GameStudies

the international journal of computer game research

volume 2, issue 1 July 2002

Cultural Framing of Computer/Video Games

by Kurt Squire

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Since their inception, computer and video games have both fascinated and caused great fear in the politicians, educators, academics, and the public at large. In the United States, this fear and fascination goes back to the early 1980s, when Ronald Reagan extolled the virtues of games to create a generation of highly skilled cold war warriors, while U.S. Surgeon General C. Everett Koop proclaimed games among the top health risks facing Americans. To be sure, such extreme cultural reactions to technological and cultural innovations are hardly new; mid twentieth-century critics feared that television watchers would become addicted to television, never leaving their homes, and critics before them feared that film would pervert viewers.

In educational and social science discourse, the reactions to new technologies, including digital gaming technologies, have been equally excessive. Some advocates of digital game-based learning imply that developing educational games is a moral imperative, as kids of the "videogame generation" do not respond to traditional instruction (See Katz, 2000; Prensky, 2001). Other educators, such as Eugene Provenzo (1991; 1992) worry that games are inculcating children with hyper competitive or warped sexual values. Looking at the range of values and powers that educators ascribe to games, games begin to look a bit like a Rorschach test of educators? attitudes toward modern social, technological, and media change, rather than an emerging and maturing entertainment medium. Indeed, similar statements were made about the potential for radio, film, television, and desktop computers to revolutionize learning, yet the overhead projector continues as the most pervasive piece of technology in most classrooms (Cuban, 1986).

The recent enthusiasm for educational gaming directs researchers, politicians, game developers and the public toward some important, overlooked issues. What are people learning about academic subjects playing games such as *SimCity*, *Civilization*, *Tropico*, or *SimEarth*? Might games be used in formal learning environments? This essay argues that these are critical questions to game studies, and educational studies, particularly work in the learning sciences, and offers some important practical and theoretical traditions that games studies can draw upon as it matures as a field.

Pawns of the Game: The Current State of Games-Based Social Science Research

In the United States, and increasingly in Europe, games such as *Doom* or *Quake* have garnered a disproportionate share of attention in the press, as they have become pawns in a culture war waged by cultural conservatives. As many gamers, critics, media scholars, and social researchers agree, this discussion has been devoid of any serious study of games. For example, in 2001, U.S. Attorney General John Ashcroft cited the game Dope Wars as an example of the "the culture of violence" that may have contributed to a spate of recent deadly school shootings" (Reuters News, April 4, 2001). How a simple,

text-based game (based on a nearly 20 year old DOS game) that is downloaded over the Internet, played on Palm Pilots, and features no graphical imagery is contributing to the increased violence among teens, given the amount of violence in American culture is questionable. As this example reveals, much of the rhetoric in this culture work has much less to do with any real knowledge of games than with fears about violence in American culture.

It is difficult for many to make sense of this contentious and politicized cultural debate because to date, there has been very little disciplined study of gaming. Some social science researchers have compared "violent" games like Doom to "non-violent" games like Myst or compared the rates of aggressive and violent behavior between gamers and non-gamers. Unfortunately, this research suffers from many problematic conceptualizations: violent acts are removed from the narratives contexts in which they are situated (Jenkins, 1998); researchers used invalid comparison techniques, studying games from different genres that differ along multiple variables -- such as comparing *Myst*, a slow-paced puzzle adventure game to *Castle Wolfenstein*, a fast-paced 3D action shooter (Anderson & Dill, 2000). These studies generally lack any real-world evidence linking game-playing to acts of violence; they ignore broad trends that that show inverse correlations between game-playing and violent behavior; finally, they make wild logical leaps in linking very constrained behaviors in laboratories to violent acts where people really get hurt. Anderson and Dill (2000) found that players who lost a round of *Wolfenstein 3D* "punished" opposing players with a noise blast that lasted 6.81 seconds, compared to *Myst* players, who blasted opponents for 6.65 seconds - a .16 second difference (there was no difference between players who won their round of Castle *Wolfenstein* and *Myst* players). To suggest that a .16-second increase in duration of a noise blast is qualitatively the same as committing mass murder is not only an illogical leap, but a disservice to the worthwhile enterprise of studying what are the root causes of tragic events like school shootings or youth violence. Fortunately, a handful of social science researchers such as Jonathon Freedman (2001) and Jeanne Funk (2001) have begun to call for more rigorous research and are taking a much more disciplined look at the impact of gaming on people's lives. Hopefully social science researchers will follow suit; as a generation of game players move into academic positions, perhaps such poorly defined research studies will be challenged and a more rigorous body of research will evolve.

