Sociocultural Contexts of Game-Based Learning

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In order to understand how games and simulations can support informal science learning, it's crucial to appreciate the specific social, cultural, infrastructural, and economic contexts that structure gaming and software-centered play in homes, gaming communities, and everyday peer play. Kurt Squire's whitepaper has outlined the range of different game, simulation, and program designs that characterize efforts to support scientific learning outside of the classroom. In this response paper, I add to Squire's approach by drawing attention to the broader social, cultural, technical, and economic contexts that drive gaming practice outside of school. My argument is that gaming practice outside of school is structured by commercial media, kids' peer cultures, and family dynamics, and any effort to insert scientific learning in this space must be highly responsive to these existing settings and associated genres of practice. Although evidence of how science learning is supported in recreational, voluntary, and familial gaming contexts is limited, research is beginning to identify opportunity areas that deserve to be investigated further.

After presenting a framework for understanding contexts for informal game-based learning, I present some areas of practice that have shown promise for scientific learning more specifically, also describing unique challenges in working in the informal space. I conclude by suggesting some areas for future research and intervention.

Contexts for Recreational and Social Gaming

Although schools have begun to adopt games and simulations, clearly informal and out-of-school settings overwhelmingly dominant kids' gaming experiences. It is worth underscoring this obvious point that gaming is primarily a sociable and recreational activity, but also that the contexts that we consider "informal" are incredibly diverse. While it is important to understand the distinctions between informal and formal learning environments (which Squire's paper effectively covers), it is equally important to understand the diversity of contexts that structure the informal space. In fact, the differences *between* different informal contexts are at least as significant as those the differences that distinguish the formal and informal from one another.

Social and recreational gaming is structured primarily by four sociocultural contexts that are present in varying degrees in any kind of gaming practice. This typology is informed by the Digital Youth Project, a recently completed ethnographic study of youth new media practice (Ito, et al. 2009).

Everyday peer cultures of game play. The dominant context that structures game practice is everyday social play among "given" local peers and siblings. Recent

studies document that gaming is practically ubiquitous among US children and teens, and is associated more with social integration than isolation (Ito and Bittanti 2009; Kahne, et al. 2009; Kutner and Olson 2008). In other words, gaming has become a key part of what we identified as casual "hanging out" and "killing time" gaming practices. These more casual and social forms of gaming are increasingly crossing gender and age lines (Ito and Bittanti 2009).

Intentional gaming groups and communities. For kids who are more heavily invested in gaming as an area of interest, more focused "intentional" gaming groups, both online and local, become an important context. These kids are a minority, are most commonly boys, and distinguish themselves for more casual and recreational gamers, often self-identifying as gamers or geeks. Locally, kids might frequent cybercafés or set up LAN parties. The online space provides for a newly expanded set of gaming experiences that extend kids' social network specifically around a gaming interest. It is in these more "geeked out" gaming practices that we seen highly focused kinds of interest-driven learning and creative production such as machinima and mods, and the production of game sites, reviews, walkthroughs, and cheats (Ito and Bittanti 2009).

Family and home life. The home and the family is the context that provisions gaming resources for most kids (consoles, titles, space, etc.), and in many families, siblings and increasingly, parents, are gaming companions. At the same time, parents and siblings compete for access to home entertainment resources in the home, and most parents will have various rules and limits in place surrounding game play. While we have seen potential for gaming to become a shared focus for productive learning in the family context, it is also an arena fraught with tension as gaming is generally considered (by both parents and kids) an activity in opposition to academic learning (Buckingham 2007; Horst 2009; Ito and Bittanti 2009; Stevens, et al. 2007).

Commercial and public media culture. The context of the commercial gaming industry is also an important factor in considering social and recreational gaming, and one that is often overlooked in more educationally-minded efforts. Any intervention in the social and recreational space will have to compete with commercial production and marketing for kids' attentions. History has demonstrated the challenges of inserting learning software and educational agendas into practices already saturated with commercial media culture (Buckingham 2007; Buckingham and Scanlon 2002; Giacquinta, et al. 1993; Ito 2009; Seiter 2005). While independent, educational, and civic games have been a marginal but persistent feature of the commercial games landscape, we have yet to witness the emergence of a robust alternative market for public interest games that are comparable to public media in television or radio.

