Moving to Rapid CAD Training

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Abstract - **By facing the demands of teaching quality and satisfaction of mass student numbers in Fundamental Computer Aided Design (CAD) courses, the role of the university as course provider to maintain quality, as a perennial player of teaching, is challenged. The champion usually focuses on increasing the investment on numbers of staff, facilities and the ultimate costs. However, with e-learning becoming a readily available technology in place today, this study carried out a series of investigations on the effectiveness of current teaching methods in ordinary CAD training and on the possible e-solutions in maximising the learning and training objectives.**

Through the phase of rethinking traditional methods of CAD training, a rapid learning mechanism is applied to deliver new adequate e-resources and Computer Aided Assessment (CAA) quality control in supporting teaching and learning.

The aim of this project is to setup a systematic, standardised, and sustainable e-learning mechanism that could be deployed for mass student numbers without losing the quality of teaching and at the meantime, achieve the goal of effectiveness and efficiency.

Index Terms – CAD training, Rapid e-learning.

INTRODUCTION

To date, at the School of Engineering and Built Environment (SEBE), University of Wolverhampton, the teaching of fundamental CAD application is facing increasing numbers of over 200 students, since CAD has become indispensable in many product lines of engineering and architectural design. To manage such a large group of students in a single module, the real pressures emerged on additional staff and facilities to maintain the quality and satisfaction. However, with finite resources in tackling rapidly expanding student numbers, a new e-learning tactic is considered in delivering the course as a supplementary and ultimately an alternative option. An e-learning project and team was then set up to seek and implement the effective solutions based on new technologies and pedagogic methods.

AIM AND OBJECTIVE OF PROJECT

The project started with a pilot survey targeted on the existing resources and teaching methods, and the current student satisfaction and expectation on the module. An interview with the module leader, lecturers, and student representatives was also carried out to identify the extent of the problems in delivering the courses. The aim and objectives of project were then proposed.

The aim of this project is to setup a systematic, standardised, and sustainable e-learning mechanism that could be deployed for mass student numbers without losing the quality of teaching and at the meantime, achieve the goal of effectiveness and efficiency.

The subset objectives include:
- Explore and identify the technologies in creating e-learning resources.
- Create e-learning resources to supplement the existing teaching methods, which are constructed with online lecturing & demonstration, game, and CAA.
- Deploy and implement the e-learning materials into classes, and examine the effectiveness of using the new methods.
- Model a prototype for implementing e-learning in other modules.

RAPID E-LEARNING APPROACH

The development of rapid e-learning is nowadays becoming a growing trend among many Higher Educators. A rapid e-learning approach usually refers to:
- Rapid e-learning development – fast and perhaps cheaper, development of e-learning applications.
- Rapid e-learning delivery – methods that increase the speed at which people learn.

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- Rapid e-learning deployment – technologies that speed up the connection between Subject Matter Expert (SME) and learners.
- Rapid e-learning outsourcing – serviced that enable organisations to add e-learning offerings to their online curriculum quickly (Brandon, 2005).

According to Bersin (2005), the two overarching elements of rapid e-learning are short time frames and ease of development. The key to successful rapid e-learning is having tools and templates that make it easy for virtually any professional to quickly create a meaningful course.

Up to date, the tools for rapid e-learning enable users to create robust templates, generate Flash-based output for easy delivery and automatically build AICC and SCORM tracking for use in any industry-standard learning management system. Most also include easy-to-use assessment creation tools, such as quiz maker, for use in measuring learning progress.

In considering the timeline and availability of resources, the rapid e-learning approaches and tools are adopted in this project, creating e-learning content for teaching the basic concepts in CAD applications. The major e-learning development tool used is Adobe Captivate – software that enables the creation of versatile content. All the contents are also devised in Flash format - a user-friendly medium that is accessible on 98% of all Internet browsers.

GUIDELINES OF E-LEARNING DEVELOPMENT

Based upon the results of the early survey and interviews, several guidelines were conceived for the development of e-resources.

I. Core Training Elements

According to previous teaching practise, four CAD concepts that often caused the greatest misunderstanding were identified, typically for the first-level module – Fundamentals of Computer Aided Architectural Design (CAAD) I, which included understanding the concept of the co-ordinate system; layers; blocks and scale in plot. The further development of e-learning materials was then carried out around these four major topics.