What's missing from contemporary debate on gaming and culture is any naturalistic study of what game-playing experiences are like, how gaming fits into people's lives, and the kinds of practices people are engaged in while gaming. Few, if any researchers have studied how and why people play games, and what gaming environments are like. The few times researchers have asked these questions, they have found surprising results. In 1985, Mitchell gave Atari 2600 consoles to twenty families and found that most families used the game systems as a shared play activity. Instead of leading to poor school performance, increased family violence, or strained family interactions, video games were a positive force on family interactions, "reminiscent of days of Monopoly, checkers, card games, and jigsaw puzzles" (Mitchell, 1985, p.134). This study suggests that investigators might benefit by acknowledging the cultural contexts of gaming, and studying game-playing as a cultural practice. If nothing else, it highlights the importance of putting aside preconceptions and examining gamers on their own terms.

Rethinking the role of Educational and Social Science Research in Digital Gaming

Underlying this unease about video game violence research is a growing disconnect between anti-gaming rhetoric and people's actual experiences playing games (See Herz, 1996; Poole, 2000). The first generation of gameplayers is now in its 30s. Despite (and perhaps because of) the hundreds of hours I've spent playing war games, I'm pretty much a pacifist. I love Return *to Castle Wolfenstein*, yet I'd never own a gun. The successes of such books as *Joystick Nation* and *Trigger Happy* suggest there is an maturing generation of gamers who feels the same way: games are integral parts of our lives, yet they've largely gone unexamined.

So far, concerns about the effects of "violent" video games have drawn our attention away from the broader social roles and cultural contexts of gaming. There is some evidence that this trend could be changing - in the past six months humanities researchers have turned more attention to games. Art museums in both the United States and United Kingdom have developed or are planning substantial game exhibits in 2000-2002 (See Barbican, 2002). Panels at conferences are almost ready to give up on the "Are games art?" question and begin asking "What kinds of art are they?" or exploring how and why they work (Jenkins, in press; Jenkins & Squire, 2002). Other humanities researchers are examining games to see what they might teach us about the future of interactive narrative (Murray, 1997).

Despite this increasing attention as a maturing medium, the pedagogical potential of games and social contexts of gaming have been woefully unexamined. Already, entertainment games allow learners to interact with systems in increasingly complex ways. Digital game players can relive historical eras (as in *Pirates!),* investigate complex systems like the Earth's chemical & life cycles (*SimEarth*), govern island nations (*Tropico*), manage complex industrial empires (*Railroad Tycoon*), or, indeed, run an entire civilization (*Civilization* series). Or, they might travel in time to Ancient Greece (*Caesar I,II, & III*), Rome (*Age of Empires I, and II*), North America (*Colonization*), or manage an ant colony, farm, hospital, skyscraper, themepark, zoo, airport, or fast food chain. Anecdotal evidence from teachers suggests that the impact of gaming on millions of gamers who grew up playing best-selling games such *as SimCity, Pirates!,* or *Civilization* is starting to be felt.

Still, little is known about what players are learning through playing *SimCity*? Is it deepening their appreciation for geography, helping them develop more robust understandings about their environment, or perhaps promoting misconceptions about civic planning? How does a game such as *Civilization* III work as a cultural simulation? Does it impact players' conceptions of politics or diplomacy? Is there any way to reappropriate *Civilization* for use in history classes? Given the immense influence of *SimCity* and *Civilization* in present game design, what innovations might be sparked by games built around science, engineering, literature or architecture subjects? How might these innovations have an impact on the rest of game design?

These questions suggest at least three fruitful contributions from an educational or social science perspective: (1) Studying the role that games like *SimCity* and *Civilization* play in people's lives and how it mediates their understandings of other phenomena; (2) Examining how such games can be used to support learning in formal and informal learning contexts; (3) Creating and examining new modes of gameplay through games that draw metaphors from other domains. Although there has been woefully little research in this area, there are several research traditions in education and social science outside of media effects research tradition that offer useful models for thinking about gameplay.