These existing contexts of social and recreational gaming powerfully determine the potential and promise of alternative and new forms of gaming practice. Just as the classroom culture and educational accountabilities structure gaming in formal educational environments, the informal space is also saturated with structuring institutions, but of a more varied nature.

Opportunities and Challenges

In order to understand the opportunity space for informal science learning through games, educators and game designers must first come to grips with the fact that existing social and recreational gaming contexts operate largely in opposition to academic cultural domains and practice, including science. At the same time, the high degree of technical expertise and systemic thinking required of contemporary digital practices, as well as opportunities for peer-based learning and collaboration in online networks, create new openings for scientific learning. In particular, we have found that the contemporary social and recreational media environment is ripe for opportunities for self-directed, customized, and interest-driven learning, that in some instances mesh with science-oriented learning (Ito, et al. 2009). Here I describe some evidence that we do have of genres of activity and learning that have the potential to support informal scientific learning through gaming. These are domains of practice that are already established in kids' social and recreational worlds, and where science-oriented games-based learning could potentially make further inroads.

Networked Peer Publics

For those kids who are involved in "geeked out" gaming practices such as MMOs, LAN parties, and game modding, gaming can become a powerful vehicle for self-directed, interest driven learning that results in collateral learning related to technology, engineering, and knowledge seeking and exchange. As Squire notes in his review of studies in this space, online groups mobilizing through games like World of Warcraft, I Love Bees, or Whyville have demonstrated the possibilities of new forms of collaborative problem solving and collective action which exhibit properties of scientific inquiry. Even among local, more casual forms of gaming, kids develop capacities for social exchange that center on esoteric and specialized knowledge domains, and where gaming knowledge becomes a source of social capital. These dynamics have been documented with younger kids playing games like Pokemon and Yugioh in local peer groups (Buckingham and Sefton-Green 2004; Ito 2007; Sefton-Green 2004; Willett 2004). While kids develop some capacity for knowledge networking through local peer groups, the online environment facilitates access to more sophisticated and specialized forms of knowledge and inquiry. As the networked gaming demographic becomes younger because of games like Club Penguin, Poptropolis, Neopets, and Runescape, we can expect these kinds of dispositions towards networked knowledge to become more pervasive.

Gaming represents a domain of interest-driven learning that has low barriers to initial entry, and where kids can move along a trajectory of casual social gaming ("hanging out"), to exploration and knowledge seeking ("messing around") to more intensive forms of knowledge exchange and production ("geeking out"). We found many instances in our case studies where gaming became an entry point for a wider range of technical and interest-driven practices such as hardware hacking, video production, design, and coding (Ito, et al. 2009). At the same time, a few cautionary notes are in order. Although these kinds of peer based learning contexts exhibit

properties of scientific inquiry and technology and media-based literacy, it is rare to find recreational gaming groups that are focused on explicitly scientific content. Whyville is one exception to this and demonstrates that a voluntary, social gaming environment that focuses on science can succeed in the informal space. At the same time, it is important to recognize that the popularity of a space like Whyville is dwarfed by games such as Pokemon, Runescape, Neopets, or Club Penguin, that have very little in the way of explicit scientific content. Secondly, the more geeked out dimensions of gaming communities continue to be dominated by boys, even as the casual gaming demographic expands to include more women and girls (Kafai, et al. 2008). Games like Pokemon (Ito 2008), Neopets, and Whyville (Kafai Forthcoming) do demonstrate that girls can be captivated by these kinds of gaming activities, but there is a still a resilient cultural bias that works against girls assuming a game geek identity.

