Development and Evaluation of Engineering Drawing 1 eLearning Module of Malayan Colleges Laguna

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Abstract - Engineering Drawing 1: e-learning Module is a web-like structure that serves as an instructional material in engineering drawing comprising the fundamentals of Engineering Drawing 1 in the course syllabus of Malayan Colleges Laguna. The module uses varied media and available resources which is planned, prepared and developed for the students in improving their achievement in engineering drawing. Its structure contains texts, pictures, and video animations. This material was designed for learning and may be used beforehand to prepare the students for the procedures of drawing in the course Engineering Drawing 1. The framework consists of existing material such as the course syllabus, the used of the following software: Camtasia Studio 6.0, which recorded the screen activities, AutoCAD 2007, which was used to demonstrate the drawing procedures, and Webpage Maker 1.0, which is used to layout and position all materials together into a user-friendly learning interface. This module went into a series of testing and evaluation. Based on the results of the procedures for refining, the project was rated by the respondents comprising students who have taken and passed Engineering Drawing 1, using the 6 criteria of the validated instrument for computer aided instructional materials.

The respondents, after evaluation, perceived the usefulness of the project in learning engineering drawing. Procedures and demonstrations in drawing were included to reinforce student preparation in meeting with their drawing requirements.

Then, the Engineering Drawing 1: e-learning Module was also subjected to an evaluation of its effectiveness based on performance results of the students.

Keyword - elearning, engineering, instructional material

I. INTRODUCTION

Teaching is considered a complex activity. The task of the teacher is central to education. This calls for the teacher’s competence in order to provide effective teaching. The task must transmit to the new generation the knowledge and the use of technology.

Teaching can be done in abstraction, representation and the reproduction process and, ultimately, providing the students with the actual experience. In the use of technology for guided instruction, teaching must be actualized to concretize experiences and not only to dwell on theoretical knowledge. It has been proven that the use of technology as a means of instruction can highly affect
students in the course of learning. Therefore, the teacher must be resourceful, creative and technologically equipped to provide effective instructional materials.

Today, learning is best practiced by accessing information through a computer. This information is coupled with audio, video and graphics programmed in a medium that captivates the users’ attention to explore information. Information affects the learning process of students. In the field of education, particularly in modern schools, technology is used to make learning more effective. For example, the concepts in science and technology are now in form of animated multi-media. These materials are then used to develop among students a high level of thinking and conceptualization. That is why more educators and software experts are now engaged in the production of multimedia learning material because it gives a positive effect on learning.

Through the application of varied media in the teaching process, new means of instructions for students could be developed so that learning would become thorough and effective. Utilizing digital data in computers could be pre-requisite for e-learning.

II. DEVELOPMENT OF THE ELEARNING MODULE

In laying out the structure for an e-learning module, an identified model for its development is presented. It is serve to be easy and cost effective.

In a paper, a proposed eLearning content development model called Rapid eLearning Authoring and Development (RELAD) by Punyabukkana (2006) a significantly reduced cost of eLearning development is suggested. In RELAD, the analysis, design and development steps are combined. The content design and authoring process involves the specialization of the teacher on the course and on such software in its development. After finishing the design/authoring process, the graphic and flash objects are produced and inserted to realize the final eLearning lessons. After After this, the content is published.

Fig. 1 RELAD: Rapid eLearning Authoring and Development Model.

In Fig. 1, the course syllabus of Engineering Drawing 1 serves as a guide for the content of the e-learning module. Lecture materials were compiled from the teachers who handled the course. From the analysis of our inputs, we have design a plan to develop a web-based e-learning module.

In the process of developing the module, a Camtasia Studio 6.0 software was used to record all screen and audio activity on the computer and create industry-standard AVI video files and use a built-in producer which can turn those AVIs into lean, mean, bandwidth-friendly Streaming Flash videos (SWFs). This software was used to capture demonstration videos for the module.

AutoCAD 2007 software is used to produce drawing demonstrations of the activities especially on the procedures of technical drawing.

Animations are usually presented in web page form. A web page or webpage is a document or resource of information that is suitable for the World Wide Web and can be accessed through a web browser and displayed on a computer screen. This information is usually in format, and may provide navigation to other web pages via hypertext links.

Web Page Maker 1.0 is used to layout the design of the module. This software is an easy to use web creator that helps making web pages with no experience or HTML knowledge. The process shows the drag and dropping of images, text, music and video into a layout. During the editing process, the objects may be easily move with a mouse to anywhere on the page. Web Page Maker 1.0 comes with some high quality templates to get started. Other features include thumbnail,
Mouse-over effects, ready-to-use Java Script effects, text link style sheet, tables, forms, iframes etc. The program also includes a built-in FTP publisher to allow uploading the site to the Internet by pressing a publish button.

After the module design and development, it was then presented to the faculty who handled the course and to students who took the course on their previous terms for the evaluation of its acceptability. Feedbacks were taken to further improve the design of the module.

