

Emerging Trends and Technologies for Enhancing Engineering Education: An Overview

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ABSTRACT

Improving and enhancing education has been a prime goal for higher learning institutions that seek to provide better learning techniques, technologies, educators, and to generate knowledgeable students to fulfill the needs of industries. A significant area where improvements are required is in the engineering field. In this regard, one approach is to review the delivery and pedagogies used in current education systems. This paper examines the problems faced by staff and students in the field of Mechanical Engineering, which are found in the literature. Finally, the authors explore new technologies that could help enhance and promote the learning process of students experiencing problems.

Keywords: Education, Engineering Problems, Mixed Realities, Multimedia, Visualization

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 is becoming competitive and difficult to predict if it could improve the learning process. As

such it would be beneficial to further research and review the options and benefits of present technologies.

This paper deals with engineering education in the higher learning institution. 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 course (Scott, 1996; Gramoll, 2001; Manjit et al., 2002; Katarzyna, 2002; Manjit et al., 2005; Manjit et al., 2008). This subject is chosen because a number of academicians as reported in the literatures

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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, ability to learn/grasp) and come from different disciplines, 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 difference among undergraduate student development in the same class. Students enrolling from 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 that makes 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.

Emerging 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 of time in finding text / information (from traditional libraries / textbooks). Today, with the availability of these materials in the form of digital multimedia on-line, a vast amount of related information could be reached through a personal computer with Internet connection via simple keywords search. People could easily access and gain knowledge via ICT (Information and Communication Technology) 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 the individual but also his/her general knowledge. It gives him/her a sense of well being as well as capacity to absorb new ideas, increases his social interaction, gives access to improved health and provides several more intangible benefits (Kozma, 2005).

The availability of digital multimedia format materials such as text, sound, image,

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