

# Chapter 19

## Knowledge Management in Educational Games

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### ABSTRACT

*Use of educational games during teaching process does not represent a new topic. However, the question “How to address the knowledge in educational games?” is still open. The purpose of this chapter is to propose a model that will attempt to establish the balance between knowledge integration into game on one side, and its reusability on other. The model driven approach presented in this chapter relies on the use of Learning Objects (LO) as constructing pieces of knowledge resources, which are specialized for educational game design purpose. Presented models contribute to methodology of educational games development in a way that they embrace principles of learning and knowledge management early in design process. The authors demonstrate applicability of their models in design case study, where they developed educational game editor where the educator can easily define new educational game utilizing existing knowledge, assessment, and multimedia from repository.*

### INTRODUCTION

There is a promising role of digital games in education process. Traditional forms of teaching and passing knowledge lose their strength daily, due to development of technology and different motivational factors for the upcoming generations.

Digital game-based learning is a novel approach applying at universities’ courses and lifelong learning. In search for new role of universities in changing context of education, gaming is becoming a new form of interactive content, worth of exploration (Pivec, 2007). Features of games that could be applied to address the increasing demand for high quality education are already identified as (Federation of American Scientists, 2006): clear

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goals, lessons that can be practiced repeatedly until mastered, monitoring learner progress and adjusting instruction to learner level of mastery, closing the gap between what is learned and its use, motivation that encourages time on task, personalization of learning, and infinite patience.

Use of educational games during teaching process does not represent a new topic. Since the need for new forms of education has been recognized by the researchers in this area, new problem arose. The main issue in this area of research is “How to address the knowledge in educational games?” At this moment, development of educational games includes knowledge integration during game development process. This approach establishes strong coupling of game context and integrated knowledge which further disables reuse of that particular knowledge. In order to increase knowledge reuse, there is a need for a certain level of separation from the game. That extraction, on the other hand, can lead to poor integration with game context, which disrupts the flow of the game. Finding the right balance is essential regarding this matter.

Finding the right way to model the knowledge for use in educational games presents an important issue. Video games teach players certain skills and knowledge (De Aguilera & Mendiz, 2003; Estallo, 1995). The problem arises when there is a need to teach specific matter such as subject curriculum at universities etc. Integrating that kind of knowledge, while still making game interesting and playable presents a big challenge. The purpose of this chapter is to propose a model that will attempt to establish the balance between knowledge integration on one side, and its reusability on other. Our model driven approach is relying on use of Learning Objects (LO) as constructing pieces of knowledge resources which are specialized for educational game design purpose. Learning objects represent a small, reusable pieces of content relevant for learning (for example, an online exercise; a coherent set of introductory readings on a specific topic; or an assessment test) (Jovanović

et al., 2007). Reusability of LO represents using LO in different courses, by different teachers and learners (Gašević et al., 2004). In this case LOs can be reused in different educational games as well as other eLearning forms, online classes, tests etc.

The chapter is structured as follows. In part 2, we give a brief discussion about this area of research and survey of research result regarding this matter. Next, we give a description of the proposed approach inspired by model-driven development that represents a basis of this work. Detailed description of our metamodel is a subject of part 4 of this chapter. An example of application of the described metamodel, is described in part 5. Part 6 gives a conclusion and issues in respect to our future work.

## **Games in Education**

The essence of e-learning lies in knowledge management (Ronchetti & Saini, 2004; Kostas, Psarras & Papastefanatos, 2002). The ever-increasing importance of knowledge in our contemporary society calls for a shift in thinking about innovation in e-learning.

In the context of e-learning, ontologies serve as a means of achieving semantic precision between a domain of learning material and the learner’s prior knowledge and learning goals (Kickmeier-Rust & Albert, 2008). Ontologies bridge the semantic gap between humans and machines and, consequently, they facilitate the establishment of the semantic web and build the basis for the exchange and re-use of contents that reaches across people and applications (Antonioni & van Harmelen, 2004).

It is important to be able to separate content from expression within a LO in order to be able to clearly distinguish two important types of questions: those dealing with the meaning that has to be conveyed by the LO, and those dealing with how meaning is to be expressed (Brajnik, 2007).

On the other side, main purpose of educational games is to teach and pass knowledge. That is why a majority of educational games is focused mainly

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