

DESIGN AND DEVELOPMENT OF LEARNING OBJECTS FOR LOWER SECONDARY EDUCATION IN GREECE: THE CASE OF COMPUTER SCIENCE E-BOOKS¹

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Abstract

This paper reports on the design framework and the development of a variety of learning objects aiming at the enrichment of both, the lower secondary education computer science e-textbooks and the Greek National Aggregator of Educational Content. At first, the theoretical foundations and critical instructional design issues for computer science learning objects are addressed. The learning objects design and development method is also presented. Following, indicative examples of learning objects are presented and their affordances to support active, inquiry and constructivist learning activities in school practice are discussed. Conclusions for educational practice and further research in the schools are drawn.

Keywords: e-books, learning objects, ICT, computer science education, mental models

1 INTRODUCTION

Information and Communications Technologies (ICT) have been widely perceived as the agent of educational changes and major innovations in school practice that would lead to significant educational and pedagogical changes and support students' development on the knowledge and skills needed to succeed in the 21st century society. In the past decade, the nature of the Web and the way people access and use Web resources for personal, educational, employment, entertainment and other social purposes have been fundamentally changed. Browser is becoming the universal interface to a range of new Web tools and interacting applications. The use of Web tools for learning purposes is expected to exert a significant impact on education and the way people learn by changing the relationship between instruction and learning, inquiry and knowledge construction, and the boundaries between classroom and homework activities.

Academics, researchers, educators and policy makers have advocated that the emerged Web based tools and applications have the potential to offer enhanced learning opportunities for students and educators. Consequently, major changes are expected in the way educational materials are designed, developed and delivered to people, both students and adults, interested to learn. Current technological and pedagogical developments regarding the educational applications of ICT have led to increased interest about the development of electronic books (Kay & Knaack, 2008a; Nelson, 2008). E-books are digital form textbooks, enriched with multimedia and digital content, simulations, various resources, interactive applications, learning scenarios, problems and exercises etc. In recent years, e-books are considered as a promising idea for the integration of ICT in education offering opportunities to extend learning spaces beyond the borders of traditional classrooms.

Web based learning object systems include various tools designed to support teaching and learning by helping students to explore, share, build and apply their knowledge. The development and the integration of learning objects into classroom practice has been dynamically evolved in recent years, in various educational contexts ranging from primary (Lim, Song & Lee, 2011) and secondary education (Baki & Cakiroglu, 2010; Lowe et al., 2010; Kay & Knaack, 2008a; 2008b) to university level as well (Lam, Lam & McNaught, 2009).

This paper presents the main outcomes of a developmental project concerning the construction of learning objects and their integration into computer science e-textbooks for lower secondary education (K7-K9) in Greece. The project was implemented in the framework of Digital School (2010) programme, an ambitious national and EU funded programme, which was administered by the

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