The Construction of Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology

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Abstract: - The research on the Construction of Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology aimed 1) to construct and to find out the quality and the effectiveness of Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology, 2) to find out the learning achievement of students who learned from the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology, 3) to evaluate the students’ satisfaction towards the multimedia computer lesson, and 4) to evaluate the learning Authentic Assessment of students who learned from the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology. There were 3 experts focusing on contents and 3 experts focusing on media presentation. The study results showed that the quality of the multimedia computer lessons contents and the quality in terms of media presentation were at a “good” level of $\bar{x} = 4.03$ and $\bar{x} = 4.40$, respectively. Then, the developed multimedia computer lessons was tested with the sampling group consisting of 40 first-year vocational diploma students in the Department of Agriculture at Lopburi College of Agriculture and Technology in the second semester of the academic year 2010. They were chosen through a simple random sampling method. The results from the experiment showed that the effectiveness of the Multimedia Computer Lessons was 81.99/83.33, higher than the criteria set at 80/80. The average post-test score after learning was higher than the average pre-test score at the level of the statistical significance at .05, which also revealed that the learners had increased their learning achievement. According to the evaluation of the sampling group’s satisfaction towards the multimedia computer lessons, the satisfaction was at a “good” level of $\bar{x} = 4.27$. The result of evaluation in real condition was at a “good” level of 1.59. It can be concluded that the Multimedia Computer Lessons with Interaction on Ecosystems can be used for instruction.

Key-Words: - Ecosystems/ Interaction/ Multimedia Computer Lessons/ Lopburi College of Agriculture and Technology/ First-Year Vocational Diploma/Construction

1 Introduction

Education is important because it can help people to gain knowledge, abilities and basic skills as well as to achieve good nature of characteristics so that they can fight for themselves and for their society in terms of occupation. Education helps people grow both intellectually and spiritually when they are in the society. Therefore, education is one vital factor for life apart from 4 other factors which are residence, food, clothing and medicine. Education is the fifth factor which can help people solve life problems in the world full of changes in science and technology [1].

To organize learning and instruction, National Education Act of B.E. 2542 (1999), Section 6 reads “Education shall aim at the full development of the Thai people in all aspects: physical and mental health; intellect; knowledge; morality; integrity; and desirable way of life so as to be able to live in harmony with other people.” Section 22 reads “Education shall be based on the principle that all learners are capable of learning and self-development, and are regarded as being most
important. The teaching-learning process shall aim at enabling the learners to develop themselves at their own pace and to the best of their potentiality.” Section 23 emphasizes the fact that education must be based on learners and instructors need to provide learners with knowledge and practical experience in science and technology, religion, art, culture, sport, Thai wisdom, mathematics and language. Section 24 acknowledges the fact that educational institutions and agencies shall provide substance and arrange activities in line with the learners’ interests and aptitudes, bearing in mind individual differences and they shall provide training in thinking process, management, how to face various situations and application of knowledge for obviating and solving problems. Furthermore, the instructors are encouraged to create the ambiance, environment, instructional media and facilities for learners to learn and be all-round persons. Section 52 says that there will be development of a system for teachers and educational personnel. Section 65 allows instructors and educational personnel to develop themselves in knowledge and technology. Section 66 asks for the use of technology in learning. Section 67 encourages the production and technology development for education [2].

Nowadays, human development for the information age is vital because information technology has played an important role in the building up of learning societies. The way in which instructors can help students recognize the importance of technology in life-long learning lies in the knowledge of instructors about the technology and learning [3].

According to National Education Plan B.E. 2552 – 2559 (2009-2016), the self-sufficiency philosophy is adopted in order to lead a balanced life with sufficiency and rationality so that people can understand the world. This is to promote sustainable development and the well-being of Thai people so that the integrity can be reached. “Human” is the center of development and there will be “Balance” for economy, society, politics and environment. The plan is aimed at integrating religion, art, culture and sport with education at all levels. Moreover, education can be extended to other dimensions of society such as economy, society, politics, administration, culture, environment, science and technology, to name a few. One important ideal is to achieve life-long learning [4]. However, there are still certain students who fail to meet the expected outcomes due to the fact that the learning and instruction process in science could not meet the desired objectives.

