

Artists with the Medium

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Definitions:

Massively Multiplayer Online Game: An online game consisting of thousands of players logged on to a server in real time within a persistent environment.

Civilization: A historical simulation gaming series developed by Sid Meier.

Modding: A gaming practice whereby players change the game's artwork or underlying rule structure to create a new gaming experience

Embedded Assessments: Assessment devices and mechanisms included within the game experience players and educators to make inferences about learning.

World of Warcraft: A massively multiplayer online game in which players play as members of one of two factions, leveling up their characters and engaging in a variety of forms of battle.

Bite-Sized Gaming: Games that are designed to be played in relatively short periods of time, particularly on handheld devices.

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ARTISTS IN THE MEDIUM

Abstract: This chapter discusses emerging trends in games and learning. It argues for an approach that examines games as a new medium. With the increased attention being given to games, critiques about the instructional efficacy of games will emerge, and that educators must truly take advantage of the unique capacities of the medium, as well as keep in mind the new forms of learning supported by games. It continues to outline key trends, such as emerging game genres, new forms of productive play, and embedded game assessments. By targeting what kinds of design advances occur in contemporary entertainment games, perhaps games can be designed that will become integrated into educational systems.

"Artists in various fields are always the first to discover how to enable one medium or to release the power of another." -- Marshall McLuhan

Video games are "hot" in education. After decades of more or less being ignored by educators (other than to cast their derision upon them), video games are being taken seriously as a medium for learning.

Hopefully, the reader has found convincing reasons for this attention within the pages of this volume. For me, the reason to attend to games is as simple as the McLuhan quote which opened this article: If we look across the last 30 years of technology in education, we see that games have consistently paved the way for innovations, whether it was the relatively simple arcade and computer games of the 70s and 80s that inspired drill and practice and adventure games (and one could also argue innovations such as goal-based scenarios), or the networked multiplayer games of the early 90s that suggested work on knowledge building communities, or today's games that meld interactive fiction, real-time simulation, user creation with tools, and robust persistent worlds that educators are trying to leverage for learning.

Fundamentally, video games are the entertainment medium of the computer. They are one of the only form of digital content that people consistently pay for. They envelop digital toys (*The Sims*), virtual life (*Nintendogs*, *Neopets*), virtual communities (*Habbo Hotel*), and simulated worlds (*Second Life*). Most of these are not games in any classic sense, but the games industry (development and publishing) have subsumed these products so that they are treated with the interpretive frame of "games". As of this writing, this trend shows no signs of abating. Indeed, looking at a list of currently popular game software, we see interactive music titles (*Guitar Hero*), test prep software (*My Word Coach*), in addition to massively multiplayer games like *World of Warcraft*. For these reasons, I believe that educators ignore current developments in games at their own peril.

So what does the future of educational games hold? Anyone following the industry closely can spot this question as a land mine. For example, while announcing the PlayStation 2 at the 2000 Game Developer's Conference, Sony's Phil Harrison proudly announced how "games on little disks" were going to be a thing of the past as early as this decade (cited at Gamasutra, 2000). Games were predicted to be more and more like "interactive movies," and anyone who would have bet on *Brain Age*, *Wii Sports*, or *Nintendogs* as "killer apps" would have been seen as crazy. Five years ago, everyone thought that *Star Wars Galaxies* or *The Sims* were going to break MMOs wide open. When these titles flopped, people had just about to leave the genre for dead, before *World of Warcraft* shook up the PC industry, the ripples of which are still being felt across the industry.

With these caveats in mind, I will start with first a warning -- a few potential challenges that the field faces before it can reach stability. Next, I turn to trends already evident in today's industry -- with an eye toward what they mean for education.