The module was evaluated for acceptability as an instructional material using the validated evaluation instrument of Technological University of the Philippines (Garino, 2005) for computer aided instructional (CAI) materials. The criteria in evaluating the project are content, organization, mechanics, comprehensibility, functionality, and maintainability. It was administered to the respondents and the mean rating per criterion and the overall mean of the evaluators are computed. Each criterion was rated from 1 to 5, wherein 5 is the highest and 1 is the lowest.

**Content** is the accordance of the topics to a course syllabus. Clarity and accuracy of the topic discussion are also rated on this indicator. Inculcation of values is also part of the evaluation.

**Organization** is about the sequence of topics and its layout presentation.

**Mechanics** looks into the clarity of illustrations which may sustain user interest throughout the module. Variety of media and availability of alternative modes for learning was also considered.

**Comprehensibility** refers to the correctness of technical terms and other terminologies. Guide questions, grammar, and linkage of new concept are also examined.

**Functionality** is the user-friendliness of the project. The provision for comfort and convenience are also checked.

**Maintainability** is about the ease of maintenance, provision for diagnostic tools, and provision for enhancements and modifications.

On Table 1 is a 5 point scale rating scheme with its equivalent use for the evaluation.

<table>
<thead>
<tr>
<th>TABLE I</th>
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<tbody>
<tr>
<td>5 POINT SCALE RATING SCHEME</td>
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<tr>
<td>Numerical Rating</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

Table II shows that the Engineering Drawing 1: e-learning Module was Highly Acceptable in the teaching engineering drawing in terms of the six criteria set for evaluation.

Looking at the over-all result of 4.77, the Engineering Drawing 1: e-learning Module was Highly Acceptable in the teaching of engineering drawing. With these results, the study done by Hussain (2007) concluded that the effective use of varied media such as e-learning material depends on a well thought
out and properly designed User Interface to enable trouble free and easy access to the features of the e-material. The design of the User Interface should be user-friendly and sophisticated, at the same time, while being conscious of accessibility issues.

III. ELEARNING MODULE ON ITS EFFECTIVENESS TO STUDENTS ACHIEVEMENT

When it is ready for implementation to students, experimental design was used to determine the mean of pretest, posttest and gain scores. Two groups were identified as control group and experimental group. The experimental group was given the Engineering Drawing 1: e-learning Module while the other group used the conventional method of teaching. Two groups were evaluated using a 100 item achievement test at the beginning and at the end of the term to find out the different effects of the two methods of instruction on the achievement towards the Engineering Drawing 1 course of the students. The table of specifications was constructed to determine the level of skills to be evaluated and the proper distribution of test items based on the topics covered. The classification of the test items was evaluated and approved by the two drawing teachers and the cluster coordinator of Malayan Colleges Laguna, College of Arts and Science. It was subsequently validated by the committee member for approval. The difference between the mean score of the pretest, post test and gain scores on achievement of the two groups was computed and tested for significance.

| TABLE III |
| SUMMARY OF RESULTS IN THE EVALUATION OF ACHIEVEMENT |

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pretest</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Mean Difference</th>
<th>t-value</th>
<th>Sig. 2-tailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>65.26</td>
<td>6.400</td>
<td>0.32</td>
<td>-2.16</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>64.94</td>
<td>5.765</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posttest</td>
<td>82.80</td>
<td>6.940</td>
<td>15.29</td>
<td>-7.78</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>67.51</td>
<td>9.904</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>17.54</td>
<td>2.715</td>
<td>14.97</td>
<td>-12.306</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>2.57</td>
<td>6.665</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table III shows that the experimental group and control groups obtained a pretest mean score of 65.26 and 64.94 respectively. This indicates that the experimental group performed slightly higher than the control group. This also indicates that the two groups were almost similar in terms of background knowledge in engineering drawing. Despite the fact that the mean score of the experimental group was slightly higher by .32 as compared to the mean score of the control group.

Table III also shows that the experimental group who used Engineering Drawing 1: e-learning Module as an instructional material had a higher mean gain score of 17.54 as compared to the 2.75 mean gain score of the control group which went through the conventional method of instruction. The mean difference between the two groups is 14.97 with a computed t-value of -12.306. The significance test result is .000 which is significant at .05 level. This implies that the students who used Engineering Drawing 1: e-learning Module had a greater increase of achievement compared to the other group who were subjected to the conventional method of teaching.

The significant performance of the experimental group could be due to the use of a variety of strategies and resources to acquire a deeper understanding of the topics discussed. Further, the students learn when they are actively involved in the process on the acquisition of skills rather than just being passive learners.

The strategy of using the computer in the student’s learning process is well defined in the study of Rahmat (2009) where learning through computer animation and utilizing systematic theory and development design bring positive effects on the students, irrespective of the different learning styles and the degrees of achievement. It is also noted that different studies have examined the advantages of new strategies over the traditional methods of teaching with the use of computers that enhance the level of student achievement, Zulueta (2006).
IV. CONCLUSIONS

This paper presents an e-learning module that can be plan, design and develop for students which is an effective and strategic way of teaching engineering drawing. As for the future, this study intend to produce other engineering drawing courses into e-learning module to help students obtain an advance understanding on the operation of technical drawing. A faculty development program on how to develop and integrate varied instruction materials that may aid student performance in school can be given.

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REFERENCES