Abstract

Interactive immersive entertainment, or video games, have emerged as a major entertainment medium and enculturation force for today's youth. Yet, how games and gaming cultures operate is still not well understood. As international research and development initiatives attempting to harness the pedagogical potential of games proliferate, educational researchers might benefit by developing more grounded notions of how games work. This paper argues for examining games as *ideological words*, worlds that are constructed by particular viewpoints to express particular ideas. It argues that understandings are developed through cycles of interaction with the gameworld which are designed to elicit players' identities which are enacted within game cultures. As such, design-based research initiatives examining game-based learning need to take account of both moment-to-moment interactions and broader cultural contexts. Examples from curriculum developed for *Civilization III* and *Supercharged!* show that games can be used to communicate powerful ideas, making new ways of thinking available to students. As games studies matures as a field Opportunities exist for fruitful dialogue between games researchers and educators, particularly around issues of learning, youth culture, design, and digital literacies.

From Content to Context: Digital Games as Ideological worlds

Introduction: The Birth of Game Studies

Although it fell beneath the radar of many educators, November 9, 2004 was the largest grossing media event in world history. No, it was not the release of *Spiderman2* or the latest *Star Wars* movie, the $125 million grossed between 12 a.m. November 9-10 was for *Halo 2*, the much anticipated sequel to the runaway best selling Xbox game *Halo*. Immersive interactive digital entertainment, or "video games" have emerged as an important entertainment medium exerting tremendous economic, cultural and social influence. Many of today's youth spend more time playing in digital worlds than they do watching television, reading, or watching films. What impact is this time spent managing organizations, participating in epic narratives, and participating in virtual societies having on students, schools and our society? How will students react to traditional schooling when they can buy entire "worlds in a box," for $50? Survey studies suggest that game experiences are changing a generation's attitudes toward work and learning (Beck & Wade, 2004). Changing attitudes toward formal schooling might best be summarized by the rhetorical question "Why read about ancient Rome when I can build it?" (Moulder, 2004).[1]

Video games are now almost 40 years old, growing up hand-in-hand with the computer, but they are only now being taken seriously by academia. Digital game studies now has its own journals (i.e. *The International Journal of Computer Gaming and Simulation*) associations (Digital Games Research Association), and numerous annual conferences.[2] While games are transforming the entertainment industry, challenging contemporary legal theory, and opening frontiers in social systems design, they have kept a low profile in education and been almost entirely absent from

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[1] This comment was made by an elementary student via video at the 2004 Serious Games Conference, San Jose, CA.
[2] Academic games conferences can be traced back at least to the 1960s, when the North American Simulations and Gaming Associated began holding annual conferences.

educational research. Until very recently, there has been little, if any study of learning through game play in commercial-quality computer or video games, although *Sim City* and *Oregon Trail* inhabit most every school computer (c.f. Gee, 2003; McFarlane, Sparrowhawk, & Heald, 2002; Squire, 2004).[3]

When educational researchers have studied commercial games, they have largely failed to study games on their own terms. Provenzo's (1991) study of Nintendo Entertainment System game boxes perhaps best typifies the problems endemic 1990s educational games research. The analysis was based on a superficial screening of game materials and very little attention was paid to actual game play practices. Critical questions *do* need to be asked about representations in games, the nature of game play experiences, and game culture, but an integral part of this research needs to be playing games and researching what people do with them, much as one might actually watch a movie or read a book before commenting on it.

Studying how games become enacted through play is even more critical because fundamentally gaming is about generating *experience* for players, experiences which have implications for educators that we do not fully understand. Digital games have arisen as sophisticated texts that not just represent ideas, but represent entire worlds in particular ways that invite players to explore them (Gee, 2003, 2004a; Juul, 2003). As players relive historical eras (*Pirates!*) or earn real world dollars buying and trading virtual currencies (*as in Lineage),* games offer an implicit critique of schools where students are expected to be passive recipients of others' experiences which are sanitized for their consumption. At stake here are questions fundamental to the role of schools and society, particularly on where do we locate the boundaries of school and

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[3] Of course, there is a long history of research on games as instructional media. Most of this research has been devoid of any theoretical grounding (Gredler, 1996). Games have been productively studied as sites of "motivated" activity (e.g. Malone and Lepper, 1981). These studies, while important, fail to address major developments in game design over the past 15 years and the last decade of game studies research (c.f. Squire, 2002).

what will schools' relations with popular culture be. In an era of increased privatization of

education, expanding e-learning, and escalating after-school and enrichment learning programs, it

appears as if more and more choices for learning will be made by those who can mobilize the

resources to enact their agendas (Apple, 2003). How public education will respond to this

disruptive technology is a question that needs to be addressed.