Multimedia computer lesson is one important learning source because learners can interact with the lesson and know their response immediately. The multimedia computer lesson also presents a variety of movement with sounds and images, resulting in stimulus and motivation for learners to learn and to be motivated. In the end, the learners can meet the learning outcomes. Another benefit is that computer lesson can be accessed by anybody or it can be specially made for individual differences [5].

Application of multimedia computer lesson in instruction will help individual learners achieve their educational aim because they can learn according to their time without being forced. Learners can learn fast or slow according to their basic knowledge and their potentiality. Moreover, due to the features of multimedia format, learners can search for knowledge and skills by themselves according to their aptitude and ability [6]. Multimedia computer lesson is based on computer system to present information in various formats such as still images, animations, text and sounds and it allows users to interact directly [7].

Lopburi College of Agriculture and Technology under the supervision of the Office of Vocational Education Commission, Ministry of Education, recognize the importance of science and as such provides vocational diploma students with many courses in science in accordance with the Vocational Diploma Curriculum B.E. 2545 (and revisions in B.E. 2546). One important course is Agricultural Science and the description of the course is that students will study and gain practical experience about genetic reproduction, genetic diversion, evolution of living organism, mutation, biological diversity, biological technology, the impact of diversity on society and environment, balance in ecosystem, environmental problems, how to apply knowledge in natural resource management, local environment sustainability, petroleum and products from natural gas, crude oil, polymer, pollution from polymer, biological molecule, carbohydrate, fat and fat acid, protein and amino acid [8]. According to the importance and the rational above mentioned, the researchers would like to develop and construct the multimedia computer lesson with interaction on ecosystems so that the instruction could work effectively and the learning achievement of students increase in terms of science and technology.
2 Research Objective

1. To construct and to find out the quality and the effectiveness of Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology.
2. To find out the learning achievement of students who learned from the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology.
3. To evaluate the students’ satisfaction towards the multimedia computer lesson.
4. To evaluate the learning Authentic Assessment of students who learned from the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology.

3 Expected Outcomes

1. There would be Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology with high quality which can be used for self-study.
2. This would be a way and an inspiration for instructors and programmers to construct multimedia computer lessons in other subject areas.
3. This would be a way to develop students in terms of learning achievement and their understanding about ecosystems.

4 Research Scope

4.1 Scope of Contents
The Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology contained the following contents: definition and elements of ecosystems, structure and types of ecosystems, factors which affect ecosystems, the relationship between living organisms and ecosystems, energy transfer, food chain and mineral in ecosystems.

4.2 Variables in This Study
The independent variable was the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology. The dependent variables were (a) the quality of the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology, (b) the learning achievement of the trainees after using the Multimedia Computer Lessons with Interaction on Ecosystems, (c) the learners’ satisfaction towards the Multimedia Computer Lessons with Interaction on Ecosystems, and (d) the learning authentic assessment of students who learned from the Multimedia Computer Lessons with Interaction on Ecosystems.

4.3 Population
The population in this study consisted of 160 First-Year Vocational Diploma students from Lopburi College of Agriculture and Technology who registered in the course in Agricultural Science in the second semester of the academic year B.E. 2554 (2011).

4.4 Sampling Group
The sampling group in this study consisted of 40 First-Year Vocational Diploma students from Lopburi College of Agriculture and Technology who registered in the course in Agricultural Science in the second semester of the academic year B.E. 2554 (2011). They were chosen through simple random sampling method.

5 Tools Used in This Research
This research was based on one sampling group and the aim was to find out the quality of the developed multimedia computer lessons along with the learning achievement, the learners’ satisfaction and the learning authentic assessment. The tools used in this study were as follows:

1. The Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology
2. The quality and effectiveness assessment form for the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology
3. The learning achievement test for learners after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology
4. The satisfaction evaluation form for learners after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology
Vocational Diploma Lopburi College of Agriculture and Technology

5. The learning authentic assessment for learners after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology

The statistical approach in this study included mean, standard deviation, index of congruence, difficulty, discrimination, Kuder-Richardson’s reliability (KR Formula 20) and t-test for dependent variables. The tools used in this study were as follows:

6 Research Results

6.1 Details of Multimedia Computer Lesson
The developed Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology contained various contents and images. They were presented with texts, still images, animations, music and the students could interact with the lesson in each learning unit with pretest and posttest.