Studying the Impact of Gaming

With *SimCity* more than a decade old, a generation of youth has grown up with

edutainment. Yet, we know very little about what they are learning playing these games (if anything). Are sim games, civilization-building games, or war games having any impact on how students perceive social studies? Games such as *SimCity* depict social bodies as complex dynamic systems and embody concepts like positive feedback loops that are central to systems thinking. Are students developing intuitions about systems as a result of playing these games? Do players think they are learning anything about history or urban planning through these games? Are the perceived educational benefits part of the attraction of these games?

The study of games and learning might begin with qualitative study of game players and game playing communities. Although there have been a few survey or experimental studies of game players (See Malone, 1981; Cordova & Lepper, 1996), there have been few studies characterizing players interactions and experiences in game playing environments since Mitchell's (1985) study of families who were given Nintendo machines. Mitchell studied how purchasing Nintendo game consoles affected twenty families, finding that playing Nintendo was an important part of family play, and brought families closer together, much as a traditional board game might. More recently, researchers such as Funk and colleagues (1996) have studied correlations between game players' characteristics and popular genres, but these broad statistical studies fail to open up the complex relationships behind game players and their games or acknowledge the social contexts in which game playing is situated. Even a quick glance at fan communities around games such as *SimCity*, *Dance Dance Revolution, Railroad Tycoon*, *Everquest*, or *The Sims*, each of which has dozens of fans websites where players create and trade game objects, maps, levels, scenarios, and stories points to rich relationships between fans and these games and complex social structures that mediate the game playing experience (See Jenkins, 2001; Squire, 2000; Yee, 2000 for descriptions of these communities).

The closest examples of studying gaming communities may be examinations of online communities. In the 1990s, Sherry Turkle and Amy Bruckman studied MOO players, yielding insights into how people negotiate among their many virtual identities (Bruckman, 1993a; 1993b; 1994; Turkle, 1996). These MUD and MOO studies were not specifically of game playing communities, but they have provided both theoretical models and specific insights about online behavior that have become foundational to the design of online games and learning environments alike. Drawing more explicitly from anthropological, educational and cultural psychology traditions (e.g. Cole, 1996), future study of gaming communities might focus specifically on the shared practices, language, resources, understandings, roles that emerge through game play. Among the outcomes of examining gameplay in naturalistic contexts might be creating guidelines for more usable and playable games, leveraging and promoting social interactions and relationships in the gameplay, and insights for creating games that appeal to broader audiences.

Games in Educational Contexts

Most people assume that games like *SimCity* are used frequently in geography or urban planning classes. Indeed, Maxis has published a set of resources for teachers on its website, touting that, "*SimCity* 3000(tm) can be used in the classroom to enhance just about any instructional unit. It can stand alone as an enrichment computer activity, or it can be used as a pivotal activity connected to other activities and projects done before, during, or after using the computer program. Use the lessons in this guide to integrate *SimCity 3000* into your curriculum, with minimal preparation, or to create custom lessons to suit your needs."

As Doug Church commented at the 2002 Electronic Entertainment Exposition, most people who have played SimCity recognize that it can be an excellent resource for understanding urban planning, most people would also not want to live in a real city designed by someone who has only played SimCity. As urban planner Kenneth Kolson points out, *SimCity* potentially teaches the player that mayors are omnipotent and that politics, ethnicity, and race play no role in urban planning (Kolson, 1996). Using *SimCity 2000* at Boys and Girls clubs Barab, and colleagues (et al. in preparation) have found that students definitely learn from exploring relationships between supply and demand and population growth and taxation, but they might also develop naive concepts of how cities form, grow, and evolve. For example, one six-year old player noted that people began moving into his city when there was electricity, because people wanted to have lights for seeing in the dark. This example illuminates how the process of interpreting game play, of drawing analogies between symbolic representations in the game and their real-life analogs is one of active interpretation, and suggests that students might benefit from systematic explanations or presentations of information. In similar research in anchored instruction and problem-based learning environments, John Bransford and colleagues have found that students perform best when given access to lectures in the context of completing open-ended complex problem solving tasks (Schwartz & Bransford, 2001).