Emerging within educational games scholarship are three overlapping areas of inquiry:

Critical study of games as ideological worlds, examining games as sites of learning, and designing

games as learning contexts. Central to this study of games is are questions of ideology – how

games represent not just ideas, but entire frameworks for knowing, and then how games mobilize

players' identities within them. This suggests not just questions of what meanings players take

from games, but also what identities they develop in games (which leads to intriguing questions for

educators as the assumptions of games may contradict those of school). This also shifts the

question of "how to design games for learning" from one of "delivering content" to one of

"designing experience".

Games as ideological worlds

> "This court reviewed four different video games and found no conveyance of
> ideas, expression, or anything else that could possibly amount to speech. The
> court finds that video games have more in common with board games and sports
> than they do with motion pictures." -- Senior U.S. District Judge Stephen N.
> Limbaugh, April 2002[4]

While fans and game scholars vigorously debate the meanings of video games, mainstream

American culture has been slower to accept that games could even present a point of view.

Eventually, the 8th Circuit overturned Limbaugh's decision and argued that games are entitled to

First Amendment protection, with Judge Morris S. Arnold writing that "they are as much entitled

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[4] See the Interactive Digital Software Association v. St. Louis County <http://caselaw.lp.findlaw.com/data2/circs/8th/023010p.pdf>

to the protection of free speech as the best of literature.'" However, just because gamers, academics, and now U.S. Courts are ready to accept that games present points of view, does not mean that we yet fully understand how games express and embody ideas.

A core challenge to understanding games is that they are an interactive medium. Without players' actions, there is no game to be studied. As such, players have agency within game worlds, albeit, agency within rules and boundaries. In other words, games are systems inhabited by players, but the moment-to-moment actions that constitute the game itself are *generated* by players. Restated, if part of the motivational appeal of games comes from the *agency* we experience as we play games, then we can only understand games' meanings by understanding what players actually do with them and the meanings their players make.[5]

Within digital games theory, there is an understood tension of authorship, where a good game should constrain players through rules and narrative, but also must give players sufficient control to *enter* the world. In the words of noted game designer Doug Church: "Our desire to create traditional narrative and exercise authorial control over the gaming world often inhibits the player's ability to involve themselves in the game world" (cited in Kreimeier, 2000). One way that games reconcile this dance is by inviting players to inhabit roles and identities that both constrain choices and justify representing the world in a certain way. As such, games are constructions by both the player and the author (Robison, 2004). Part of how games choreograph this interaction is to create roles for players to inhabit, roles that span 10s, even 100s of hours of experience. How these roles get taken up, and how these roles relate to players' other identities needs to be explored.

Whereas traditional critiques of games have focused solely on the text itself, the fact that games can only be enacted through the player requires theoretical models that span the game and its contexts of consumption (and perhaps also its context of production). For example, to

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[5] In his 1981 study of game players Tom Malone found that games motivate players through fantasy, challenge, control, and curiosity.

understand what *Grand Theft Auto: San Andreas* (a controversial game simulating 1990s Los

Angeles urban culture) is about, it is essential to understand not just the text itself (as an interactive

system), but what its players do with it (and perhaps that it was developed by a team of Scottish,

most of whom experienced America primarily through other media). Not only does *Grand Theft*

Auto represent inner-city LA in ways that leads some players to understand the limited choices

available to urban youth, but it also invites them to try on the personae of an inner city black man,

appropriating elements of urban culture and experience *some* of the sensations of an urban gang

member. What's important about Grand Theft Auto is not just that it represents urban L.A., but it

allows players to inhabit it from a particular point of view and develop identities within it.

For an example closer to schooling, take *Civilization III*, the third installment of the top

selling *Civilization* franchise, a strategy game where the player rules a civilization from 4000 BC

to the present. The game is based on a geographical-materialist game system where players built

cities to gather natural resources (food, natural resources, and commerce). Different physical

structures, governments, and great wonders affect the rates of developing these resources.

Civilization III also models military, political, social, and economic systems, giving rise to

interesting situations such as civilizations negotiating (and perhaps warring) over scarce resources

such as oil. A single game requires about 20 hours to play and achieving mastery requires

hundreds of hours. The game includes a 250 page manual and an equally dense online

"Civilopedia" of game terms including 256 different game concepts (Squire, 2004).

When considered in light of Jared Diamond's (1999) *Guns, Germs, and Steel, Civilization*

III can be seen as a geographic / material -based model of history. Indeed, in studying high school

students playing *Civilization III*, Squire found that some students used the game as a model for

simulating European colonization, interpreting the game as an argument for "how geography and

gold (i.e. materialist goods) determine how history plays out." *Civilization III* enlisted some inner

city kids' identities as gamers and allowed them new perspectives for thinking about history.