Fig.1 Screenshots of the multimedia computer program (Main Menu)

Fig.2 Screenshots of the multimedia computer program (Content)

Fig.3 Screenshots of the multimedia computer program (Test)

6.2 Quality of the Multimedia Computer Lessons
The quality assessment for the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology could be summarized in the table below.

Table 1. Quality assessment of the multimedia computer lessons

<table>
<thead>
<tr>
<th>Items to be assessed</th>
<th>x</th>
<th>S.D.</th>
<th>Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experts in contents</td>
<td>4.03</td>
<td>0.39</td>
<td>Good</td>
</tr>
<tr>
<td>Experts in media presentation</td>
<td>4.40</td>
<td>0.08</td>
<td>Good</td>
</tr>
<tr>
<td>Average</td>
<td>4.22</td>
<td>0.26</td>
<td>Good</td>
</tr>
</tbody>
</table>

6.3 Effectiveness of the Multimedia Computer Lessons
The effectiveness of the multimedia computer lessons (E1/E2) was 81.99/83.33, higher than the criteria set at 80/80.

Table 2. Effectiveness of the multimedia computer lessons

<table>
<thead>
<tr>
<th>Activity</th>
<th>Score during Training (30 persons)</th>
<th>Effectiveness from the test during the training of each activity (Eli) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>259</td>
<td>86.47</td>
</tr>
<tr>
<td>2</td>
<td>240.5</td>
<td>80.17</td>
</tr>
<tr>
<td>3</td>
<td>238</td>
<td>79.33</td>
</tr>
<tr>
<td>Effectiveness of the lesson during the training (E1)</td>
<td></td>
<td>81.99</td>
</tr>
</tbody>
</table>

6.4 Learning Achievements
The learning achievements of the students after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology could be seen in the following table.
Table 3. Learning achievements of the sampling group

<table>
<thead>
<tr>
<th>Test</th>
<th>n</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>$\sum D$</th>
<th>$D^*$</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>40</td>
<td>8.93</td>
<td>1.91</td>
<td>290</td>
<td>2310</td>
<td>30.21*</td>
</tr>
<tr>
<td>Posttest</td>
<td>40</td>
<td>16.18</td>
<td>1.38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*statistically significant at the .05 level

6.5 Learners’ Satisfaction

The satisfaction of the learners after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology could be seen in the following table.

Table 4. Learner’s satisfaction towards the multimedia computer lessons

<table>
<thead>
<tr>
<th>Items to be assessed</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General features</td>
<td>4.33</td>
<td>0.07</td>
<td>High</td>
</tr>
<tr>
<td>2. Texts</td>
<td>4.31</td>
<td>0.12</td>
<td>High</td>
</tr>
<tr>
<td>3. Images</td>
<td>4.27</td>
<td>0.08</td>
<td>High</td>
</tr>
<tr>
<td>4. Sounds and narration</td>
<td>4.18</td>
<td>0.19</td>
<td>High</td>
</tr>
<tr>
<td>5. Content presentation</td>
<td>4.30</td>
<td>0.08</td>
<td>High</td>
</tr>
<tr>
<td>6. Interaction</td>
<td>4.23</td>
<td>0.17</td>
<td>High</td>
</tr>
<tr>
<td>Average</td>
<td>4.27</td>
<td>0.06</td>
<td>High</td>
</tr>
</tbody>
</table>

6.6 Learning Authentic Assessment

The learning authentic assessment of the learners after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology could be seen.