The challenges behind using games to support learning are far from new, particularly in social studies education. In 1973, Wentworth and Lewis summarized the findings from nearly fifty research studies on learning through gaming: "In the majority of these studies, students did neither significantly better nor worse than other learning experiences in their impact on student achievement as evidenced by paper and pencil scores." In his 1991 review of the research on games and simulations in social studies, Clegg reached similarly inconclusive findings. Consistent with contemporary instructional design theory (e.g. Heinich, Molenda, Russell, & Smoldino, 1996), Clegg argues that the instructional context that envelopes gaming is a more important predictor of learning that the game itself. Specifically, how the game is contextualized, the kinds of cooperative and collaborative learning activities embedded in gameplay, and the quality and nature of debriefing are all critically important elements of the gaming experience. This tradition of games and simulations in instructional technology, chiefly promulgated through the *The Society for the Advancement of Games and Simulations in Education and Training* and the Sage journal *Simulation and Gaming* has resulted in a rich body of practical knowledge about designing effective games to support learning; however, there is actually very little agreement among educational technologists as to the theoretical underpinnings of why we should use games, how games should be designed to support learning, or in what instructional situations games make the most sense (Gredler, 1996).

The research on games and simulations in education cautions against overexhuberance about the potential of digital games to transform education. In using a game such as SimCity, minimally, there needs to be a close match among desired learning outcomes, available computer and supporting human resources, learner characteristics (such as familiarity with games conventions), "educational" game play, and potential supplementary learning experiences. Fortunately, one can imagine creating instructional resources around a game like *SimCity* or *Civilization* that pushes students to think about their game-playing more deeply. For example, *Civilization* players might create maps of their worlds and compare them to global maps from the same time period. Why are they the same? Why are they different? Students might be required to critique the game and explicitly address built-in simulation biases. Finally, students might draw timelines, write histories, or create media based on the history of their civilization. The possibilities for using a game like *Civilization* as a springboard into studying history are endless, but so

far, there are less than three magazine or journal articles published on the topic and no one has done empirically-grounded research in the successes and challenges of using such a game to support learning (See Berson, 1996; Hope, 1996; Lee, 1994; Prensky, 2001; Teague & Teague, 1995).

Creating Next-Generation Educational Media

Despite these cautions about the potential of games to support learning, games may be the most fully realized educational technology produced to date. Tom Malone (1981) showed how games use challenge, fantasy, player control, and curiosity invoking designs to create intrinsically motivating environments. More recently, Lloyd Rieber (1996) has argued that digital games engage players in productive play - learning that occurs through building microworlds, manipulating simulations, and playing games. Rieber gives reason for renewed optimism for using games to support learning in leveraging the increasing power of the computer to immerse the player in interactive simulated worlds. Whereas historically educational games have relied heavily on exogenuous game formulas, games where content is inserted into a generic gaming template, like hangman, a game like SimCity might be thought of as an endogenuous game design, where the academic content is seamlessly integrated with gaming mechanics. In an endogenuous game, players learn the properties of a virtual world through interacting with its symbology, learning to detect relationships among these symbols, and inferring the game rules that govern the system.

While edutainment games such as SimCity and Civilization are intriguing educational materials, the most promising developments in educational gaming might come through games that are explicitly design to support learning. One example of such a project is the Games-to-Teach project, a project led by Randy Hinrichs at Microsoft Research and Henry Jenkins of MIT's Comparative Media Studies program. In 2001-2002, the Games-to-Teach Project (http://cms.mit.edu/games/education/), presented 10 conceptual prototypes of next-generation educational games to support learning in math, science, and engineering at the advanced high school and introductory undergraduate levels. Among these prototypes is: *The Jungle of the Optics*, a game where players use a set of lenses, telescopes, cameras, optical tools, and optics concepts to solve optics problems within a role-playing environment; *Hephaestus*, a massively multiplayer resource management game where players learn physics and engineering through designing robots to colonize a planet; Replicate!, an action game where players learn virology and immunology through playing a virus attempting to infect a human body and replicate so that the virus may spread through a population. *Supercharged*! A flying / racing game where players learn Electromagnetism by flying a vessel that has adopted the properties of a charged particle through electric and magnetic fields. The Games-to-Teach team will be developing and testing two of these games in 2002-2003.