Interviews with designers of Civilization reveal that the game's emphasis on resources

(particularly the addition of scarce, strategic resources) is intentional, and it is not coincidental that

many players find themselves confronting choices such as "should I go to war for oil?".

Whereas *Civilization III* was designed more as an entertainment game than as a political

statement, many contemporary video games *are* designed with politics in mind. *Deus Ex* is a

popular science fiction game full of government-sponsored terrorists, powerful corporations, and

duplicitous government leaders. The goal behind the original game, according to designer Warren

Spector, is to give the player moral choices between trusting organizations versus individuals, and

let the player rethink who is considered "enemies" of the state. In *Deus Ex 2*, the player must

continuously decide whether to ally with multiple competing organizations (governments,

corporations, family loyalties) in a world where every choice involves moral ambiguity and no

decision is ethically "right." One's personal politics aside, it is clear that games are introducing

players to powerful ideas, some of which may align with school, some of which may not.

Games provide high graphic, dynamic "worlds in a box," but these worlds are not full

representations of reality; they are stripped down worlds, with limited opportunities for interaction.

A *Civilization III* player cannot invent a new religion, and a *Deus Ex* player cannot (really) make

love to an NPC. As such, games focus our attention on what is important, and what is to be ignored

in a world. These choices, particularly what has been stripped away from a world can be read as

ideological when read in reference to other systems.[6] We are only beginning to understand how

these games are interpreted and understood by their players. Building from work on other media

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[6] This last caveat – that games meaning resides not purely in the text, but in an interpretation of the text in regards to another object is core to Pierce's (1938) triarchic semiotic system and vitally important for understanding games. For example, as Bryan Mitchell points out, the "dog eat dog" world of DOOM can be read as a commentary on corporate America with surprising insight.

(c.f. Black, 2004; Jenkins, 1992), we can predict that some of this interpretive work occurs through

interpretive communities where meanings are produced, negotiated, and given legitimacy.

Games as sites for studying learning and literacies

      Until recently, games have received little attention from learning theorists. Tom Malone's

(1981) study of game play showed that games are intrinsically motivate players by providing

challenge, curiosity, control, and fantasy (as well as opportunities for social interaction,

competition, and collaborative play). More recently, James Paul Gee (2003) offers 32 learning

principles one can glean from games.[7] The lack of study of more studies games and cognition is

ironic, because as Lemke (2004) points out, they are intriguing sites for studying cognition. Much

as previous generations of psychologists studied expert chess players, Vai tailors, or the navigation

of destroyers as sites of "cognition in the wild" (Hutchins, 1995; Lave & Wenger, 1991), games

can be used to unpack theoretical issues core to the learning sciences. As designed spaces, games

embody particular rules and assumptions that can be examined and studied systematically. Games

generate (and can potentially record) interactions on a micro-second timescale to lifelong

timescale, which gives learning scientists an unusually robust platform for studying learning. The

study of cognition in game worlds has practical implications as well, as games are perhaps the

quintessential sites of and enculturation mechanisms for new digital literacies.

      Digital Literacies. The way that games create presence, or emotional immediacy may be

their most appealing feature. Core to the game experience is not that we are just manipulating

pixels on screen, but in a very real sense, that we are *entering* the world. Clinton (2004) argues that

this immersion is built fundamentally through *interaction* with the game world. The verbs that

games give players -- running, jumping, diving, punching, kicking, and swinging through enemies

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[7]For another take on this issue, see Michael Young's (2004) ecological, systemic approach to understanding game play.

and obstacles are the building blocks by which players *become* action heroes, civilization leaders,

or L.A. gangsters. Drawing on ecological psychology models of cognition that stress cycles of

perception and action, Clinton argues that cognition in digital worlds is thoroughly mediated by

players' capacities for action (c.f. Young, 2004); the player's actions are that player's interface

with the world. Clinton observes that the first act most players perform is to familiarize themselves

with the controls, noting that "figuring out what your character's body can *do* in the world is, in a

sense, figuring out who you *are* in that world." Clinton compares the player's control of the avatar

to the blind person's control of the cane, which becomes an extension of the self (c.f. Friedman,

1998). Thus, for Clinton, as the avatar becomes automotized whereby the avatar's capacities for

action become the player's possibilities.