Table 5. Learner authentic assessment of the sampling group

<table>
<thead>
<tr>
<th>Items to be assessed</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Readiness for activities and practice</td>
<td>1.38</td>
<td>0.52</td>
<td>Good</td>
</tr>
<tr>
<td>2. Step-by-step practice</td>
<td>1.38</td>
<td>0.52</td>
<td>Good</td>
</tr>
<tr>
<td>3. Sharing duty and responsibilities</td>
<td>1.25</td>
<td>0.46</td>
<td>Good</td>
</tr>
<tr>
<td>4. Helping one another</td>
<td>1.63</td>
<td>0.52</td>
<td>Good</td>
</tr>
<tr>
<td>5. Enthusiasm to work</td>
<td>1.50</td>
<td>0.53</td>
<td>Good</td>
</tr>
<tr>
<td>6. Accuracy of data about waste management and pollution treatment</td>
<td>2.00</td>
<td>0.00</td>
<td>Good</td>
</tr>
<tr>
<td>7. Variety in waste management and pollution treatment</td>
<td>2.00</td>
<td>0.00</td>
<td>Good</td>
</tr>
<tr>
<td>8. Creativity</td>
<td>1.38</td>
<td>0.52</td>
<td>Good</td>
</tr>
<tr>
<td>9. Presentation</td>
<td>1.75</td>
<td>0.46</td>
<td>Good</td>
</tr>
<tr>
<td>10. Finished work</td>
<td>1.63</td>
<td>0.52</td>
<td>Good</td>
</tr>
<tr>
<td>Average</td>
<td>1.59</td>
<td>0.26</td>
<td>Good</td>
</tr>
</tbody>
</table>

7 Conclusion and Discussions

1. The Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology was of good quality with the mean score of 4.22.

2. The effectiveness of the developed multimedia computer lessons was 81.99/83.33. This means that the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology met the criteria set at 80/80 and it could be concluded that the lessons could be used for effective learning and instruction.

3. The comparison of the scores for pretest and posttest of students after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology showed that their average posttest score was higher than the pretest score with statistical significance at the .05 level.

4. The satisfaction of the learners after using the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology was at high level with mean score of 4.27.

5. The learning authentic assessment of the learners after using the multimedia computer lessons was at good level with mean score of 1.59. The quality and effectiveness assessment form for the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology was at high level with mean score of 4.27.

According to the results, it could be concluded that the quality of the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology was at good level. The quality of the contents was at good level and the quality of the content presentation was at good level. The learning achievement of learners increased with statistical significance at the .05 level in accordance with the hypothesis. This is in accordance with the research by Beesuda Daorueang [9] who studied the development of computer assisted online learning lesson for the course in information technology for second-year vocational diploma students and the result was that their students showed higher learning achievement after learning the lesson with statistical significance at the .05 level. The learners’ satisfaction towards the multimedia computer lessons was at high level. This is similar to the research by Chalairat Ammak [10] who examined the satisfaction of grade 8 students at
Wachirabaramee Pittayakhom School, Pichit Province, towards the computer assisted lesson about science on earth and changes and the result showed that the students expressed high level of satisfaction towards the lesson. As for the learning authentic assessment of the learners, it was at good level. This is in compliance with the research by Prapaphon Sithakul [11] who says that authentic assessment is a way to measure knowledge, ability and skills of learners in the situations which are similar to real life through stories, events and real contexts in daily life experience. This could stimulate learners to express themselves, practice or produce what is expected from them. The product with high quality will mirror their knowledge, ability and skills as well as their success.

9 Suggestions

9.1 Suggestions for the Use of Research Results

1. The developed Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology could be used as a supplement in the classroom for self-study and instruction because the lessons could help the students see the relationship between contents and topics, resulting in stimulation and motivation. With sound, students pay more attention to the lessons.

2. The colors of the texts and the background need to be well designed so that there is contrast.

3. The images should be larger in size with high resolution so that they are suitable for presentation and meanings.

4. The balance of the layout and composition need to be considered so that the contents are spread in a well-balanced manner on screen, not focusing on either side of the screen.

5. Narrator for the lessons needs to have a clear voice with appropriate volume and the music needs to be stimulating.

6. There should be analysis of the relationship between contents and topics through brainstorming and concept map.

9.2 Suggestions for Further Research

1. There could be Game-Based Multimedia Computer Lessons on Ecosystems.

2. There could be Simulation-Based Lessons on Ecosystems.

3. There could be learning activities about ecosystems so that learners could learn together online.

10 Acknowledgment

This research on the Multimedia Computer Lessons with Interaction on Ecosystems for the First-Year Vocational Diploma Lopburi College of Agriculture and Technology could be completed thanks to the funding from the Office of the Vocational Education Commission for the project “Thai Strength”, to the executive at Vocational Diploma Lopburi College of Agriculture and Technology who allowed the researchers to conduct research and particularly to the sampling group who participated in the research with their useful information.

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