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Chapter XIV

Interactive Learning in Engineering Education

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Abstract

In the process of teaching and learning, computers as a tool help the students to develop their reasoning and intelligence. In engineering education, computational packages are usual but somewhat didactic and require specific knowledge on the part of the student. Motivation, creativity and autonomy are important for success in chemical engineering courses. This chapter presents novel experience of a chemical engineering education, including a technique and object-oriented programming system applied mainly to undergraduate and graduate students.

Introduction

Technologies as conveyors of information have been used for centuries to "teach" students, whereas interactive technologies began to be introduced early

in the 20th century to "engage" students in the learning process. Educational communications and the technologies in which they are encoded are conceived, analyzed, and designed by educational specialists (often referred to as educational or instructional technologists). Historically, teams of educational technologists, including instructional designers, media producers, and media managers, in collaboration with other specialists, e.g., subject matter experts and teachers, have developed educational media. These teams often employ systematic instructional design models to guide their efforts to analyze, develop, produce, and evaluate instruction. Sometimes it is difficult to get in the academic institutions. The teachers still remain the great Masters and the keys to the development of learning processes. Excellent teachers use varying lecture styles that actively engage students in the learning process.

To make this explanation more concrete, it will present in this chapter computed-based cognitive tools and interactive learning environments with chemical engineering examples in different courses.

Computers in the Process of Teaching and Learning

In the process of teaching and learning, computers as a tool help the students to develop their reasoning and intelligence. The progress of computer usage in the teaching and learning process can be observed following this order: programmed instruction, simulation, educational games, programming language, application packages, and intelligent tutorial systems. The components of this evolution are described below (Notare et al., 2003).

Instructional Program

This was the first form and the most widely used. It is also known as CAI (computer-assisted instruction). The instructional program consists, basically, of repetitive exercises, tutorials, or demonstrations. The programs lead the student to carry out a series of exercises with increasing degrees of difficulty. Some information is displayed on the screen, and then the learning is tested. Questions are introduced as multiple choices or with blank spaces to be filled. After each answer, the student is praised for a correct answer or a new change in case of a wrong answer. This kind of instruction can be used at all levels of education. Other types of instructional programs are the tutorials, which make the computer replace the function of the teacher. Usually, a tutorial supplies little information