Perception of the game world is the other half of the perception / action system. Games'

graphics are more than pretty pictures, but signs that the player must learn to read. As players

interact with the world to ascertain possibilities for action, developing a *professional vision* for the

affordances of the world (Gee; in press; Goodwin, 1994; Jenkins & Squire, 2004). This

professional vision is shaped by the strategic significance of the world's signs; a *Viewtiful Joe*

player for example, learns to read the signs of the system in terms of his or her goals and needs in

the space (probably staying alive), pointing to the importance of *intentionality* in cognition and

understandings (c.f. Barab et al. 1999). Peculiarly, games forge what James Paul Gee (2003) has

called a projective identity, whereby the player adopts the perspectivity of the avatar, developing a

sort of empathy for the character on screen. Clinton shows how icons and representational bars

attune players' perceptions in the world to those of the avatar making precise the *character's*

perceptual state. Examining *Prince of Persia*, Clinton concludes,

> So the representational bar, due to the ways it moves, provides a visual, moment-to-
> moment update specifying the perceptual state of the character.…..videogames are using

symbols in the exact *opposite* ways that schools do. Instead of using symbols as a way of abstracting away from the sensory present, abstract symbols are used to create a concrete, sensory present.

Critically, symbols in games are embodied in actual representations and events, made real through action within the world. These semiotic ties, grounded in first hand experience function to create moments of emotional valence.

If learning in game play comes through cycles of *doing*, *seeing and being* then games are interesting sites for expanding Pragmatic theories of knowing and learning. Expanding a learning analysis over time, as in the case of a game like *Civilization III*, we can see mastering a game's semiotic system as *abductive* cycles of interpretation, reflection, and action. As players detect and adopt goals in the game space, they identify important causal variables, interpret and analyze game play, and devise strategies based on emergent understandings. These cycles of recursive play can produce *concepts-as-tools*, concepts that arise through action and is used for future action (Barab, Hay, Barnett, & Squire, 2001). For example, as students study historical maps to be better *Civilization* players it is possible to examine how such tools are or aren't taken up in future contexts (Squire & Gionavetto, in press). In one such interview, a long time *Civilization III* player using terms such as golden ages, cultural imperialism, and "culture flipping" (the process in *Civilization III* whereby a civilization's influence spreads thereby enveloping other civilizations into its fold). The interviewee explained how in *Civilization III* terms, the United States was going for a "cultural victory" whereby it hopes to achieve global domination by spreading its values of capitalism and republican democracy. How ideologies represented in other games (*Sim City, Grand Theft Auto: San Andreas, Deus Ex*) are taken up by players is also worth investigating.

Participating in Social Worlds. Games as artifacts and game play as an activity is thoroughly mediated by encompassing social structures, such as families, peer groups, affinity

groups, or classrooms (Crawford, 1982; Hakkarainen, 1999; Mitchell, 1985; Salen & Zimmerman, 2003; Squire, 2002; 2003).[8] Indeed, observe most children playing games, and you will likely see them talking about games, sharing strategies, downloading FAQs from the Internet, and participating in online forums (to speak nothing about the media – drawings and stories they create about games). Most gamers describe their play as a social experience, a way to connect with friends, and rare is the player who truly games "alone" in any meaningful sense (Kuo, 2004).

The most intense social learning probably occurs in massively multiplayer games, games where players can interact with thousands of other players in real time over the Internet. What makes these games unique is their *persistence*. Data on players' avatars persists across sessions, so that their online avatar becomes another identity that they inhabit, one that has what psychologist Sherry Turkle (1995) calls *pseudonymity*. Players are anonymous to other players, so they might "gender-bend" explore playing as a different gender, or play in an environment less defined by race or class. Critically, the state of the *world persists* across sessions, so that if my character on *Star Wars Galaxies*, a persistent world game owns a house, a land speeder, and a droid, those objects remain on the server next time I log in.

This persistence makes such persistent world games more like worlds, services, or digital nations than traditional games (Bartle, 2003). Steinkuehler (2004a) finds that games such as Lineage are neither private nor public, but as "third spaces," places where players socialize, explore develop new identities and boundary cross. As such, digital worlds make intriguing cultures to study, and a number of legal scholars, economists, and sociologists are studying using them as laboratories for gaining fundamental insights about their fields (Castronova, 2001; Ondrejka, 2004).

Online worlds are understudied learning laboratories. They offer intriguing spaces for studying how learning occurs in complex, distributed environments, how new identities form and evolve, how learning occurs over broad timescales, how new computational literacies develop, and how cultures can be designed to promote particular practices, understandings, and values. Perhaps most importantly, they are sites for studying learning within relatively discreet communities, whereby we examine not just how people learn material practices, but identities within communities.

