COMPUTER BASED TEACHING AND LEARNING OF PHYSICS AT UNDERGRADUATE LEVEL BY USING MULTIMEDIA

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Abstract

Recent academic approaches emphasize the role of technology in science learning. Multimedia and computer-based tools enable students to perform complex, inquiry-based learning activities. CBT and learning of physics became quite common component of the process of science education. It includes tutorials assessment, experiments, data processing and presentation, modeling and simulation. On experiment basis, model lessons for UG students have developed by covering the leading topics of physics and have delivered. Follow-up results clearly indicate increase in learning as compared to the traditional lecturing methods.

1. Introduction

Literature review relevant to Computer Based Teaching (CBT) & learning of Physics by using multimedia at undergraduate level clearly indicates the enhancement of understanding level as compared to the traditional lecturing methods. There was a time when multimedia was considered a very technical venture (Hill et al, 1994). Cognitive theory proposes that activities which require the learner to relate new information to existing schema can impact on and facilitate the learning (Ausubel, 1960 &1968). Constructive theory also believes that previously acquired knowledge plays an important role to activate the construction process (Shu-Ling Lai, 1998). Results on computer based teaching and learning of physics and investigation of different teaching methodologies were reported by Valiati & Heineck, 2002). Research studies also reflect the improvements of student's learning in comprehension of concepts relative to electric circuits and deepening in how they learn Physics through computer based teaching (Mamalougos et al, 2003). Computer based teaching and learning of Physics is a quite common component in the process of education, which includes tutorials, assessment, experiments, data processing and presentation, modeling and simulation (Bohm, 2008). On experiment basis, model lessons/lectures for undergraduate students have developed by covering the leading topics of mechanics, electricity & magnetism etc and have delivered. Follow-up results clearly indicate increase in learning of physics by the undergraduate students as compared to the traditional lecturing methods.

2. Computer Based Teaching (CBT) of Physics

The Physics CBT developed by our university applies the power of multimedia to the Physics course for undergraduate students of engineering disciplines, offers full motion animation and video, engaging interactive graphics, and clear and concise text. The team was comprises of Physicists and multimedia experts. It focuses on those concepts that students typically find most difficult in the course, such as Mechanics, Thermodynamics, Electricity & Magnetism, Optics and Modern Physics. The animations and graphics are presented to aid the student in developing conceptual models of difficult topics often hard to explain with words or chalkboard illustrations. The CBT also presents step-by-step problem solving strategies and provides animations of problems in order to promote conceptual understanding and to sharpen problem solving skills.

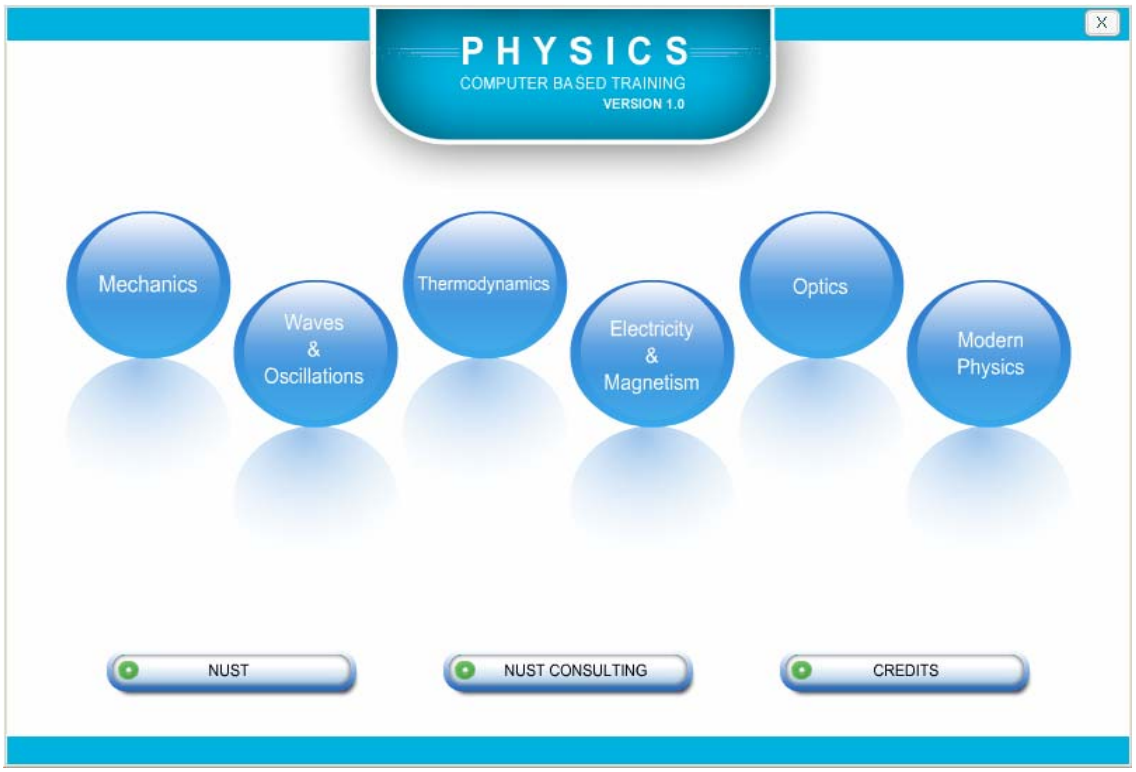

Fig1. Computer Based Teaching of Physics

2.1 *The Contents Organization*

The whole contents are divided into six sections (as shown in block diagram below). Each section is organized into a series of main topics and sub-topics that address a single topic or a group of closely related topics. Additionally, many screens contain further links such as Physics Applications, Thinking Physics, Numericals, Interactive and Derivations.

2.2 *The Features of the CD-ROM*

a. Uses live video, animation, interactive graphics and text to teach fundamental principles of introductory physics.
b. Applies the presented concepts to real world phenomena by bridging physical principles to the mathematics that describe them.
c. Provides effective tool for learning and doing physics.

2.2 *Objective*

The main objective of this effort was to help our undergraduate students to develop a deep and practical understanding of physical phenomena, to directly assist them in their study of Physics. Because, problem solving is an essential component of syllabus therefore solved examples are included and ‘pop questions’ within the presentation.

3. Results

We have taken undergraduate students already selected for engineering disciplines of the university on merit basis across the country. They were divided into two groups (control and experimental group). Each group was further divided into four sub-groups. One group was taught by traditional lecturing method, whereas other group was taught through CBT by using multimedia. Results of both the groups were collected and statistical treatment was given to the results. The comparison of results clearly indicates increase in learning of physics by the undergraduate students as compared to the traditional lecturing methods.

4. Conclusion

Recent educational approaches emphasize the role of technology-enhanced environments in science learning: such environments allow learners to explore scientific phenomena interactively. Multimedia and computer-based teaching enable students to perform complex, inquiry-based learning activities. Our computer based teaching and its learning results clearly indicate increase in learning of physics by the undergraduate students as compared to the traditional lecturing methods.

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