

## Chapter 2.15

# The Design and Development of Educational Immersive Environments: From Theory to Classroom Deployment

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### ABSTRACT

Computer game technology is poised to make a significant impact on the way our youngsters will learn. Our youngsters are ‘Digital Natives’, immersed in digital technologies, especially computer games. They expect to utilize these technologies in learning contexts. This expectation, and our response as educators, may change classroom practice and inform curriculum developments. This chapter approaches these issues ‘head on’. Starting from a review of the current educational issues, an evaluation of educational theory and instructional design principles, a new theoretical approach to the construction of “Educational Immersive Environments” (EIEs) is proposed. Ele-

ments of this approach are applied to development of an EIE to support Literacy Education in UK Primary Schools. An evaluation of a trial within a UK Primary School is discussed. Conclusions from both the theoretical development and the evaluation suggest how future teacher-practitioners may embrace both the technology and our approach to develop their own learning resources.

### INTRODUCTION

The design and development of computer games for education and training has become a hot topic in multidisciplinary research involving elements from education, computing, art and design. The fruits of this research are now starting to penetrate the classroom, as serious computer games based

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educational material is developed. This in turn will inform classroom practice and eventually national policy. Like many educational innovations, the proposed use of computer games may be traced to the availability of a new and cost-effective technology (such as the introduction of interactive white-boards), but in this case the context is much more complex and involves many factors.

First there is the cultural context of our digital age, where our youth has grown up immersed in digital technologies, especially computer games. These ‘Digital Natives’ (Prensky, 2001) expect to play computer games. This expectation when coupled with the findings the JISC report (JISC, 2004), which suggests that learning should be congruent with the cultural context and also with Prensky’s description of today’s learners as ‘engage me or enrage me’ (Prensky, 2005), leads to the conclusion that our digital natives will *expect* computer game technology to appear in some form on the school curriculum. In this chapter we argue that this technology should be harnessed to produce ‘Educational Immersive Environments’ (EIEs), learning resources which use computer games technology, but which are based on sound pedagogical principles and may be used in all school classes from physics to literacy (Price, 2008; Moore and Price, 2009).

A second factor has been the falling recruitment in ‘Science Technology Engineering Mathematics’ (STEM) subject courses. This is especially true of physics education which is seen to be in a state of crisis due to lack of interest in these subjects (Smithers & Robinson, 2005; 2006). The Institute of Physics has called for ‘an increasing number of young people who should be enthused by physics’ (IOP, 2001). What better motivation than virtual experiments investigated within an EIE? A third factor is the drop in literacy standards in UK primary schools (Freen & Woolcock, 2007; Paton, 2007). This has resulted in a call for an examination of teaching standards in education and a call for new forms of expression in the classroom in order

to prepare our Digital Natives for the knowledge-based 21st century (Dede 1995).

Against this backdrop, research has suggested that computer games may be used to address these issues (FAS, 2006; Gee, 2003; Price, 2006). Indeed it is suggested that computer game technology may be transformed into a new educational technology which, when grounded in educational theory such as *experiential learning* may equip our Digital Natives with skills required in the contemporary world (FAS, 2006). The design of any EIE must start from sound educational theories as well as being informed by content specified by the curriculum (Tang et al., 2007). Often in the past, educational materials have been driven by technology, with learning approaches adjusted to the technology.

The history of computer games in training and education can be traced back to the ‘America’s Army’ games; the first ‘AA-Soldiers’ game was aimed to combat falling recruitment, the second ‘AA-Operations’ game was developed as a training resource (Zyda et al., 2003; Zyda et al., 2005). These are examples of ‘Serious Games’ which combine various aspects of education and simulation. Other examples include ‘Foodforce’, ‘Stone City’ and ‘VR Therapy for Spider Phobia’. Some early educational games were produced as part of Becta’s ‘Computer Games in Education’ project and MIT’s ‘Games-to-teach’ project. A more recent educational game is Disney’s ‘Hot Shot Business’, a game designed to teach children of ages 9-13 how to run a business. Links to these games are provided at the end of this chapter.

This chapter aims to provide teacher-practitioners with theory and skills to help them appreciate the usefulness of EIEs, and also to consider authoring their own material. In the first section this chapter explores how a successful EIE may be designed using (i) educational theory, (ii) instructional design principles, (iii) approaches to game design. Some novel theoretical approaches are suggested in (iv) where an integration of various theories and approaches is provided, to construct

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