The question of how people around the world, from ages 8 to 82 learn such complex practices, become literate within online worlds, develop (and negotiate) such identities, and coordinate such activity are the subjects of new lines of research. To be an expert player, means to not just know the difference between kiting and trolling, beta vets and n00bs, and twinking and nerfing, but to use them through participate in Discourses. "Being" a troll, elf, princess, droid maker, or architect, or speculator in an online world is a complex accomplishment, a task that demands learning new geographies, literacies, rule systems, and ways of expressing oneself (Steinkuehler, 2003; Squire & Steinkuehler, in press). As the real world value of in game currencies becomes more and more established, creating new "new economy" jobs around buying and selling characters, equipment selling, online currency speculation and, recently international sweatshops, the stakes for participation in these virtual worlds only increases.

Cognitive psychologist Constance Steinkuehler who studies the Lineage series, argues that MMO spaces, such as Lineage are Discourses, with expertise displayed through players' identities and ways of being within the gameworld, as much as simply knowledge of skills or facts. Despite the many "literacy" scares about games replacing text, Steinkuehler (2003; 2004b) finds that written language coordinates players activities, is used to enact identities, and apprentice others

into the community. Using discourse analysis, Steinkuehler (2004b) describes the core features of one practice: Joint participation in mutually valued practices, whereby an expert modeling expert behavior, guiding practice through focusing attention on important environmental features, and gradually entrusting control to the apprentice – all done within legitimate game play and with all information given just-in-time. As Steinkuehler emphasizes that players do not only train practices, but "socialize (players) into certain ways of being and understanding the virtual world, ways that are tied to particular value" (p.6-7). The instantiation of such "cutting edge" instructional theory in a site as socially maligned as massively multiplayer games is noteworthy in its ownright, but particularly interesting because in this case, Myrondonia was only 12 years old, mentoring someone 20 years her senior.

As educational researchers, it is noteworthy to examine the complexity of literacy practices naturally occurring outside of school (Black, 2004; Jenkins, in press; Leander & Loworn, 2004). Common game play practices – including mentoring, writing FAQs, participating in message boards, developing fictional backstories, and creating mathematical models of game systems. In his work with the fifth dimension, Michael Cole (Brown & Cole, 1992) uses the term *leading activities* to describe how cognitively complex practices in informal learning environments might serve as powerful experiences preparing students for future learning (a popular contemporary view of transfer, c.f. Bransford & Schwartz, 1999). As such, Steinkuehler argues, MMORPG games contain implict critiques of schooling, as players assume identities and participate in powerful modes of learning not available to them in most classrooms.

Indeed, MMOG designers and teachers share more in common than just the task of entertaining surly 14 year olds: Both are charged with the unenviable task of *designing cultures*, creating rule sets and participant structures designed to elicit particular kinds of behavior. One

particular strategy employed by both game designers and instructional designers is complex tasks requiring *differentiated roles*, which are tasks significantly complex to require multiple skill sets and different differentiated information in order to be solved. Such differentiation tends to produce joint collaborative practices and cultures where collaboration and mentoring are normed.

In their studies of *Star Wars Galaxies (SWG)* Squire and Steinkuehler (in press) describe how designers manipulate organizing activities, activities that serve as attractors for behavior and steer cultures in particular directions. Squire and Steinkuehler show how in the *SWG* communities organized around powerful participant structures, such as the "jedi attainment" system. In the first instantiation of *SWG*, players could become jedis by advancing through several professions by gaining all the skills central to that profession. The designers, building off of Richard Bartle's theory (1996) of player behaviors, wanted to use the Jedi system as a reward for those players who oriented toward the game primarily as *achievers*. However, becoming a Jedi was alluring to many, and becoming a Jedi was a powerful attractor of behavior. Soon, many players started playing the game as "achievers" hoping to become Jedi. Before long, players who wanted to become Jedi but did not want to go through the requisite skill trees started exploiting loopholes in the system. Cantinas, fields, and forests were full of players "holo-grinding," a term players developed to describe mindless (and at times automated) game play toward another goal. Wisely, the game designers quickly revamped the Jedi system so that it would promote a wider range of practices.

This study suggests at least three profitable lessons for educators. First, is the idea of *attractors* organizing behavior. As teachers know, learning environments are complex systems that can neither be over-designed nor left completely to emergence. Teachers need to design structures so that desired learning occurs while some sort of order is maintained. Reward structures, such as grades, teachers' attention, or social capital are all powerful organizers of activity. Game designers

intentionally provide multiple reward structures in order to appeal to diverse players,' promote collaboration, and create a rich social fabric. A second lesson is that social systems (i.e. learning environments) design is an ongoing process, and educators might benefit by using similar design processes, whereby the set up trajectories of experience, analyze students' progress, and redesign these pathways of experience as necessary. This suggests a third important lesson for educators, which is that if a goal is to design learning environments that appeal to a broad range of learners (i.e. leave no child behind) then educators might profit from examining what reward structures, trajectories of participation, and ways of developing identities as competent learners are available to students. Outside of school, in games such as *SWG*, students have opportunities to become architects, shopkeepers, designers, warriors, Jedi, financial traders, or dancers, and can make real world wages while playing a game. Will we provide students similarly diverse opportunities for experience in schools?

