Theorizing Games in/and Education

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Abstract: Games are a nascent topic for educational research, with an increasing number of conferences (e.g. Games, Learning, & Society), print publications (e.g. Games & Culture), and even federal grants (e.g. Quest Atlantis, RiverWorld, Whyville) recently given to the study and design of gaming technologies in/for education. However, to date, games have been chronically under-theorized – a “technology in search of a paradigm” (Gredler, 1996). This symposium proposes new conceptualizations of games in relation to education. Our collective goal is to better articulate the nature of contemporary interactive technologies so as to forward educational theory; each paper addresses crucial aspects of games and gaming culture against a backdrop of research on learning, education, and society (c.f. Shaffer, Squire, Halverson, & Gee, 2005; Steinkuehler, in press). To do so, this unique symposium combines (a) ethnographies of naturally occurring game environments, (b) game-based learning programs based on findings of how learning occurs in such environments (c) an empirical model based on games for thought, a type of professional practice simulation games, and (d) a research project using games and game technologies for social science theorizing. Together, these papers suggest new directions for the cognitive sciences pointing toward how to design learning systems for an information age networked society.

Games as a Highly Visible Medium for the Study of Distributed, Situated Cognition: Constance A. Steinkuehler

Early academic discussions in game-related fields about what games are and how they ought to be studied tend to fall back on a tired dichotomy drawn between ludology (the study of games as formal rule systems) and narratology (the study of games as texts), even when core scholars on both sides acknowledge that the debate is an unfortunate red herring (cf. Aarseth & Jenkins debate, 2005). Games are designed experiences (Squire, in press) and, as such, their study requires an understanding of the full range of human practices through which players actively inhabit those worlds of rules and texts and render them meaningful. Games are a “mangle” (Pickering 1995) of production and consumption – of human intentions (with designers and players in conversation with one another, Robison in press), material constraints and affordances, evolving sociocultural practices, and brute chance. While rules and stories partially constitute the designed object or little-g “game” at the center of a given individual’s play experience with it, it is the emergent culture or big-G “Game” around them that renders them meaningful and consequential (Gee, 1999; Shaffer, 2005; Shaffer, et al. 2005; Squire, 2002, Steinkuehler, in press).

Such big-G Games provide a highly visible medium for the study of cognition as inter(action) in the social and material world. Accounts of thinking, learning, and understanding based solely on a symbolic processing model, which treats the mind as a wet-wired symbol processing system analogous to the computer (e.g. Anderson & Lebiere, 1998; Simon, 1989), cannot easily account for the range of everyday human activity or its meaning – how it is distributed across tools, representations, and other people; how it is situated in the material, social, spatial, and temporal context in which it occurs; how it ontologically changes who and what the person is (rather than just the epistemic contents in the head) (Packer & Goicoechea, 2000); or how it is tied to larger sociocultural (and political) “forms of life” (Wittgenstein, 1958) enacted out in the world. In order to construct such accounts, we must rethink cognition as a distributed and situated event.

Games are an extremely valuable context for the study of cognition within this paradigm. They provide a representational trace of both individual and collective activity and how it changes over time, enabling the researcher to unpack the bidirectional influence of self and society – how a given sociocultural context shapes and influences individual activity and meaning-making through socialization and enculturation (Nasir, 2005), and how the individual shapes and influences the culture in which she participates in return. As both designed object and emergent culture, g/Games (a) consist of over-lapping well-defined problems enveloped in ill-defined problems that render their solutions meaningful, (b) function as naturally occurring, self-sustaining, indigenous versions of the
Designing Learning Environments for an Interactive Age: Kurt D. Squire

Interactive immersive entertainment or video games have emerged as a major entertainment medium and enculturation force for today's youth. Videogames epitomize a potentially destabilizing wave of technologies where students access information and social networks any time, anywhere. More importantly, videogame cultures have tacit assumptions about knowledge, learning, expertise, and formal institutions which may be at odds with school (Beck & Wade, 2004; Gee, 2003; Lankshear & Knobel 2003; Squire & Giovanetto, in press). As students confront more and more sophisticated digital worlds outside of school, a challenge becomes how will schools react: Do we present and expect students to pursue print-based literacies, ignoring the visual culture and computer mediated worlds they inhabit out of school? And, perhaps most importantly, what identities do we make available to students in school? Whereas our schools ask students to all learn at the same rates, in the same ways, at the same time, games make a variety of different paths to learning available.

