

# Chapter 10

## Game-Based Representations as Cues for Collaboration and Learning

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### ABSTRACT

*Literature suggests that games can support learning in schools by enabling creative problem solving, allowing dynamic resource allocation, providing a motivating, immersive activity, and supporting explorations of identity. A descriptive, inductive study was carried out to identify how high school students make use of the video game interface and its representations. Results demonstrate that specific cues direct attention, helping to focus efforts on new or underutilized game tasks. In addition, consistent and well-organized visualizations encourage learning and collaboration among students by providing shared referential resources and scaffolding coordinated sequences of problem solving acts during gameplay. Conversely, when affordances are inconsistently represented, students' focus can shift from problem solving at the goal level (game strategy, etc.) to problem solving at the game interface level (which is frustrating their goals). In general, the design of game representations and behaviors can help guide or hinder student learning.*

### INTRODUCTION

Squire (2005) suggests that games provide a rich learning context, in which gamer strategizing and the management of complex problems can foster creative thinking skills and demonstrate to players how their decisions have dynamic outcomes. Ac-

ording to Squire (2005), “it seems the important question is not can games be used to support learning, but how” (p. 1). In this chapter, we provide a description of how high school students make use of video game interfaces while engaged in playing commercial video games in a school setting (*Civilization IV*, *RollerCoaster Tycoon 3*, and *Making History: The Calm & the Storm*). This study focused on ways that the designed

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visualizations and behaviors of game interfaces guide player activity and collaboration, creating opportunities for learning; and how those player interactions in turn influence player activity to support learning. Concepts from previous work on representational guidance (Suthers, 2001; Suthers & Hundhausen, 2003) were applied to video game interfaces to provide a description of how students collaboratively made use of the game interface for learning. A qualitative, inductive case study drawing on ethnomethodology (Garfinkel, 1967; Koschmann, Stahl & Zemel, 2005) and grounded theory (Glaser & Strauss, 1967; Charmaz, 2006) was conducted to provide a descriptive analysis of the acts through which participants used the video game interface to support learning and collaboration in an educational setting. Results revealed patterns in collaborative activity among students, and revealed ways in which the video game representations guided student learning and collaboration.

This article begins with a brief discussion of the analytic and methodological foundations of the work. Then the study context and data collection methods are described. The remainder of the chapter identifies several findings and provides examples of the data on which these findings were based

## **BACKGROUND**

Research on gaming and education is diverse, examining for example: the adoption (or lack thereof) and impact of games in the classroom (Annetta et al., 2006; Sandford, Ulicsak, Facer & Rudd, 2006; Squire, 2005), the educational value of specific games (Murray, Mokros, & Rubin, 1998), gender and gaming (Cassell & Jenkins, 1998), social behavior in massively multiplayer games (Ducheneaut, Yee, Nickell & Moore, 2006; Nardi & Harris, 2006; Sherlock, 2007), embodied interaction in games as virtual environments (Moore, Ducheneaut & Nickell, 2007), design frameworks

(Winn, 2008), and evaluation frameworks (Sharritt, 2010c). Gee (2003) and Shaffer & Gee (2006) provide comprehensive yet accessible accounts of the learning potential of games. The present research views games from a different perspective, taking a close examination of the relationship between the designed features of games and the behavior of collaborating gamers. The approach is inspired originally by Collins & Ferguson's (1993) concept of "epistemic forms" that guide different inquiry practices, and was developed further by Suthers (Suthers, 2001; Suthers & Hundhausen, 2003) into the concept of "representational guidance." Apart from this theoretical motivation, the present work remained deliberately open on what constitutes a learning episode, adopting methods that allow for emergence of understanding what is happening in game play. We summarize these theoretical and methodological influences below.

## **Theoretical Motivations**

The fundamental concept of representational guidance is that the perceived affordances of a representational tool will influence the actions considered and taken by users of that tool. Affordances are potentials for action that reside in the *relationship* between an actor (in this study, students) and an object (elements of the video game interface and peers). It follows that the same object might offer different affordances for different actors. As described in Heeter (2000), "A child might scan a kitchen and notice playthings and treats, a non-cook might notice possibilities for eating quickly -- a microwave, refrigerator, and bag of potato chips, while a chef would see myriad tools and ingredients". Originally, affordances were described as potentials for action by an animal in its environment, as part of an ecological theory of perception (Gibson, 1977, 1979). Later, the concept was adapted by the field of human-computer interaction, which focused primarily on *perceived* affordances (Norman, 1988).

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