Games as Designed Contexts for Learning

        With the emergence of games as a entertainment medium and the increased recognition of games as complex problem solving spaces, no wonder educators at Stanford, Harvard, MIT and other top institutions of education. On the one hand, given that most every other medium has been used for learning it seems self-evident that games eventually will become a part of our educational system. On the other hand, games embody many values (anti-institutionalism, propensity for risk) which are at odds with those of formal schooling, and the history of educational media suggests that those media which do not fit with the values of the broader system will not be taken up (Beck & Wade, 2004; Cuban, 1986). Although drill and practice games and relatively simple simulation activities have long been used in formal learning environments, today's contemporary games, which frequently last 40+ hours in length, operate under different assumptions (See Table 1). An

emerging model of games suggests that they excel by providing learners situated experiences of activities, whereby they develop new ways of thinking, knowing, and being in worlds (Shaffer, Squire, Gee & Halverson, 2004; Squire, in press).

   Examining entertainment games used for learning. For a generation of students, their first experiences with world or ancient history does not come through school, or even television or the movies, but through video games. Games such as Age of Empires or *Civilization III* introduce students not just to historical names and dates, but ways of representing the world. In the case of Civilization, a game which represents broad sweeping changes of history (and includes expansion packs with historical scenarios, such as the fall of Rome). *Civilization III* models history as the result of interacting geographic processes, and ships with relatively accurate geographical maps. As such, *Civilization III* makes an intriguing resource for learning world history, as it provides a geographical - materialist model for how civilizations evolve over broad time scales. As players manage natural resources, they learn not only where oil, coal, or sugar cane is located, but how these resources affect the growth of civilizations. Ross Dunn (2000) has identified this approach to world history the "patterns of change" model, whereby world history is presented as patterns of human activity across broad timescales.

   Squire (2004) found that the open-ended nature of *Civilization III* allowed students to explore hypothetical histories, which provided marginalized students new trajectories of participation through world history curricula. Most students turned *Civilization III* into an historical simulation of European colonization and derived pleasure from comparing gameplay to history. Turning *Civilization III* into a colonial simulation affected the kinds of questions students asked, observations they made about their games, and the solutions they posited to problems.

Students mostly read their game events off of pre-existing notions of colonization or geography,

expanding and modifying their understandings of colonization in the process.

Students used these game experiences to think about why civilizations grow, flourish, and

fade, and how wars, revolutions, and civilizations' evolution are the products of interweaving

geographical, social, economic, and political forces. Many students who rejected traditional

school-based curricula as "heritage" or cultural myths of "western progress" found that

Civilization allowed them to "replay history" and learn history through geographical materialist

lenses rather than the ideology of western progress. In one discussion (reported in Squire & Barab,

2004), students report what it is they learned through playing *Civilization III*.

Tony:	Luxuries buys you money and money buys you everything. The right location gives you luxuries gives you income more income gives you technology which affects your politics. It all connects.
Kent:	Geography affects your diplomacy because it gets your more resources and affects how they treat you.
Tony:	Geography can affect the growth of your civilization.
Dwayne:	It affects your war.

As students interacted with the game (and discussed it in class) they began to understand

its ideological bias and at times, took it up as a framework for explaining world history.

Games as New Educational Media. If we take McLuhan's "the medium is the message"

seriously, then it is interesting to think about how representing ideas through games remediates

how we experience them, something that educational game programs must consider. As game-

based learning projects thrive, opportunities exist to rethink how the medium in which ideas are

represented shape those ideas. Holland, Jenkins, and Squire (2003) discuss four such prototypes

developed through the MIT/Microsoft Games-to-Teach Project (2003), a project which has

designed 15 conceptual game prototypes ranging from Hephaestus, a robot-engineering game

where the player collaborates with other players to terraform a planet. Holland et al describe their

design process as one of rethinking content areas to understand what it would mean to remediate phenomena, such as virology or robotics engineering through a game-like structure. Fundamentally, this exercise means taking traditional "content" and rethinking it as experience represented through challenges, goals, and practices. Such an approach might allow educators to get beyond the content fetish and provide guidance for thinking about education as the design of experiences.