THE IMPENDING BACKLASH TOWARD GAMES

I believe that within the next 12-18 months there will be a backlash of sorts against games. Some of the criticism is certainly welcome. Much of the field (particularly the field of "serious games") has organized as an industry, rather than academic field, and as such is geared toward generating business opportunities and profits rather than meaningful learning. Meaningful learning certainly *can* occur from such situations; it is only to say that primary activities surrounding "Serious

Gaming” has been to promote business. Healthy criticism as to whether there are solid learning principles behind these designs, whether they embody good instructional design practices, and perhaps most importantly, what the ideologies are underlying these materials -- whose interests are being served by them -- is critical. So a first backlash may be that critics will look at the field, and wonder where there is any meaningful learning going on within games, and those operating within this commercial space will need answers better than “but commercial game developers worked on them!” for the field to survive. Indeed, an unfortunate side effect of the (mostly deserved) attention to game designers may be a fetishizing of their skills and devaluing of more traditional instructional design and learning sciences skills within certain circles.

From an academic perspective, we might anticipate a second criticism -- that game scholars need to generate more careful and empirically backed claims about games and learning. Some will argue that government and industry is spending millions on a medium that has not been “proven” to work. Already, we can see some signs of this emerging critique. Critics such as Clark (2007) have perhaps rightly questioned the pedagogical underpinning of many so called **serious games**, while also calling for more controlled studies of games.

This critique is useful, in the capacity to investigate questions that could yield such claims now exists; five years ago, a student wanting to do a dissertation on the learning mechanisms in a massively multiplayer game would have had a hard time finding a committee member understood the phrase. Now, with academic conferences such as GLS, initiatives such as MacArthur’s Digital Media and Learning, and the Department of Education’s recent call for an Instructional Technology Center focused on games, such a topic is squarely within the mainstream field. As particular features of the medium become outlined (see Gee, 2003; Davidson, 2005; Squire, 2006; in press for examples), we can begin thinking about designing environments based on the effective learning principles of games. And, as a result of these supporting institutional mechanisms (particularly funding for development, graduate student research and so on), the field is ready to create such designs to begin testing them more rigorously.

A third criticism which could arise stems from academic turf wars -- and that is that scholars are not asking the right questions, using the proper underlying theoretical framework, or the right kinds of methods that are considered “real” research. Given the national rhetoric around this issue, which is based upon somewhat bizarre notions of “science” as a particular methodology used in the medical / pharmaceutical industry, we might expect this type of criticism to filter down. If such a discourse were aloud to develop, it would really be too bad, as one of the strengths of the field thus far is the diverse range of scholars and people drawn to it, and the interchanges and exchanges across research projects.

For example, the way that Salen and Zimmerman’s (2003) basic work on play, Jenkins’ (2006) work on transmedia storytelling, Gee’s (2003) work on learning and game principles, and Steinkuehler’s (2006) work on apprenticeship has been leveraged by Barab and colleagues (in press) in designing **Quest Atlantis** suggests how different research traditions can become the

basis of a field. Granted, each of these research programs shares some common underlying assumptions, such as treating game play as a social practice embedded within cultural contexts. Yet, it is also critical that this kind of work is enriched by conferences, journals, and books that comfortably span basic research on games, historic / poetic analysis of games, phenomenological analyses of game play, ethnographic work on games, and design-based research. To cleave off any one strand of this work into its own academic discipline would rob it of its vitality.

Underlying the criticisms suggested by Clark (2007), one senses a core tension within educational technology as whether to look at games as a technology, an instructional strategy, or a medium for learning (or, in the spirit of McLuhan, all three simultaneously). Within educational technology, we frequently carve up the world in terms of technologies (such as VR vs. web-based learning), seeking to identify the core attributes of technologies (such as synchronous vs. asynchronous communication) (Jonassen, 1996) and then understanding how they intersect with particular instructional strategies (such as online problem-based learning). Hopefully, the rapid rate at which games evolve, incorporate new technologies and features (such as online play), reshape themselves in response to one another, and then lead to entirely new modes of interaction reveals the trappings in dwelling too long on defining formal features, as any formal analysis would be outdated before it went to press. A defining way I, and many other scholars have approached the field of games, learning, and society is to treat gaming as a social practice, meaning that it occurs at the intersection of people's goals, technological affordances, and social and cultural contexts.