Such games will demand a broad, industry-wide investment if they are to succeed. Long-term, this kind of project requires creative game designers who understand the tools and capabilities of the medium, educators who can help ensure an effective product and visionary thinkers who can design a suite of games that will appeal to a broad market. A primary goal of the Games-to-Teach Project has been to create games that will engage a broad audience of players by creating rich characters, nuanced gameplay, complex social networks, and interactive stories that tap into a broad range of emotions and player experiences. Hopefully other projects trying different approaches will emerge in the next few years, as there have been signs that perhaps the industry and medium are ready for such a challenge.

Understanding and unpacking how learning occurs through game play, examining how gameplay can be used to support learning in formal learning environments, and designing games explicitly to support learning are three areas that educational research can contribute to game studies. In the next section, I argue that socio-cultural learning theory, activity theory, and educational research on transfer are three theoretical traditions that might also be of use to game studies. Although I present each of them from an educational technology perspective, each one is interdiciplinary in origin, sitting at the nexus of anthropology, sociology, cultural psychology, cognitive psychology, and educational studies and for simplicity, will be referred to as the Learning Sciences.

Unpacking Gameplay Through The Learning Sciences

A fundamental tension facing game studies is that if games do not promote or "teach" violence, then how can researchers claim that they might have a lasting impact on students' cognitive development? Far from trivial, this concern touches on many core social science research issues. What is the role of the viewer/participant in consuming media? What are the cultural and social contexts of media consumption? How does - or doesn't - knowledge transfer from one context to the next? Educational discussions of transfer, practice, and social activity offer three promising ways for game studies to think about gameplay as cultural practice.

Transfer. Much of the hype and hyperbole surrounding games and their potential impact on human behavior (whether it be fear about games' impact on human behavior or hope that games are teaching students to think sharper or more quickly) rests on assumptions about activities developed in game–playing contexts transferring to new contexts. In educational research, this phenomena is commonly called the "transfer problem" (See Detterman & Sternberg, 1993). In the early 1900s, E.L. Thorndike and colleagues (e.g. Thorndike & Woodworth, 1901) conducted a pioneering set of studies challenging popular notions that the mind functions as a "mental muscle" and that excellence in general subjects such as Latin or Calculus could result in increased mental functioning. Thorndike and Woodworth (1901, cited in Schwartz & Bransford, 2001) write "The mind is ...a machine for making particular reactions to particular situations. It works in great detail, adapting itself to the special data of which it has had experience.... Improvements in any single mental function rarely brings about equal improvement in any other function, no matter how similar, for the working of every mental function group is conditioned by the nature of the data of each particular case" (pp. 249-250).

One classic example of challenges in transferring thinking across contexts is mathematics. Across industrialized nations, most citizens learn the basic skills needed to solve everyday mathematical problems using fractions or Algebra, but most people rarely use but the most simple computational math in their every day lives. Psychologists working constructivist and situated learning traditions argue that human behavior is circumscribed by context (e.g. Barab, Cherkes-Julikowski, 1999; Brown, Collins, & Duguid, 1989; Solomon, 1993). The purpose of human activity, our goals and intentions, constrain the kinds of information we collect in the environment, and how this information is used (Barab, et al., 1999; Lave, 1988). For example, studies have shown that students who learn Algebra through problem-solving are more likely to use Algebra in solving problems than students who learn Algebra through traditional means (e.g. Cognition and Technology Group at Vanderbilt, 1992). Situational constraints also shape and constrain activity. Studies of navigators sailing ships, office workers using computers, and students in classrooms all show how the tools and resources that are available in our environment

both guide thinking and constrain actions (Solomon, 1993). For example, people doing fractions in cooking frequently simplify the problem to make mathematics simpler, or manually divide ingredients using kitchen tools rather than using Algebra. As a result,, people who have learned Algebra become very good at using Algebra to solve textbook-like problems within school situations, but develop very different strategies for solving real-world problems (Bransford, et al., 1977; Lave & Wenger, 1991; Pea, 1993).

Unfortunately for educators looking to use games to support learning, this skeptical transfer limits what we hope players might learn from gaming. While pundits and theorists suggest that game-playing might be increasing kids critical thinking or problem-solving skills (See Katz, 2000; Prensky, 2000), research on transfer gives very little reason to believe that players are developing skills that are useful in anything but very similar contexts. A skilled *Half-Life* player might develop skills that are useful in playing Unreal Tournament (a very similar game), but this does not mean that players necessarily develop generalizable "strategic thinking" or "planning" skills. Just because a player can plan an attack or develop a lightning quick reactions in Half-Life does not mean that she can plan her life effectively, or think quickly in other contexts, such as in a debate or in a courtroom - one of the main reasons being that these are two entirely different contexts and demand very different social practices.