This research paper describes findings from an ongoing design experiment iteratively building and researching an after-school learning environment around Civilization III and now IV. In this after school program, kids learn world history through playing and designing historical scenarios (Squire, Giovanetto, Devane, & Durga, in press). Building on ethnographies of online gaming "Universities,” the program aims to move players from game “players” to “designers” of historical scenarios, a program in which students develop historical knowledge, historical modeling and reasoning skills, and new digital literacies around game development. This project seeks to develop an educational model for an interactive age (c.f. Lemke, ) in which students are self-directed, draw on multi-modal discourses, and participate in socio-technical networks appropriate for the digital age through drawing on Crowlely's (2002) notion of islands of expertise, coupled with Gee's (2004) notion of affinity spaces, and Jenkins (in press) notions of participatory media structure.

Specifically, this paper draws on data from a year long, ongoing after-school club with fourth sixth grade underachieving students (mostly of color) where they reciprocally play and develop historical modifications for the computer game Civilization III. It follows the trajectory of three students who entered the program as novice game players and reluctant producers of media, to skilled historical modelers. Drawing on roughly 100 hours of observations, videotaped interactions, and clinical interviews with students, it provides narrative case study accounts of how they develop new historical and technical literacies, deeper conceptual understandings of geographical history, and transformations in identity from consumers to producers of media. This process includes students' developing (a) an interest in the game history, (b) students seeking outside sources (including texts) to meet developing curiosities, (c) desires to create historical scenarios to communicate ideas and impress their colleagues, (d) a desire to interact with other developers over the Internet.

The study details specific historical understandings that evolved through participation in this program, such as systemic view of the geographical impact on the fate of civilizations, and explores the limitations of students' understandings, particularly as they develop in a non-linear context. Using prepost tests administered every 3 months, or after 20 hour intervals, it details growth in their historical vocabulary, understanding, and interest in history. The paper concludes with a tentative model for how such clubs might be developed and replicated at other sites, addressing key issues of scalability and sustainability in design research projects (Shaffer & Squire, in press).

Games as Social Systems Theory Testing: Games for Instructional Leadership: Richard Halverson

This paper explores how video game design can provide social science researchers with a powerful method for testing theory adequacy and interdependence, outlining our effort to bring the principles of game design and play into the world of school leadership in the form of the Instructional Leadership Game (ILG). We take theories of school improvement and school leadership as a subset of social science theories in order to investigate how
videogames might test social science theory adequacy and reliability. We know that school leaders play a critical role in developing structures and communities for sustained learning across schools – without good leadership, the best research-proven educational innovations fail. The ILG provides a research-driven context for leaders to see the short- and long-term consequences of trying out new strategies, engaging in the politics of leadership, and practicing the micro-tasks of supervision, management and planning. In so doing, the ILG not only helps novice school leaders learn new practices but also provides a sandbox for experienced leaders to customize the game to their schools and engage in what-if experimentation. The paper provides a review of our efforts to build the ILG as an occasion to discuss the emerging role of videogames and social science research. The birth of cognitive science was marked by the new capacity of information technologies to simulate complex cognitive processes, such as chess playing and decision-making (Gardner, 1985). Such simulations enabled researchers to see complex interactions in simplified environments, which in turn informed the development of models in disciplines from weather to economics. Social science theories, however, have proven particularly difficult to test in domains representing complex practices, such as school leadership. Yet, recent advances in videogame design have opened new possibilities for including interactivity in complex systems models, thus enabling researchers to study how, for example, agency plays out within complex systems. Real-time strategy games such as *Rise of Nations* and *Civilization* immerse players in complex, research-based theories-of action through the development of rich, open-ended narrative environments that allow players to participate in complex systems and to learn from the consequences of their actions. Thus, videogames allow for two directions of theory testing: 1) game design allows for the articulation and specification of models for how theories play out in practice (see, for example, Burns, 2002 on the influence of Jared Diamond’s *Guns, Germs and Steel* on the design of the *Civilization* games), and 2) game play allows individuals to experiment with complex theoretical models in order to understand, as it were, social theories from the inside.

