Chapter 7

The Use of Learning Objects as an Alternative for Providing Curriculum Flexibility in Engineering Courses

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ABSTRACT

This chapter is intended for tutors, professors, and students, and seeks to contribute to the development of online communication activities as a means of providing curriculum flexibility in engineering courses. It describes the use of online learning resources, called Learning Objects (LO), and their development at the Pontifical Catholic University of Parana (PUCPR) by a multidisciplinary staff. The design of the LOs takes into account the difficulties students encounter during face-to-face activities as reported in previous studies carried out by the authors during their teaching careers. LOs allow Information and Communication Technology (ICT) to be used as an aid to face-to-face learning, with reorganized learning and teaching strategies. LOs are available in the university's own virtual environment, Eureka, and can be accessed by approximately 14,000 students and more than 1,200 teaching staff at the institution. Student feedback was also collected and is described here.

INTRODUCTION

Previous studies of engineering education by other authors have discussed the academic difficulties associated with certain learning methods, the assessment of students, and the structuring of the curriculum required to offer a complete professional education that addresses social, human, and ethical issues. To provide such an education, teachers must combine technical expertise with teaching skills.

The challenges faced by those teaching engineering include not only the difficulties caused

by having to teach in the existing conditions, but also the problems caused by the reduced number of course hours for several subjects compared with previous curricula.

This chapter outlines the legal issues related to engineering curricula in Brazil; the process involved in developing digital resources (Learning Objects, or LOs) for online education in higher education; the online activities carried out by the students; and students' assessment of online study methodologies.

THE PROFILE OF TODAY'S STUDENTS AND NEW WAYS OF LEARNING

Today's students have changed significantly compared with those of previous years. In general, they are over 18 years of age, work part-time or full-time and have to balance their professional goals with their personal lives. They go to university not only to gain a degree but also as part of a lifelong learning plan.

Face-to-face and distance education are educational choices that can meet their needs. In this study, LOs were developed and used to support face-to-face learning for this new type of student.

The use of computers and Information and Communication Technology (ICT) has been responsible for significant changes in face-to-face, blended and distance teaching/learning processes.

ICT has made the third generation of distance learning possible. This generation, according to Torres & Fialho (2009, p. 31), "is characterized by interactive learning management systems."

A number of authors, including Trindade (2002), Domênico and Torres (2006), Ramos and Torres (2006) and Siqueira and Torres (2010), report that LOs have been validated as a resource to help students develop self-learning when combined with regular face-to-face curricula.

However, the use of educational digital media does not mean converting material that is already prepared into digital teaching objects, let alone giving it to students so that they perform online reading only. Rather, it requires a well thought out change in the way that teaching is thought about and planned, with students and the ways in which they learn being the main focus.

Quoting Tori (2009, p. 122): "There are few face-to-face courses that do not include distance activities." This justifies the use of the methodological and technological approaches developed for distance learning with face-to-face undergraduate courses, a strategy known as blended learning. In this model, the strengths of face-to-face and distance learning are combined. The convergence between these two types of learning is increasing because of the number of students who want to keep up-to-date with their professional field while staying in the workforce. Here, LOs were developed for this specific student profile, which corresponds to the population in this study, and used to support face-to-face teaching during one semester.

BRIEF DESCRIPTION OF THE LEGAL, INSTITUTIONAL, AND REGULATORY ISSUES

On October 18, 2001, in directive no. 2253 the Minister for Education, Paulo Renato de Souza, authorized the use of non-face-to-face teaching for 20% of the total curriculum of higher education courses in colleges and universities. This directive was revoked by Minister Tarso Genro, who signed directive no. 4059 on December 10, 2004. The new directive maintained the authorization for 20% of the total number of course hours and specified that evaluations must be face-to-face and that teachers/tutors must have a specified number of distance and face-to-face teaching hours.

Thus, subjects related to those on the course curriculum—established to meet the curriculum guidelines for each course—such as multidisciplinary subjects, can be taught in activities outside the classroom, where they can be dealt

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