Enrichment Activities

Shifting focus from the more purely social and recreational contexts of gaming to contexts that are more adult guided, certain forms of gaming have historically enjoyed a privileged status as an "enrichment" activity. Chess, Scrabble, and Go are examples of games that are generally adult sanctioned, are culturally validated as learning games, and can be tied to more structured kinds of clubs and competitions. The online world is breathing new life into these longstanding brain game genres. In the eighties, we saw the emergence of a genre of electronic learning games, under the rubric of "edutainment," that were largely marketed to adults as enrichment activities for kids. Games such as Civilization or those under the Sims and Lucas Learning labels were developed that were more entertainment-oriented, but had a stamp of approval from parents and educators and often crossed over to the school and enrichment space (Ito 2009). Squire's whitepaper introduces us to a new generation of learning games that exploit more of the potential of networked and social gaming. These kinds of games have the potential to become a focus for intergenerational gaming that has a more explicit learning agenda, that can be linked to more structured learning settings, and is not dominated by the commercial gaming industry and the logic of existing kids' peer cultures. Here there is more potential to insert explicitly scientific content, as well as supporting the development of capacities for knowledge seeking, inquiry, and exchange.

The genre of adult-guided enrichment activity does pose unique challenges, however. While younger children are more open to adult guidance in the media they consume, as they enter their late elementary and teen years, kids become more resistant to adults dictating their media choices. This is why the edutainment market is largely targeted towards early childhood, and why games with an explicit learning agenda find a hard time sustaining interest in the home context for older kids. Further, unlike the recreational and mainstream console gaming space, these enrichment-oriented games suffer from certain class associations, and are culturally marked as more highbrow media forms. This means that any interventions within this genre of game play needs to be attentive to issues of class distinction,

accessibility, and status issues in kids' peer cultures. Research on media access has demonstrated that while game consoles and entertainment titles are pervasive in even lower income homes, PCs and learning software are not widespread (Buckingham and Scanlon 2002; Giacquinta, et al. 1993; Roberts and Foehr 2008), nor are they associated with positive social capital within kids' peer networks. Studies of homes and family dynamics have demonstrated that parental cultivation of enrichment activities and the insertion of learning agendas into kids play is associated with more interventionist middle class parenting styles (Lareau 2003; Seiter 2007). With the addition of geeky and scientific content, the potential for alienating certain populations of kids increases dramatically, as we see with the cultural stereotypes associated with playing chess and other "brainy" games. In the case of the privatized contexts of the home, these kinds of socioeconomic and cultural distinctions are in full force, because the contexts do not benefit from the same equalizing effects that we see in public educational contexts. As Squire describes in the cases of Kafai's Whyville work, his own work with Civilization, or the work of the Fifth Dimension project, afterschool spaces and computer clubs can function as mediating contexts in broadening access to these enrichment oriented genres of gaming.

Public Culture

Squire ends his whitepaper with an appeal to mobilize games in order to support the development of a scientifically literate populace. He cites the example of the educational film, Mr. Sun, which saw popular uptake in both homes and schools. Like other forms of popular media like television, film, radio, newspapers, and magazines, games have the potential to function as public media that can enrich our scientific literacy. Public television, documentaries, science magazines and features are well-established genres for this science education in public media culture. Games such SimEarth,, the Dr. Brain series, Planetary Taxi, the Magic School Bus series, DinoPark Tycoon, and the Incredible Machine opened up this genre in the eighties and nineties. Squire reviews a wave of new science-based games that update this genre of popular science gaming for the current networked games ecology. Games can clearly be a compelling vehicle for representing scientific knowledge and generating interest.

The challenge with popular science gaming is that the science learning can be very elusive and diffuse without a social context that supports deeper inquiry and engagement. We lack evidence that games in the genre of popular science lead to scientific interests, literacy, or dispositions in the absence of a social or educational context that fosters deeper engagement. In my studies in the late nineties of play with games such as The Magic School Bus Explores the Human Body, DinoPark Tycoon, or The Island of Dr. Brain, I found that kids rarely oriented to the scientific content of the game without the explicit intervention of an educationally-minded adult. One their own, these games become absorbed into the dynamics of kids' play culture, and kids were more focused on "beating" the game and playing with the special effects then engagement with the scientific content domain (Ito 2009). The

popular science genre functioned more as a way of legitimizing the game for the adult provisioners rather than as a focus of interest for kids. Unlike more traditional analog media, games are highly responsive to player intentionality and context, and kids can easily circumvent engagement with "content" when playing with an entertaining simulation or multimedia adventure.