The particularities of gameplaying as social practice, the contrived and computer-mediated nature of digital game play raise serious questions for educators using gaming to support learning that will transfer across different contexts. What are the goals and intentions of players in gaming environments? Do these overlap with the situational constraints of other social or classroom practices? Do game players have opportunities to think with authentic tools and resources in gaming environments? Examining gameplay as social practice provides one model for approaching these questions.

Game-Playing as Social Practice

Anthropologists Jean Lave and Etienne Wenger (1991) use the term "practice" to discuss how actions are situated in their socio-cultural contexts. Essentially, a practice is an activity that involves skills, resources, and tools, and is mediated by personal and cultural purposes. One way to produce more meaningful educational games would be to design games in which players are engaged in richer, more meaningful practices. A game like *Civilization* III, which involves analyzing geography in order to determine the best geographic location for a city, negotiating trade deals with other civilizations, and making taxation and social spending decisions, comes closer to the kind of meaningful practices educators would like to produce than, say, *Half Life*.

Note that despite the wonderful educational opportunities in playing *Civilization* III, playing the game is still simulated activity – as opposed to participating in historical or social practice. Sasha Barab and Tom Duffy (2000) distinguish between practice fields and legitimate participation in social practice. Playing *Civilization III* is exploring a simulation / model – whereby learning occurs through interacting with and observing the outcomes of a model, which is clearly not the same as actually participating in social practices valued outside of school - like writing history or in participating in political, government, or commercial institutions that extend beyond the school context, or creating a model for research purposes. In short, playing *Civilization* might be a tool that can assist students in understanding social studies, but playing the game is not necessarily participating in historical, political, or geographical analysis. Therefore, building on our earlier discussion of transfer, there is very good reason to believe that students may not use their understandings developed in the game - such as the political importance of a natural

resource like oil - as tools for understanding phenomena outside the game, such the economics behind The Persian Gulf War or contemporary foreign policy, even in a game as rich as *Civilization* III.

Understanding learning as participation in social practice, however, also suggests ways for educators to transform game playing into participation in social practice. For example, Civilization could be presented as a tool that can be used for answering historical questions, such as why Europeans colonized North America, instead of vice versa, or the comparative advantages and disadvantages of political isolationism. In a hypothetical *Civilization* III unit, students might spent 25 percent of their time playing the game, and the remainder of the time creating maps, historical timelines, researching game concepts, drawing parallels to historical or current events, or interacting with other media, such as books or videos. In this way, the educational value of the game-playing experiences comes not from just the game itself, but from the creative coupling of educational media with effective pedagogy to engage students in meaningful practices. Indeed, research on teachers' adoption and adaptation of materials suggests teachers will adapt the learning materials we create to maximize their potential to support learning regardless of designers' intentions (Squire, Barnett, MaKinster et al., in press). As such, the pedagogical value of a medium like gaming cannot be realized without understanding how it is being enacted through classroom use.

Activity Theory

Conceptualizing practice conceived broadly enough to capture the individual's goals and intentions, the tools, and resources employed in practice, and the social organization and institutions that mediate practice – all within empirically grounded cases, is challenging. Restated, how can one theoretical framework account for both the moment-to-moment interactions that constitute gameplay (including the player's goals and intentions) while also accounting for the broader socio-cultural contexts that situate the activity?

Over the past decade, socio-cultural psychologists have been struggling with this issue, and proposed *Activity Theory* as one theoretical framework for understanding how human activity is mediated by both tools and cultural context (Engeström, 1987; 1993). For an Activity theorist, the minimal meaningful context is the dialectical relations between human agents (subjects) and that which they act upon (objects) as they are mediated by tools, language, and socio-cultural contexts (Engeström 1987; 1993). A generic activity theory system is portrayed in Figure 1. *Subjects* are the actors who are selected as the point of view of the analysis. *Objects* are that "at which the activity is directed and which is molded or transformed into outcomes with the help of physical and symbolic, external and internal tools" (Engeström, 1993, p. 67, italics in the original). As such, objects can be physical objects, abstracted concepts, or even theoretical propositions. *Tools* are the concepts, physical tools, artefacts or resources that mediate a subject's interactions with an object. The *community* of a system refers to those with whom the subject also shares transformation of the object; the cultural-historical communities in which a subject's activity is situated. Communities mediate of activity through division of labor and shared norms and expectations.