The paper is structured into three parts. First, we review the ILG game design by describing how we operationalized key components of school improvement efforts, such as professional community, data-driven decision-making, high-stakes accountability and theories of day-to-day administrative practice into the underlying systems model of the ILG. We found that each component theory was radically underspecified and that we needed to engage in interviews and basic research in schools to understand how the theories would play out in practice. Assembling the model involved extensive user testing to insure that the designed process actually represented authentic practices. Second, we describe game play with a review of our user-testing process. We asked eight school leaders to interact with the game and reflect on a) what they learned, and b) how the game could be improved. Finally, we discuss the implications for video-game design as a tool for vetting existing school improvement theories and speculate on the next-generation of theory development that might result from game-modeled research.

**Games for Thought: The Future of Education and How We Can Get There:**

**David Shaffer**

In this talk, I present the concept of Games for Thought, a view of games that moves our education system beyond traditional academic disciplines and classroom practices to a new model of learning through meaningful activity in virtual worlds as preparation for meaningful activity in a postindustrial, technology-rich society. I argue that practices in the world, such as the professions, have coherent epistemic frameworks (Shaffer, 2005, in press). So the ways in which professionals and members of other valued communities acquire their practices provide an alternative educational model: a model based on epistemic games – games that recreate the training and practice of professions and other socially-valued communities (Shaffer, 2004; Shaffer, et al., 2005).

To do this, I examine two epistemic games, using these games to illustrate an educational system of *Games for Thought* in which students learn to think as urban planners, architects, engineers, journalists, and other socially-valued practitioners not in order to train them for these pursuits in the traditional sense of vocational education but because learning to work as members of these communities of practice provides students with an opportunity to learn about the world in ways that are fundamentally grounded in meaningful activity and well aligned with core skills, knowledge, identities, values, and epistemologies for life in a postindustrial society.

**Digital Zoo**

In the epistemic role-playing game *Digital Zoo* (Svarovsky & Shaffer, in press), children cultivate their natural tendencies to explore, create, and design by working as professional biomechanical engineers who solve design problems in a realtime persistent world. By playing *Digital Zoo*, students develop scientific understanding by seeing, thinking, and acting as engineers.
Stage One: In-House Design.

Middle school students solve engineering design challenges on SodaConstructor, a Java-based spring-mass modeling simulation using rapid iterations of the Design-Build-Test cycle – the core practice of engineering design – to learn physics through epistemic gameplay.

Stage Two: Prototyping for External Clients.

Students level up to work as biomechanical engineers developing structural character prototypes on SodaConstructor for the next Pixar movie. They conduct prototype evaluations, interface with clients, and balance competing design objectives as they learn about engineering design, physics, and animation. In this paper, I present an overview of Digital Zoo and data from both stages of gameplay, focusing on how engaging in authentic iterations of the engineering Design-Build-Test cycle develops scientific knowledge and engineering values.

MyCity

Human beings are the architects and planners of cities, so good stewardship and good citizenship require an understanding of the relationship between the built and natural world. One way students can gain an awareness of a city's ecological relationships is through urban simulation: for example, in computer games such as SimCity, where players solve urban problems by managing a fictitious urban environment. But before there was SimCity there were real cities, and the real urban planners who organize their growth and development. The epistemic game MyCity (Beckett & Shaffer, in press) shows how a game based on the authentic practices of urban planning helps players think like urban planners about the complex relationships of urban ecology. In MyCity, high school students learn about urban ecology by working as urban planners, using an interactive planning model to redesign a popular downtown pedestrian mall. Studies of the MyCity game show that students begin to think like urban planners by inhabiting a virtual world in which they take up such roles.

Methods

Each of these epistemic games was pilot tested through 10 hours of game play by 10-15 students (middle school students for Digital Zoo and high school students for MyCity). Clinical interviews were conducted immediately before and after game play, including “content questions” and “game play” questions. Content questions were analyzed for changes between pre- and post-test. Game play questions were analyzed within a grounded theory framework which attempted to relate students’ assessment of and experiences in the game to each other and to changes in content questions.

Results

In both games, students showed a statistically significant change in their knowledge of scientific concepts. Both games also showed that students developed ways of thinking characteristic of the profession they were role-playing. Finally, in both games there was a significant qualitative and quantitative relationship between changing understanding of science and development of professional ways of thinking and acting.

References


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