A related challenge is in navigating the boundary between the genre of more school-based content and entertainment content. While many of the early edutainment games were designed for a consumer market, in today's online ecology, it is very difficult for a game in an educational genre to be successfully marketed to home-based players. Some successful commercial games, such as Spore, Portal, or puzzle games incorporate mathematical thinking or scientific referents, but are light on scientific content. More content-heavy games such as River City or WolfQuest were developed with public sector funding support, and are not designed or marketed as consumer entertainment titles. In order for games to be successful in home-based and recreational space, they need to acquire legitimacy and status within kids' peer cultures of play, and explicit scientific content is a difficult sell, particularly for older kids. While it may be possible for these public sector games to break in to more mainstream consumer awareness, like other forms of public media, it is an ongoing challenge to orchestrate a genre crossover.

Next Steps

The current state of science gaming in informal environments, and our state of knowledge about this area suggests a few areas that are ripe for future inquiry. On the research side, we need effective methodologies and frameworks for documenting and assessing learning in social and recreational gaming contexts. Most of the research on learning outcomes is derived from assessment methods designed for formal educational contexts where context is assumed to be relatively controlled, and outcomes are measured on an individual basis. In informal environments such as the home or most afterschool contexts, players can exercise much more choice, both in the selection of the game as well as in determining the mode of play. In other words, the surrounding "social envelope" (Giacquinta, et al. 1993), genre, and purpose of the activity is powerfully determining of learning outcomes, outcomes that are highly diverse and often unpredictable. It is not simply that educators must recognize that kids will experience different outcomes from participation. Some kids may orient towards scientific content, others towards knowledge networking, and others toward hacking and tinkering, all with the same gaming title. In fact, it is the ability to specialize and develop individualized and interest-driven trajectories that is one of the most important features of the informal learning space. Evaluating learning in these kinds of contexts needs to rely less on standardized measures of skill and knowledge and more on an assessment of the properties of particular contexts to support diverse and specialized knowledge seeking, exchange, and interest-driven learning.

Research also needs to look at the comparative benefits of environments such as specific home-based gaming configurations, afterschool programs, and online

gaming groups to support learning trajectories towards scientific interests and identities. Further, it is crucial that we develop ways of tracing learning as it happens across these different contexts and in relation to school-based learning. Engagement with science games or media titles in purely recreational or social-peer based contexts are unlikely to be tied to durable scientific knowledge or dispositions without links to and from more academic learning contexts. Rather than simply evaluate the effect of particular environments, software, or programs on learning, we need to evaluate whether that learning builds synergistic ways with other institutional frames and social contexts, or whether those boundaries are characterized by tension and opacity.

On I related note, I would suggest that on the design and program development side, success hinges on new kinds of educational and public media partnerships that can bridge some of the boundaries between formal and informal learning spaces, the public and private sector, and educational and entertainment genres of media. While educators and technology developers tend to focus on the design of technology and programs, in order to bridge existing social practices and cultural genres, we need to spend much more energy intervening on the broader sociocultural and political economic conditions that condition how technologies are marketed, distributed, and taken up by diverse players. For example, it is as critical to spend resources on supporting gaming communities, parent outreach, and afterschool centers as it is to fund new technology development. Infusing scientific learning into kids play and social life, and conversely, mobilizing kids passions for interest-driven learning for science, both require new kinds of institutional and economic alliances, bringing parents, commercial industries, and community organizations more effectively into the agenda of science education.

References

Buckingham, David
2007 Beyond Technology: Children's Learning in the Age of Digital Culture. Malden, MA: Polity Press.

