Chapter VII

Principles of Educational Software Design

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Abstract

Despite the generalized use of Information and Communication Technologies (ICT) in teaching, their educational applications have not yet been standardized: a general consensus does not exist on how ICT can be applied to teaching nor on how educational software must be constructed. In this chapter, it is argued in favor of educational software construction being guided by a didactic problematique. In this framework we consider as a promising software category mindtools and, in particular, the so-called open microworlds. Their design must be guided by a number of principles: the tool logique, the multiple interface and the multiple representations principles. In this chapter, a detailed critique of these principles is also presented.

Introduction

From the time computers were invented until today, this latest decade has been intensely characterized, more than any of the previous ones, by the infiltration of the so-called new technologies in everyday life. Information and Communication Technologies (ICT) are also being integrated into education at all levels. In fact, this integration is a two-way process, as it has consequences for the educational system in which ICT are integrated. The influence of ICT on the way lessons are planned and conducted, on the administration of teaching institutions (schools, universities, and others), on existing teaching methodologies, on evaluation, and finally on the educational system in general, is so deep rooted, that ICT is likely to be the cause of a complete restructuring of the entire educational system.

Despite their use in teaching, which is constantly expanding, as well as the important influence they have on transforming current curricula, the educational applications of ICT have not yet been standardized, meaning that a general consensus does not exist on how ICT can be applied to teaching and a consensus does not exist that can be used as a general guideline for the development of educational software.

More specifically, concerning those points where a consensus of opinion does not exist, the following could be stated:

- **The characteristics of educational software:** There are many categories of educational software, which correspond to the different characteristics of that educational software as well as what its most appropriate use might be. The general characteristics of the software and its use are based on, explicitly or implicitly, learning theories, and pedagogic and didactic assumptions; therefore, these different points of view may be incompatible.

- **The usefulness of computers and educational software:** In certain situations, the effects of ICT on the educational system are obvious. For example, ICT have enabled long-distance learning to be reorganized based on new foundations due to the creation of computing networks and communication mechanisms among users at multiple levels (synchronous or asynchronous, with images, sound, video).

  In the majority of cases, even though the use of ICT is considered imperative, because, theoretically at least, ICT improve the lesson, this improvement, however, has not been amply documented. In other words, even though a basic reason for the use of ICT in education is the hypothesis that they improve both teaching and learning, the conditions that render teaching more effective are not actually known, and often, related research does not highlight any significant difference in the quality of the lessons based on ICT (http://teleeducation.nb.ca/nosignificantdifference/). Opin-

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