Chapter 17
New Trends and Futuristic Information Communication Technologies for Engineering Education

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ABSTRACT

Improving and enhancing education is a goal for higher learning institutions that seek to provide better learning techniques, technologies, and educators and generate knowledgeable students to fulfill the needs of industry. A field in need of significant improvement is engineering. One approach is to review the delivery and pedagogies used in the current educational system. This paper examines the problems faced by staff and students in the field of mechanical engineering. In addition, the authors explore new technologies that enhance and promote the learning process.

INTRODUCTION

Education is the driving force of economic and social development in any country (Cholin, 2005; Mehta & Kalra, 2006; Manjit, 2007). Considering this, it is necessary to find ways to make education of good quality, accessible and affordable to all, using the latest technology available (Hattangdi & Ghosh, 2009). The vast availability of technologies makes it difficult to predict if they could improve the learning process. As such it would be beneficial to research and review the options and benefits of present technologies.

This paper deals with engineering education in higher learning institutions. Our focus is mainly targeted to mechanical engineering education since it was found in the previous studies that some first year undergraduates faced problems in understanding the concepts of engineering mechanics courses (Gramoll, 2001; Katarzyna, 2002;

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Manjit, 2007; Manjit & Ramesh, 2008; Manjit, Ramesh, & Selvanathan, 2005; Scott, 1996). This subject is chosen because a number of academicians as reported in the literatures found that the main problem faced by students is visualization of dynamic motion of particles or rigid bodies.

COMMON PROBLEMS FACED BY ENGINEERING STUDENTS

Katarzyna (2002) reported the problems that first year undergraduates face while studying the Engineering Mechanics Dynamics course is the difference in understanding with regard to what is being taught in the classroom. Undergraduate students often expect a variety of teaching methods to be used in their learning. Although, in general, the lecture method is a common way of delivering knowledge to students, it treats all students on the same level of the basic acquired knowledge. However, in general most of these students do not bring to the course the same academic preparation (do not have the same motivation, interest, and ability to learn). They come from different disciplines, some from remote regions with limited exposure to modern technology, have varying learning styles, and have different levels of proficiency in material learned at the foundation level. This results in different starting points, progress rates, and ultimately different levels of satisfaction, academic progress, and performance.

However, the aforementioned is not the only reason for the difference among undergraduate student development in the same class. Students enrolled in the same foundation program but from different institutions and cultures are taught varying degrees of basic material, which they are required to know.

Finally, some entry-level undergraduate students do not have very strong grades in science and mathematics which make certain engineering subjects difficult for them to comprehend and this discourages learning from taking place. As a result of this problem, if the lectures are too fast, this set of students may not be able to keep pace with the rest of the class, thus the gap in their knowledge will only get wider as compared to the more advanced students. In this situation, some students are left out, and often the instructors are forced to find alternative methods (for example conducting extra classes) to help these students in understanding the subject matter. Since some students may take more time to understand the problem solving techniques and may require the lesson to be repeated several times before they understand, there is a need to study and understand the availability and benefits of newer technologies that could help them visualize and understand the engineering problems better. The emerging trends and benefits of new technologies are briefly addressed in the next sections.

NEW TRENDS OF ENGINEERING EDUCATION

This section briefly describes present emerging trends in engineering education with regards to technology enhancements. In the current information society, there is an emergence of lifelong learners as the shelf life of knowledge and information decreases (Bhattacharya & Sharma, 2007).

In the past, it could take ample time to find information from traditional libraries and textbooks. Today, with the availability of these materials on-line in the form of digital multimedia, a vast amount of related information can be reached through a personal computer with Internet connection via a simple keyword search. People can easily access and gain knowledge via information and communication technology (ICT) to keep pace with the latest developments (Plomp, Pelgrum, & Law, 2007). In such a scenario, education, which always plays a critical role in any economic and social growth of a country, becomes even more important. Education not only increases the productive skill sets of an individual but