These games function in ways very different from traditional "educational" games; whereas traditional educational games use context as a motivational wrapper for the game experience, these games literally put players *inside* of game systems. As in *Replicate*, where the player is a virus trying to infect a host, thereby learning how the body responds to infectious diseases, players given agency within systems, drawing on games' natural ability to help players develop empathy within complex systems (Gee, 2004). Expanding upon Rieber's (1996) distinction between endogenous and exogenous games, we can contrast those games where the context is the irrelevant to game play, and those where the context *is* the game play (See Table 1). Perhaps not coincidentally, this shift parallels a similar shift in educational psychology from one where context is a variable to be stripped away to one where cognition is distributed across people, tools, and social contexts. As such, games share much in common with the "new paradigm" of instructional approaches where students learn through doing (Reigeluth, 1999).

As an example of what a game-based pedagogy might look like, consider Supercharged!, a physics game developed at MIT to help students learn basic concepts in elestrostatics (Jenkins, Squire, & Tan, 2004). Electrostatics, an area foundational in physics, is particularly difficult for students to grasp because although students may use electricity or even play around with magnets, they have no *direct experience* of charged particles interacting or moving through magnetic fields.

One particularly central but non-intuitive idea is that of forces acting at a distance, the way that opposite charges attract, or like charges repel one another. Coulomb's Law $F = k \, q \, Q \, / \, r^{2,}$, where the force equals the product of the force multiplying two charges, times the constant k, divided by the square of the distance. This relatively simple formula is the basis for much of electrostatics, and can be used to describe a wide range of electrostatics phenomena. Not surprisingly, physics educators have usually introduced Coulomb's law early in physics in hopes that students will gain robust foundations for understanding physics, but as many researchers observe, students frequently do not develop deep conceptual understandings of physics phenomena (Chi, Feltovich, & Glaser, 1991; diSessa, 2000; Forbus, 1997).

In contrast, studies of physicists in labs show that in order to understand physics phenomena, they frequently put themselves *into* problem spaces to understand them. Elinor Ochs and colleagues (1996) write "… scientists express their subjective involvement … by taking the perspective of (and empathizing with) some object being analyzed and by involving themselves in graphic (re)enactment of physical events." Given that one of the affordances of games is the way that they put players into systems, interesting opportunities exist for designing educational media that literally put players into physics problems. Researchers at MIT designed *Supercharged*, an electrostatics simulation game with precisely this idea in mind (Holland, Jenkins & Squire, 2003; Jenkins, Squire & Tan, 2004). In *Supercharged* players enter a spaceship and lead a group of classmates through classic physics thought experiments where they are electric charges flying through electric and magnetic fields. Building on diSessa's notion of intuitive physics, the game is designed to confront players' understandings of physics phenomena and help them develop more robust intuitions of electrostatic physics. Figure 1, for example, shows a level designed to build players' intuitions around electrostatic forces and distance; players, attempting to go straight

through the level and toward the goal frequently hypothesize that the forces generated from each

charge will negate one another or create a "balance" of forces. In reality, because the strength of

the force diminishes over distance by an exponential rate, the player quickly moves toward the

closer charge. As players confront a variety of levels designed to elucidate this mathematical

principle, they begin to intuit how electrostatic forces interact.

In a study of Supercharged in a middle school classroom, Barnett and colleagues (2004)

found that students who participated in a unit based on playing Supercharged out performed

students in learning physics through hands-on experiments, demonstrations, and viewing

simulations. In a post interview, one student described how he learned the meaning of field lines (a

scientific visualization technique) in the game. "The electric goes from the positive charge to the

negative charge like this [drawing a curved live from a positive charge to a negative charge]. I

know this because this is what it looked like in the game…". The most dramatic results, in fact,

came from students who were unsuccessful in school, suggesting that game-based formats may

make complex science thinking accessible to a broader range of students.

Conclusions

Although digital games have largely been ignored by educational researchers, they are a

powerful new medium with potentially dramatic implications for schooling. They contain

ideologies that many argue are affecting the assumptions students about learning students bring to

school (Gee, 2003; Beck & Wade, 2004). Games have the dramatic potential to put players in

complex systems, allowing them to learn the points of view of those systems (like representations

of History) and develop identities within those systems. Studies of Civilization players adopting

geographic materialist lenses or Supercharged players empathizing with physical systems are but first steps in coming to understand the pedagogical potential of this medium.

Just as traditional apprenticeships were fruitful sites for studying learning in the 1980s (c.f. Lave & Wenger, 1991), games are important sites of with much to teach us about learning in a digital age. Games epitomize a potentially destabilizing wave of technologies that enable students to access information and remain tied into social networks any time, anywhere. As our 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? When students can be the leader of a civilization in a world history simulation (*Civilization III*) or a trader earning thousands of real world dollars in virtual economies and international prestige through online societies (such as *Everquest*), how will they react to the identities made available at school?