II. Universal Formation

CAD training that conforms to the latest CAD packages and applications often requires updating in response to new software advances, more frequently to the interface change in particular. To avoid these version-related issues, the e-learning contents of using Autodesk architectural design packages are created in a format that can be introduced and referred to when using any relevant AutoCAD versions.

III. Learning Progress Control

To effectively and efficiently manage and monitor the learning progress of a large group of students, corresponding computer aided formative and summative assessment and feedback mechanisms were considered in the module deployment. By integrating with the University's existing e-learning platform, the module deployment is enabled to

monitor the engagement of e-learning contents, create automated feedback, and record students' learning progress.

MULTI-DIMENSIONAL E-LEARNING

Instead of conventional classroom lecturing, the new form of e-learning approach is proposed comprising multi-dimensional learning components, including e-lecturing, game, Computer Aided Assessment (CAA).
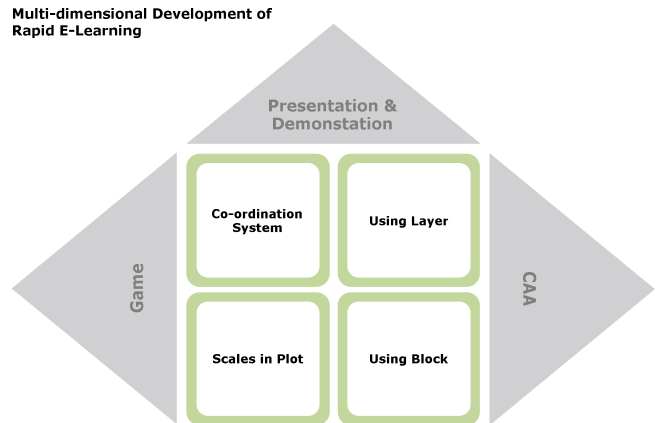
FIGURE 1

I. E-lecturing

The component of e-lecturing preserves the features of lecturing in classroom, such as multimedia PowerPoint presentation and software demonstration, into flash-based broadcast form, which can be delivered through many online learning platforms. Likewise, the standardised e-lecturing can be delivered time and again to massive numbers of students even beyond the classroom. The rapid e-learning support tool, such as Adobe Captivate, is able to convert general PowerPoint slideshows into rich Flash format with embedded audio and video clips. For the training of operating particular software, it also enables users to capture sequences of activities and add various highlights and captions through the screen demonstration.

The samples of e-lecturing are shown in Figure 2&3:
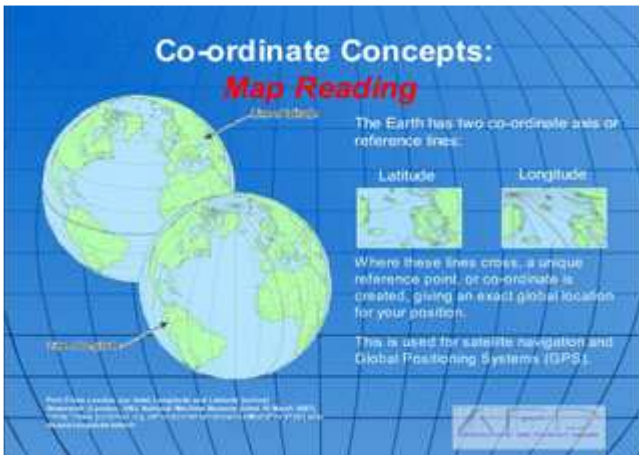
FIGURE 2

FIGURE 3

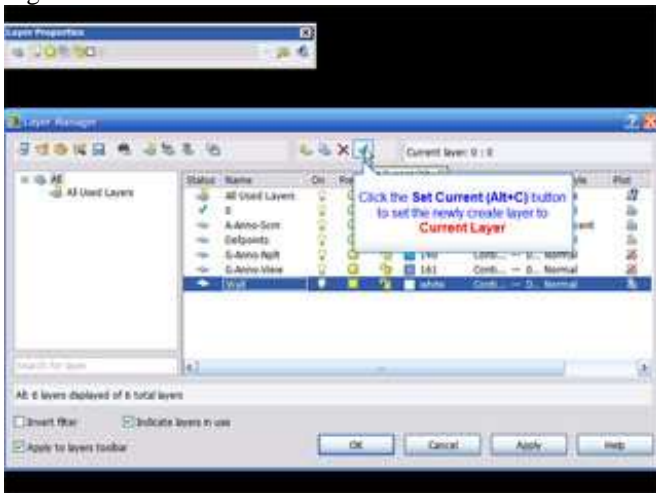The samples of software demonstration are shown in Figure 4 &5:

FIGURE 4

FIGURE 5

II. Game

A target-oriented game program is used within the project for stimulating a more enjoyable learning experience, reinforcing and maximizing the understanding and absorption. To aide understanding of the concept of the co-ordinate system in CAD, a dedicated Flash game was developed. The game is devised with a maze game style and three general co-ordinate input mechanisms – absolute co-

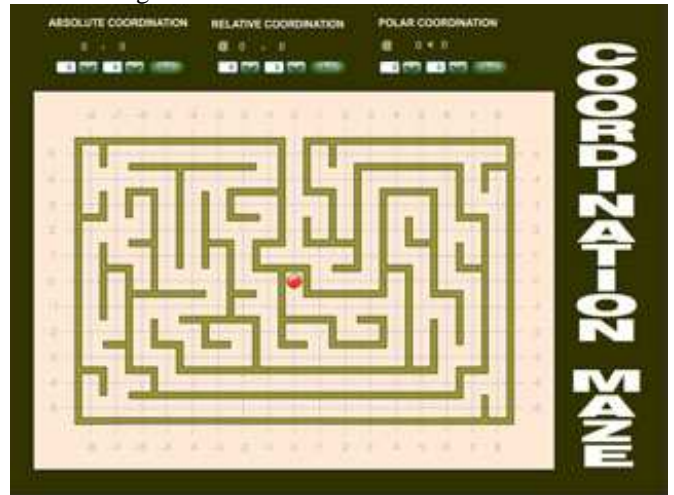ordinate, relative co-ordinate, and polar co-ordinate, is shown in Figure 6.

FIGURE 6

III. Computer Aided Assessment (CAA)

By using the quiz maker and scenario simulation in Adobe Captivate, the project also creates self-exam-based formative CAA for generating automatic feedback to students and lecturers as a part of learning reinforcement and quality control.

The quizzes will examine students' understanding of concepts, and scenario simulation will test students' abilities in applying relevant concepts to CAD operation.

A further computer aided summative assessment system is also considered with the aim of reducing the load of marking large numbers of students' assignments.

FURTHER DEVELOPMENT

As the first stage of the project, the project team has created individual components for four major topics. Some future works are then planned.

I. Webcasting

All the e-learning contents are going to incorporate with existing webcasting system. Recently, the university has developed its own e-learning platform – called WOLF for delivering e-learning materials. WOLF also features formative assessment, a forum, and attendance record. Thereby, the main focus of webcasting is on the utilisation of existing features of WOLF into project deployment.

II. Deployment and Implementation into Real Class

As an alternative to the existing lecturing, the e-learning contents will be deployed and implemented into a small group of the class first as an experiment, and then introduced to the majority of classes teaching the same module. The teaching strategy switches are determined as the major issue at this stage.

III. Validation and evaluation of project

Later, as the final stage of the project, validation and evaluation procedures will be carried out in terms of examining the effectiveness and efficiency of the project.

ULTIMATE SOLUTIONS

This project aimed to create a systematic way of teaching fundamental CAD concepts by using rapid e-learning development mechanisms. It integrated standardised instructional tactics into the development of e-learning materials, such as e-lecturing, software simulation and demonstration, game, and formative & summative CAA, with the aim of achieving maximum learning outcomes and effective and efficient quality control. In terms of sustainability, several guidelines are set up at the earlier planning of project. Through the definition of the concept learning topic, its formation, and CAA mechanism, it guarantees the development of the project smoothly and unanimously.

Through the practice of project development, it proved that by utilizing rapid e-learning mechanism and tools, it can quickly, easily, and inexpensively create e-learning contents and meanwhile deliver that content in a rich and engaging manner. It enables the teaching of large numbers of students and better use of resources without compromising quality.

Also, by developing CAA in the project, it becomes an essential component for managing the users and their learning process, and ultimately, to analyse and measure the effectiveness of e-learning and knowledge and skill transfer.

As an irreversible trend of shifting to new e-pedagogic teaching and learning, this project shows a good example of developing rapid e-learning for a module that is encountering massive student numbers. By using similar tactics, the experiences can then be passed through into developing various other modules, and eventually, evoke and elevate a new scheme of High Education fulfilled to more students.

ACKNOWLEDGMENT

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