

# Chapter XIII

## Problem-Based Learning at a Distance: Course Design and HCI in an Environmental Management Master's Programme

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### **ABSTRACT**

*A case study approach is taken to illustrate a design approach to the development of a Masters course. Over a 10-year period, the course was developed from traditional delivery and teaching modes, through the introduction of problem-based learning, and the incorporation of human computer interaction (HCI) elements. The latter development coincided with a shift from classroom-based teaching to distance learning mode, and the resource and design issues in this dual transformation are discussed. Pedagogic principles of problem-based learning were applied along with a range of other case conditions in framing the design intent. It is concluded that the design process in HCI and problem-based learning applications is central in ensuring that appropriate learning environments are established. While there is no single formula for designing problem-based learning or integrating HCI into learning programmes, the application of appropriate principles and methods is essential.*

### **INTRODUCTION**

It is commonly accepted that people can learn more effectively when they “own” parts of the learning process, by having some control over how, when, and what they do. Online learning resources appear to offer benefits in these respects.

This term is subject to multiple definitions, which may include e-learning, Internet learning, tele-learning, distributed learning, virtual learning, computer assisted learning, Web-based learning, and distance learning. Ally (in Anderson & Elloumi, 2004, p. 4) notes that the common factor is that the learner is at a distance from the tutor,

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obtains tutorial support, and uses some form of technology to interact.

Students vary widely in their preferred learning styles. Anderson and Elloumi (2004) provide a thorough exploration of the theory and practice of online learning and in particular examine the different ways in which students learn. Learning programs that incorporate a variety of learning techniques, tools, and materials, and allow students to exercise choice as to how they utilize them, offer potential advantages in flexibility and effectiveness across a range of learning styles. However, direction may be required within *student-centered* learning programs if learning outcomes are to be maximized across the cohort. Issues such as the organization of materials on screen, the use of advance organizers to provide a framework for learning, prerequisite testing, chunking of information provision and strategies that promote application, synthesis, and evaluation of knowledge are all important aspects in design for effective learning (Ally in Anderson & Elloumi, 2004, pp.11-12).

Diversity in learning modes and materials is not effective *per se*. HCI technology allows diversity, but unless each element is integrated within a coherent structure and directly linked with meeting learning outcomes, their effectiveness will be limited. This is a case for design, and central to the course design process are both student needs and the interplay of these needs with curriculum, learning outcomes, and appropriate selection from the suite of HCI and other learning tools available (Anderson & Elloumi, 2004; Koschmann, Myers, Feltovich, & Barrows, 1994). Online learning places a greater onus upon students to generate and maintain motivation. Students who are physically distant from their tutor lack the discipline of scheduled classes and immediate peer support, so the course materials themselves need to provide intrinsic motivation in their design. For example, Ally (in Anderson & Elloumi, 2004, p.6) comments that capturing learners' attentions at the outset; establishing

relevance of materials to learners' experiences or aspirations; making explicit statements of expected outcomes; and regular reinforcement of progress by testing and review are all relevant attributes of good design. Rapid engagement with learning materials is helpful in all learning situations, and, in the case of online learning at a distance, it may prove crucial. Popper's (1999) description of the essential nature of problem solving as a path to knowledge acquisition and understanding is informative in this regard. He argues that trial and error, undertaking a process of *problem—attempted solution—elimination (of unsuccessful solutions)* mirrors the natural evolutionary process and intimates that, perhaps as a consequence, it represents a natural approach to learning (Popper, 1999).

The approach to course design and the use of HCI is the central topic of this chapter. A wide and growing literature indicates both the complexity and importance of this issue, building on seminal work in the field (Barrows & Tamblyn, 2000; Koschmann et al., 1994; Koschmann, Kelson, Feltovich, & Barrows, 1996). The context for this chapter is the application of group-centered *problem-based learning* within a distance mode. A case study approach is adopted in order to demonstrate development and evolution of the use of HCI in course delivery through the application of design principles over a 10-year period. The aim is to illustrate how HCI can help bridge the gap between distance learning modes of learning and the essential group interaction associated with problem-based learning-based approaches in multidisciplinary studies. In progressing toward this aim, the following objectives will be outlined and discussed:

- An overview of developments in knowledge and techniques in the area;
- An historical account of the phases in the development of the course case study;
- Analysis of the challenges, successes, and problems encountered;

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