

## Chapter 17

# Representational Inquiry Competences in Science Games

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### ABSTRACT

*This chapter considers the enactment of competences in a particular science learning game Homicide, which is played in lower secondary schools. Homicide is a forensic investigation game in which pupils take on the role of police experts solving criminal cases in the space of one week. The Homicide game-based learning environment was designed with the aim of supporting scientific inquiry through a simulation of elements of a professional forensic practice situation. The game is thus designed to support work with genuine scientific inquiry and to meet the seventh- to tenth grade curriculum objectives for science and Danish education in Danish schools. This chapter presents the results of a long-term empirical study conducted with four school classes who played the game. The focus of the study has been to understand what competences are enacted when a professional inquiry is played out in schools. The chapter considers how students constructed visual representations of the cases they investigated and how they used these representations to establish hypotheses and evidence. The term ‘representational inquiry competences’ is developed; it refers to the students’ ability to construct, productively use, transform and criticize visual representations as an integrated part of conducting an inquiry in the science game.*

### INTRODUCTION

In the past decade, science education has been the focus of studies and development of a new generation of theory-based learning games (Squire, 2002; Barnett *et al.*, 2004; Shaffer *et al.*, 2005; Magnussen

& Jessen, 2006). It has been argued that active and critical learning about rich semiotic systems and complex problem-solving that well-designed games are thought to involve, are similar to science learning when understood as an active process of inquiry involving real-life science (Gee, 2004, 2003). In spite of the boom in game learning research, relatively little is known about how learning occurs

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through game-play or what interaction occurs when complex game-based learning environments are brought into a school culture. The objective of the research in this chapter is to provide a detailed understanding of practices and competences that are seen and developed in the science game environments in school. In this chapter I present results from a three year long study of the science game Homicide (Magnussen, 2009).

## **BACKGROUND: GAME SIMULATION OF SCIENCE PROFESSIONS**

The empirical focus is the science game *Homicide*, which can be grouped as part of a new generation of theory-based learning games that simulate professional environments. One common trait 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.

Some examples of simulations are environmental engineers trying to find a polluted site (Squire & Klopfer, 2007), urban planners redesigning the central pedestrian street in a town (Shaffer, 2006), or criminal investigators investigating a murder using forensic techniques (Magnussen, 2007). An objective for creating these types of games is to apply the game media to designing complex settings based on the learning environments of real-life professionals, thus allowing students to engage in the complex, creative, and innovative problem solving and learning processes of these professionals.

The motivation for developing these types of games stems from a critique of the teaching of standardized 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 that they do not solve problems using creative, innovative thinking or collaboration. An objective of designing 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 (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 difference between the commercial games and this new generation of learning games is that the designs are based on learning theories and/or detailed studies of the learning processes and the tools of real-life professionals. Some of these games are also designed to meet the goals of the formal school science curriculum (Magnussen & Jessen, 2006), while others, "create the epistemic frame of a socially valued community by re-creating the process by which individuals develop the skills, knowledge, identities, values and epistemology of that community" (Shaffer, 2007, p164). The latter class of games is defined as 'epistemic games'.

The empirical field work in this chapter consists of observations of the game Homicide being played in four schools. The game is an IT-supported game where players role-play forensic experts. It is designed for cross-disciplinary science education in lower secondary schools in Denmark and was developed by a game development group (including the author of this paper) at Learning Lab Denmark at The Danish School of Education and was published by the Danish school book publisher Malling Beck. The game takes five days to play (if you start at eight in the morning and finish around one or two pm in the afternoon). It is organized as a combination of work in investigative groups (each working on their individual case) and meetings where groups share information about their cases and are encouraged by the chief of police - the teacher - to set new goals in their investigation.

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