Another (unfortunate) potential critique might stem from comparing the learning outcomes from game-based environments with more traditional ones, without asking what *new* kinds of learning games make possible. This view asks how media reshapes how and what we want to learn, as much as simply can it meet traditional goals more effectively. The sheer existence of games such as *Civilization* or *World of Warcraft* dramatically alters what it means to study history or economics if you are a 14 year old building historical mods or writing programs downloaded by 10,000s of people. Borrowing from comparative media and literacy studies, there is a strand within contemporary work to seek how digital technologies such as games are literally changing what we value as educators, much as the proliferation of print led to decreased emphasis on memorization, and increased emphasis on coherent linear arguments (Ong, 1982).

As such, a final emerging critique is that game-based learning scholars need to be "agnostic" in their study of games. This argument might be made two ways. One way is to suggest that we should have a critical distancing toward games as an instructional method, in case we find out that other means work better. However, if we treat games as a medium, the critique looks different; can one imagine having a critical distancing toward books? Underlying this view, I argue is a belief that we might close our eyes and games will go away go away, or that if we find that games do not produce meaningful learning within the next 18 months, we might forever abandon them. A more pragmatic stance would argue that interactive, immersive, networked, simulation experiences seem destined to exist in some way, shape or form for years to come. A

job for educational technologists is to understand how they work and to research the impact that they have on learning.

However, there is certainly value in understanding what is gained and lost with different generations of media. The transition toward a more visual culture has had sweeping implications for politics for example, and as games proliferate, we would be wise to attend to what these changes are for politics, education, and so on. Ong and McLuhan both were ambivalent toward the cultural changes accompanying the rise of visual broadcast media and deep reservations about the loss of print culture. Similarly, we might identify some things lost in the transition toward digital cultures. For example, gaming and new media privilege an orientation toward examining situations as systems, and then identifying leverage points for achieving one's own ends (and then manipulating social networks to obtain those ends). One can imagine an increased cynicism developing, or at least a further erosion of the sense of a common good, something supported by broadcast media. Indeed, as a generation of scholars raised with such media rises through the ranks of the academy, it may be critical for those old enough to remember a time without games or the Internet to remind the field of this historical context.

FUTURE TRENDS IN EDUCATIONAL GAMING

Having identified some potential pitfalls, let us turn toward perhaps more energizing themes that are emerging within the field.

A Proliferation of Educational Game Genres

One productive way out of the conundrum of whether or not games “work” and so on, is to refine the level of analysis to describe particular types of games designed to meet specific goals within specific contexts, something that I think of in terms of game genres. Educational genres might be thought of as families, or approaches to games that share common goals, assumptions, underlying learning theory, and strategies to solving problems (see also Aldrich, 2003, who called for educational genres). David Shaffer's (2007) *epistemic games* for secondary learning are one good example of a genre of game, as are Sasha Barab's *Quest Atlantis* (games to achieve social commitment). Elsewhere, I have argued for targeted games, open-ended sandbox games in history, and professional role playing games in science as similar models (Squire, in press). Treating such games as genres may (much as with problem-based learning) enable researchers and developers to come together around a common set of concerns, terms, and research findings and to move forward both tangible designs and theoretical commitments (cf. Barab & Squire, 2004).

Such an approach also may allow for developing specialized engines, technical platforms, and assessment tools that are reusable across games. For example, in the examples outlined above, we might imagine professional role playing games requiring the ability to render realistic environments in 3D with at least a classroom full of users (technologies that exist). We can also outline some challenges to such a game; for example, conversations with Non Player Characters

(NPCs) are still primitive at best. Further, NPCs respond poorly (at best) to our actions, if they are aware of them at all. To realize the potential of this genre, these are but two areas that would need to be improved. Defining genres thusly would enable developers to create targeted solutions such as conversational systems.

