Examining Epistemic Practices of the Community of Players of Dwarf Fortress: “For !!SCIENCE!!”

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ABSTRACT

Dwarf Fortress is a digital game with an unusually detailed and complex underlying simulation based on real world systems. Gameplay is unforgiving and condensed knowledge resources that support effective play are scarce. To learn more about the inner workings of the game and make its challenges more tractable, the community of Dwarf Fortress players engages in systematic, evidence-based, experimental inquiry of the game. The community calls this pursuit “dwarf science”. In this paper, the author investigates the origins, evolution, and practice of “dwarf science”, and frame it as a model of how digital games for science learning might support the epistemic frame of science among learners.

Keywords: Epistemic Frames, Epistemic Games, Gaming Communities, Gaming Forums, Gaming Wikis, Inquiry in Digital Games, Knowledge Spaces, Simulations

INTRODUCTION

Why is Dwarven science always on fire?

Because normal science is boring. (User “lolghurt”, Dwarf Fortress official forums)

Socio-constructivist perspectives on learning suggest that learners develop domain understanding by working on authentic tasks in realistic environments. In terms of science education, this would translate as encouraging students to “act like scientists”, and participate in activities of true scientific inquiry. In practice, however, creating an inquiry-based science classroom may be an infeasible objective for some teachers (Crawford, 1999).

As an alternative approach, research suggests that the activities of scientific inquiry can be effectively simulated and performed by students in digital environments (van Joolingen, de Jong,
Lazonder, Savelbergh, & Manlove, 2005; Asbell-Clarke & Rowe, 2014). Current scholarship also supports the idea that digital games can be valuable environments around which students can construct both science expertise and participate in a community of practice (Barab et al., 2009). However, recent reviews (Martinez-Garza, Clark, & Nelson, 2013) have concluded that digital games are rarely designed or intended to help students learn about the authentic practice of science, including scientific inquiry.

According to the National Research Council, the five essential elements of classroom inquiry are:

1. Learners are engaged by scientifically oriented questions;
2. Learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically oriented questions;
3. Learners formulate explanations from evidence to address scientifically oriented questions;
4. Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding;
5. Learners communicate and justify their proposed explanations (Center for Science, Mathematics and Engineering Education, 2000, p. 24).

These guidelines have been incorporated into digital learning environments in several ways. Some researchers seek to create digital environments which provide a realistic context where students can practice inquiry to solve problems relevant to the simulated environment (Nelson & Ketelhut, 2007; Ketelhut, 2007, Barab et al., 2009). Others view the authenticity of the tasks required in the context as a key element (Foster, 2008; see also Gee, 2006). Along this line, Shaffer (2006) proposed a form of digital game that supports “participation in a thickly authentic simulation that gives learners access to the epistemic frame of a community of practice” (p. 2). These approaches differ in the degree to which they allow fictional narratives or situations which, being a key signifier of “game-ness”, distinguish digital games for science learning from their close kin, i.e. scientific microworlds or professional simulations. However, both of these approaches assume that the environment itself is realistic, i.e. that it simulates and displays phenomena in a way that is true to life and that students will thus recognize as valid contexts where inquiry can occur.

Less research has been done on scientific inquiry in environments that have a higher fictive content and lower realism, i.e. games that are more recreational than educational. In recreational games, inquiry is driven more by the performance goals of players than by the game itself. Thus, in World of Warcraft Steinkuehler & Duncan (2008) found discourse elements of scientific inquiry in players’ discussions, and Choontanom & Nardi (2012) described how certain players use mathematical tools to investigate the game’s inner workings, a practice called “theorycrafting”. However, the value of World of Warcraft and other similar games in promoting authentic science inquiry among learners is constrained by the fact that games operate on rules that, while internally consistent, do not hew closely to the principles of operation of the real world.

Very few games combine high fictive content with in-depth and realistic rules of operation, and thus little is known about the value of these games as environments to support science inquiry. In this paper, I will describe the epistemic activities of the community of players of the game Dwarf Fortress, as they engage in systematic, evidence-based inquiry. I believe this community to be unique in terms of the depth and intensity of its epistemic activity. I will argue that these activities are fundamentally shaped by the designed affordances of Dwarf Fortress and share the epistemic frame of practicing scientists. By this “epistemic frame” I mean the ways that practicing scientists perform inquiry, deciding what is worth inquiring, and how the results
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