Buckingham, David, and Margaret Scanlon
2002 Education, Entertainment and Learning in the Home. London: Open University Press.

Buckingham, David, and Julian Sefton-Green
2004 Structure, Agency, and Pedagogy in Children's Media Culture. *In* Pikachu's Global Adventure: The Rise and Fall of Pokémon. J. Tobin, ed. Pp. 12-33. Durham: Duke University Press.

Giacquinta, Joesph B., Jo Anne Bauer, and Jane E. Levin
1993 Beyond Technology's Promise: An Examination of Children's Educational Computing in the Home. Cambridge, U.K.: Cambridge University Press.

Horst, Heather
2009 Families. *In* Hanging Out, Messing Around, and Geeking Out: Kids Living and Learning with New Media. The John D. and Catherine T.

MacArthur Foundation Series on Digital Media and Learning. Cambridge, MA: MIT Press.

Ito, Mizuko

2007 Technologies of the Childhood Imagination: Yu-Gi-Oh:,, Media Mixes, and Everyday Cultural Production. *In* Structures of Participation in Digital Culture. J. Karaganis, ed. Pp. 88-111. New York: SSRC.

—

2008 Gender Dynamics of the Japanese Media Mix. *In* Beyond Barbie and Mortal Kombat: New Perspectives on Gender and Gaming. Y.B. Kafai, C. Heeter, J. Denner, and J.Y. Sun, eds. Cambridge, MA: MIT Press.

—

2009 Engineering Play: A Cultural History of Children's Software. Cambridge, MA: MIT Press.

Ito, Mizuko, et al.

2009 Hanging Out, Messing Around, and Geeking Out: Kids Living and Learning with New Media. Cambridge, MA: MIT Press.

Ito, Mizuko, and Matteo Bittanti

2009 Gaming. *In* Hanging Out, Messing Around, and Geeking Out: Kids Living and Learning with New Media. Cambridge, MA: MIT Press.

Kafai, Yasmin B.

Forthcoming The World of Whyville: An Introduction to Tween Virtual Life. Games and Culture.

Kafai, Yasmin B., et al., eds.

2008 Beyond Barbie and Mortal Kombat: New Perspectives on Gender adn Gaming. Cambridge, MA: MIT Press.

Kahne, Joseph, Elaine Middaugh, and Chris Evans

2009 The Civic Potential of Video Games. Cambridge, MA: MIT Press.

Kutner, Lawrence, and Cheryl Olson

2008 Grand Theft Childhood: The Surprising Truth About Violent Video Games and What Parents Can Do. New York: Simon and Schuster.

Lareau, Annette

2003 Unequal Childhoods; Class, Race, and Family Life. Berkeley, CA: University of California Press.

Roberts, Donald F., and Ulla G. Foehr

2008 Trends in Media Use. The Future of Children 18(1):11-37.

Sefton-Green, Julian

2004 Initiation Rites: A Small Boy in a Poké-World. *In* Pikachu's Global Adventures: The Rise and Falll of Pokémon. J. Tobin, ed. Pp. 141-164. Durham: Duke University Press.

Seiter, Ellen

2005 The Internet Playground: Children's Access, Entertainment, and Mis-Education. New York: Peter Lang.

—

2007 Practicing at Home: Computers, Pianos, and Cultural Capital. *In* Digital Youth, Innovation, and the Unexpected. T. McPherson, ed. Pp. 27-52. The John

D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, MA: MIT Press.

Stevens, Reed, Tom Satwicz, and Laurie McCarthy
2007 In-Game, In-Room, In-World: Reconnecting Video Game Play to the Rest of Kids' Lives. *In* The Ecology of Games: Connecting Youth, Games, and Learning. K. Salen, ed. Pp. 41-66. John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge, MA: MIT Press.

Willett, Rebekah
2004 The Multiple Identities of Pokémon Fans. *In* Pikachu's Global Adventure: The Rise and Fall of Pokémon. J. Tobin, ed. Pp. 226-240. Durham: Duke University Press.