second group used as the control group was not treated but only measured. Product testing was conducted on Class X students of Vocational Middle School 5 of Padang in Electrical Engineering Department.

3. RESULT AND DISCUSSION
Validity Test Results from the development module indicate that the modules produced are valid both in terms of material and media. Data validity is shown in the following table:

Table 1. Results of Validation of Student Guidebook Materials on Development of electric lighting installations.

<table>
<thead>
<tr>
<th>No</th>
<th>Assessment Aspect</th>
<th>Average</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aspect of Content Feasibility</td>
<td>4.4</td>
<td>Valid</td>
</tr>
<tr>
<td>2</td>
<td>Aspects of Feasibility of Presentation</td>
<td>4.5</td>
<td>extremely Valid</td>
</tr>
<tr>
<td>3</td>
<td>Language aspects</td>
<td>4.2</td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>4.4</td>
<td>Valid</td>
</tr>
</tbody>
</table>

The table above shows that the module developed is in accordance with the curriculum of 2013, which has interesting presentation and is able to increase students’ interest in learning and have effective language. The Student Handbook is also practical and can increase student motivation and make the learning process more effective. This is shown by the practical results of the Student Handbook as follows:

Table 3. Practicality Test Results of Student Handbook.

<table>
<thead>
<tr>
<th>No</th>
<th>Assessment Aspect</th>
<th>Percentage</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Appearance</td>
<td>85 %</td>
<td>Very practical</td>
</tr>
<tr>
<td>2</td>
<td>Material</td>
<td>85 %</td>
<td>Very practical</td>
</tr>
<tr>
<td>3</td>
<td>Benefit</td>
<td>85 %</td>
<td>Very practical</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>85 %</td>
<td>Very practical</td>
</tr>
</tbody>
</table>

From the practicality test, the figure is 85% on aspects of appearance, material and benefits. From these values, it can be said that students are able to learn the material in the Student Handbook very well. In terms of appearance, the media used in the module is able to increase the attractiveness of students to study very well. In terms of benefits, the module is able to increase student learning motivation. The use of the Student Handbook which is the result of development based on the Curriculum of 2013 in the learning process is more effective than the conventional learning process. In the following table and figure, it is shown that the use of the Student Handbook in learning can improve student learning outcomes and the percentage of students’ learning completeness on the subject of electric lighting installation.

Table 4. Percentage of student learning outcomes.

<table>
<thead>
<tr>
<th>No</th>
<th>Treatment</th>
<th>Graduation Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use the Student's Handbook</td>
<td>87.1%</td>
</tr>
<tr>
<td>2</td>
<td>Without a student's handbook</td>
<td>53.3%</td>
</tr>
</tbody>
</table>

Figure 1. Graph of comparison of student learning outcomes by using the Student Handbook and without using the Student Handbook in class X of Vocational High School 5 at the Electrical Engineering Department. The effectiveness of teaching materials in addition to the percentage of learning can also be determined from the effectiveness of the learning process, which is where students can actively participate in the learning process. In the 2013 Curriculum, it is expected that in the learning process a scientific approach can be applied. Students are expected to be able to observe, reason, ask questions, try to work on problems and form networks. In learning using the Student Handbook, the five aspects of the scientific approach in the Curriculum of 2013 can be improved. This can be shown in the following table.

Table 5. Results of observations of student activities in learning using modules.

<table>
<thead>
<tr>
<th>No</th>
<th>Observation aspects of student activities</th>
<th>Average</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Observing Ability</td>
<td>95.2 %</td>
<td>Good enough</td>
</tr>
<tr>
<td>2</td>
<td>Asking the teacher</td>
<td>75.8 %</td>
<td>Good enough</td>
</tr>
<tr>
<td>3</td>
<td>Reasoning Ability</td>
<td>71.0 %</td>
<td>Good enough</td>
</tr>
<tr>
<td>4</td>
<td>The ability to try to work on the question</td>
<td>88.7 %</td>
<td>Very good</td>
</tr>
<tr>
<td>5</td>
<td>Ability to discuss with friends</td>
<td>93.5 %</td>
<td>Very good</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>84.8 %</td>
<td>Very good</td>
</tr>
</tbody>
</table>
From these data the average score is 84.8% with good categories, which means that students are able to follow the learning process using modules well and the scientific approach can be implemented properly. This is in line with research conducted by Erly Septa Setyanti entitled Development of ICT-Based Mathematics Teaching Materials in Differential Jigsaw Material Learning Models in 2013. ICT-based teaching materials on the jigsaw learning model on differential material were tested on high school students of Muhammadiyah Kudus in class XI of natural science. The results of the t-test of the one left for $\alpha = 0.05$, with $dk = 60$, obtained $t = 4.251$ and $t$-table $=-1.670$. Because $t$-count - $t$-table, then $H_0$ is rejected, it means that it can be concluded that there are significant differences in the teaching methods of new and old work, where the Easy to Differential Modules are more effectively used as teaching materials in differential material. Based on the research conducted, it can be concluded that teaching materials are very important in the teaching and learning process because with teaching materials the learning process will be more planned and the learning objectives will be achieved. Teaching materials must refer to two concepts, namely: (1) subject matter that becomes the contents of the curriculum in the form of concepts used to achieve learning objectives, and (2) subject matter consisting of a unified subject matter and materials arranged to achieve learning objectives.

4. CONCLUSION
From the research that has been carried out, it can be concluded that:
1. Student Handbook for electrical lighting installation has been produced for class X Vocational High School in the electrical engineering department based on the Curriculum of 2013 using the Borg and Gall Model.
2. Test the validity of student handbook as a result of the development based on the curriculum of 2013 obtained a value of 4.4 for material with valid categories, and a value of 4.15 for media with valid categories.
3. The practicality of the student handbook for learning chemistry from the results of development can be seen from the responses of students with a score of 85% with a very practical category.
4. The student handbook of electrical installation learning results of this development are very effective in terms of the learning outcomes of X class students in the Department of Electrical Engineering 1 in the State Vocational Middle School 5 in Padang which has a 87.1% completeness score. This completeness value is higher than X class of Electrical Engineering 2 who do not use the module with the completeness rate of only 53, 3%.

5. REFERENCES