Games can and do contain powerful ideas and ideologies. Fundamental to the medium is a primacy on experience, which allows students to develop situated understandings, learn through failure, and develop identities as expert problem solvers in a domain where crucially, the develop identities aligned with those practices (Beck & Wade, 2004). Perhaps most importantly, games and gaming communities are available any time, any where, and make a range of identities available to students. 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. Whereas school cultures ask students to inhabit a relatively limited and very particular set of identities, particularly recipients of ideas and agendas prescribed for them, games expect players to be active participants in co-constructing their worlds with designers. Games and their associated technologies may not

render schools obsolete, but it is no longer tenable for educational researchers to completely ignore the kind of learning that occurs through games and digital worlds.

Not surprisingly, it is advertisers, the military, and religious groups who are capitalizing on this medium the quickest. Already games and gaming technologies are used by the military for training and propaganda (Li, 2004). Radical groups in the United States and abroad also have begun using games to promote their ideologies. As private and for profit educational institutions also examine educational games as ways of increasing profits, the public sector, particularly those who cannot afford such technologies, risk falling even further behind. Unfortunately, schools could be the last place that this powerful technology penetrates.

Table 1: Contrasting game types.

Game	Exogenous	Endogenous
Learner*	Empty receptacle	Active, sense-making, social organism
Learning is	Memorizing	Doing, experimenting, discovering
Knowledge	Discreet facts, "true" by authority	Tools for use, socially legitimized
Social Model	"Claustrophobic". Players are alone, with no resources or help	Gaming is fundamentally social, designed to be played collectively, in affinity groups, and distributed across multiple media.
Pre-knowledge	Is reduced to facts, knowledge, skill. To be assessed for proper pacing	Leveraged, played upon. Expected to color perception, ideas, and strategies
Identity	?	Recruited, managed, built over time
Instruction	Transmission	Making meaning / construction, discovery, social negotiation process
Context	Motivational Wrapper	The "content" of the experience

Figure 1: Screenshot from Supercharged. The player's position is represtented by the camera

position. The black whole is the goal and the numbers indicate the distance to the goal. The blue

stars indicate negative electric charges; the lines are field lines showing the force of the charge.
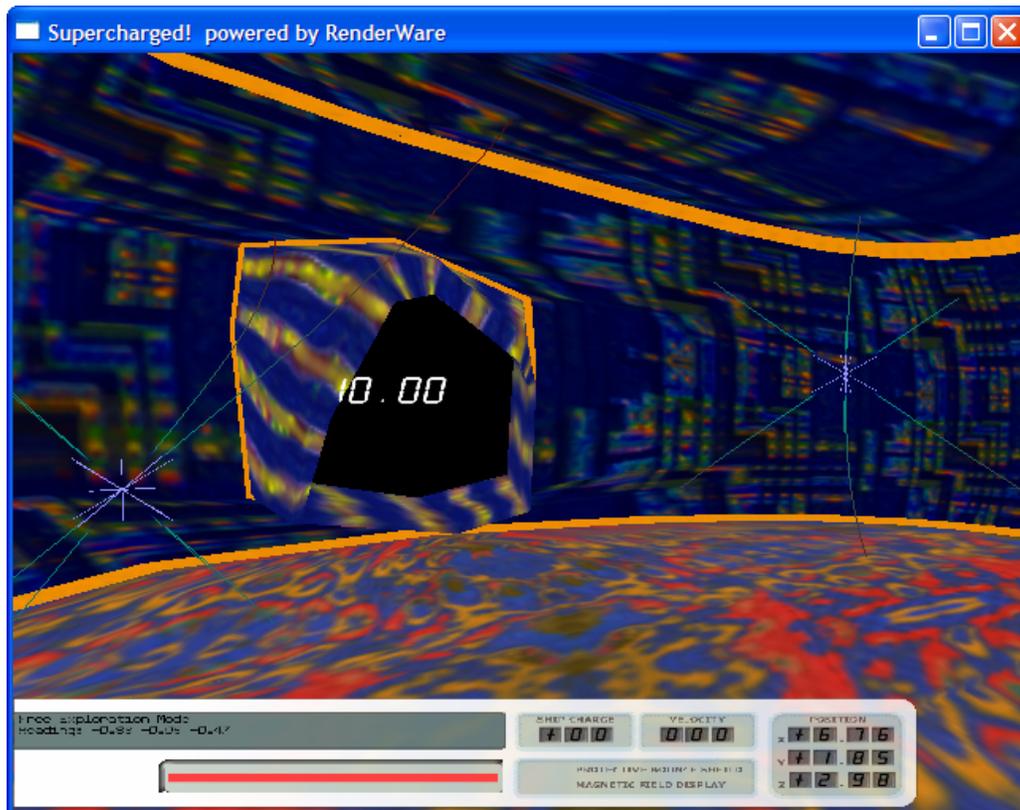
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