Chapter 3
Game–Like Technology
Innovation Education

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ABSTRACT
This paper examines the methodological challenges and perspectives of designing game-like scenarios for the implementation of innovation processes in school science education. This paper presents a design-based research study of a game-like innovation scenario designed for technology education for Danish public school students aged 13-15. Students play the role of company heads that develop intelligent music technology. This game-like learning environment was designed to develop innovation competencies through the simulation of a practical learning situation. The term “game-like” is used to denote that the scenario should not be considered an educational game, such as the educational computer games used in many schools today. The focus of the design is to include practices and tools from innovative professions and use game principles and elements to create a meaningful frame around the creative and innovative practices.

INTRODUCTION
One key-adage of our time is that Western countries will only survive based on their populations’ abilities to be innovative, flexible and creative in a world of global warming and foreign industries that exploit cheap labour (Drucker, 1993). To meet these challenges, the primary task of educators has been defined as preparing learners to participate creatively in the knowledge economies that most Western countries have become (OECD, 2000). In spite of this being one of the main educational challenges of the 21st century, schools still teach students that knowledge is static, and as a result, students are being taught to become experts at consuming knowledge rather than producing new knowledge (Sawyer, 2006).

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Past science and technology studies of actors in the field have led to a discussion of what is meant by "authentic science" in school education (McGinn & Roth, 1999). Rather than the traditional picture of the scientist as the isolated genius endowed with superior mental abilities, scientific knowledge in the field of science and technology studies is seen as emerging from disciplined ways of organising and making sense of the natural world, as well as being a construction of visual representations (Latour, 1999; Lynch & Woolgar, 1990; Latour & Woolgar, 1986). Visual representations such as graphs, x-ray images, maps, models, diagrams and hybrids of these are central in creating and communicating science and it has been argued that this view of scientific practice should have implications for how science is taught (diSessa, 2000; McGinn & Roth, 1999).

Games that simulate scientific practice have been mentioned as an approach for implementing innovation in school education (Shaffer, 2007). The game media is well suited for simulating complex rule systems and real-life settings. Game scenarios offer a medium equipped for complex simulations integrating many different aspects of real-life learning environments and framing them in a simulation a player can identify with and relate to. Access to a wide range of professional tools and representations supports authenticity and allows for players to tackle complex problems from professional contexts (Magnussen, 2008). Though the potentials of game media in technology innovation education are clear, how innovative practices in game-based environments occur has yet to be fully understood.

In this paper, the design of a game-like technology innovation scenario is presented. The scenario was developed as part of a design-based research study of how to implement innovative learning environments into cross-disciplinary science education in schools. I present the design, preliminary results and the methodological discussions that arise from the first application of the design.

GAME-LIKE SIMULATED PRACTICE

The empirical data in this paper is gathered from a technology innovation scenario, which is part of a new generation of theory-based educational games that simulate professional environments. One characteristic that these games share is that they simulate elements of the objectives and environments in a specific profession by using and making available the technology, tools and/or methods of that profession to students playing the game. Examples of simulations include environmental engineers trying to locate a polluted site (Squire & Klopfer, 2007), urban planners redesigning a central pedestrian street of a town (Shaffer, 2006), or criminal investigators investigating a murder using forensic techniques (Magnussen, 2007, 2008). The objective for creating these types of games is to use the game media to design complex settings based on the learning environments of real-life professionals, thus allowing students to engage in complex, creative, and innovative problem solving and learning processes of the professions. The motivation for developing these types of games stems from a critique of the teaching of standardised skills to children in today’s school system. The skills acquired in this system do not prepare them for a future that involves a constantly changing, complex work life (Shaffer & Gee, 2005). Critics believe that, under the current system, students do not learn to deal with problems that do not have ready-made answers and do not solve problems using creative, innovative thinking or collaboration. As a result, the aim of this type of game is to use the game media to create environments with simulations of complex real-life situations where students have to think like professionals and solve problems in innovative ways as professionals do (Gee 2003; Shaffer, 2007). Simulating professions is not new. Commercial games such as Counter-Strike or the game version of CSI simulate the professional practices of counter-terrorists and forensic detectives. The
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