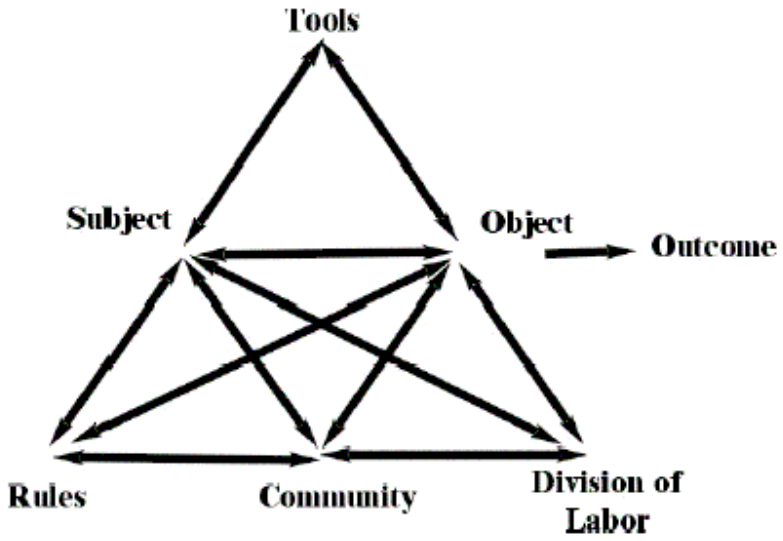

Figure 1: Visual Depiction of an Activity System

Understanding the basic components of an activity system can be a useful way of mapping and categorizing key components of experience. However, for Activity Theorists, it is not the presence of these components in isolation that make for meaningful analysis, but rather, the interactions within among these components. Engeström (1993) refers to such relations as primary and secondary contradictions. Primary contradictions are those that occur within a component of a system (e.g. *tools*), while secondary contradictions are those that occur between components of a system (e.g. *subjects* and *tools*). In a situation where *Civilization III* is used in formal learning environments, one might imagine tensions between winning *Civilization III* and learning social studies as the object of an activity system, depending on whether the student or the teacher is the subject of the activity system.. Predicated on Hegelian / Marxist philosophy, Activity Theory suggests that the synthesis and resolution of such contradictions brings change and evolution to the system, and Activity Theorists argue that characterizing the tensions of an activity system can help participants understand and react to changes in the system.

Activity Theory offers a theoretical framework with strong intuitive appeal for researchers examining educational games. Growing out of Vgotsky's discussion of the mediating role of artifacts in cognition (1978), Activity Theory provides a theoretical language for looking at how an educational game or resource mediates players' understandings of other phenomena while acknowledging the social and cultural contexts in which game play is situated. Learning is conceptualized not as a function of the game itself - or even a simple coupling of the player and game; rather, learning is seen as transformations that occur through the dynamic relations between subjects, artifacts, and mediating social structures.

As games studies matures as a field, no doubt it will draw theoretical concepts from a range of disciplines and research traditions. Thusfar, most social science research around gaming has come from the media effects tradition, leaving a range of other research traditions unrepresented. The impact of digital games on learning and behavior, as conceptualized through researchers in the learning sciences communities is an important, but frequently overlooked area of games studies. My hope is that in the upcoming months, discussions around gaming and cognition will draw upon research in the learning sciences. While I have argued for the value of theoretical positions developing out of cultural psychology, cognitive science, and educational psychology, certainly there is room at the games studies table for other researchers in these fields contributing their

theoretical models, as well as researchers from the Humanities, History of Science, Media Studies, and other disciplines.

The author would like to thank Henry Jenkins, Principal Investigator of the Games to Teach Project, for sharing his vision of using educational games to expand the cultural sphere of gaming and his contributions to this paper. The author would also like to thank Alex Chisholm, Co-Producer of our first Games-to-Teach Project prototype on optics, for comments on earlier drafts of the paper.

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