This would imply some common platform infrastructure / tools. A major challenge facing the industry has been coming up with common technology platforms. Platforms such as ActiveWorlds have successfully been used for multiplayer game scenarios such as *Quest Atlantis* and *River City*, although they have severely limited these projects' ability to capitalize on various aspects of the medium. For example, ActiveWorlds can easily support movement in 3D space, and limited agent-based modeling, but complex interactions with the world and other characters, something core to creating simulation or interactivity are difficult. Government, industry, or military support in a toolset to support a particular genre, such as professional role playing games might help solve the problem of projects recreating technologies over and over again, and allow custom tools and solutions to be traded among them.

As we see such genres forming, however one challenge will probably be to outline the *limits* of where they work; as Reigeluth (1999) commented in his *Instructional Design Theories and Models Volume II*, educators (researchers in particular) seem better at outlining the potential of an approach than defining its boundaries or limitations. Ask most any person pursuing Computer Supported Collaborative Learning, Problem-Based Learning, or Professional Role Playing Games when they work less well, and you usually get a very garbled answer. Part of this is because each pedagogical approach is somewhat defined by its theoretical goals and commitments; Scardamalia and Bereiter (1994) for example, outline very clearly that the goal of their work is to create knowledge building communities, as it is a core need and function of the knowledge economy. Gee's (forthcoming) work with game designer focuses on the need for innovative problem solving in technologically mediated environments, and as such, emphasizes design. However, for the field to advance, and to aid educators and policy makers in making the kinds of decisions they need to, we may need mechanisms for deciding and choosing among these various approaches.

One way to move forward could be more strategic collaborations across groups, although such collaborations are difficult given the reality of academics. One could imagine implementing an *epistemic game* and a professional role playing game back-to-back within a classroom, or alternating classrooms (or doing any sort of a number of things), and exploring the results. However, the current structure of academics disincentives this type of research. My own approach has been to work in multiple settings with multiple groups (such as open-ended sandbox games for history learning, and place-based augmented reality games for science literacy) in order to keep from being too invested in one approach, and keeping each of my own team honest on the limitations of our work. This approach is quite time intensive, however.

New *Input Devices*

As educational gaming genres proliferate, I believe another trend will be *advances in input design that create a proliferation of games that look less and less like what we call games today*. In part, advances in input design create new ways of interacting with a computer/ console, as we have seen most notably with the Wii, but also with *Karaoke Revolution*, *Donkey Konga*, *Samba de Amigo*, *Guitar Hero*, *Rock Band*, and the Nintendo DS. Indeed, if one examines the current best seller list as of this writing, it is dominated by games that exploit a new input device to create new and interesting forms of interaction with the computer.

Indeed, the runaway success of *Wii Sports*, *Brain Age*, or *Guitar Hero* each of which has avoided the pitfall of “bigger games with more polygon counts” should encourage educational designers that a successful game can be built around an innovative game experience, rather than simply fancier graphics. *Wii Sports* with its many modes shows how relatively simple game ideas can be reshaped into new game experiences. *Brain Age* takes very simple drill-and-practice activities and makes them fun by providing us an overarching compelling fantasy arc to the activity (getting younger), employing assessments devices intelligently, and using basic **input devices** such as the microphone and stylus in new ways.

Of the many ways that future games might innovate, one worth spotlighting here is the role that haptic devices might play in giving players instantaneous feedback on fine motor skills. In addition to the more obvious uses of these (such as surgery), one might imagine haptic devices unlocking more of the creative capacity of the medium, as the player uses the haptic device to carve an object out of wood, or steer a ship in a more immersive fashion. These are simple, unformed ideas, but they suggest how new devices could radically alter the kinds of games available. Already, with the success of games such as *Trauma Center* on the DS, we see proto models of such game play. For this reason, educational technologists might keep an eye on games as a site of innovation, functioning as a “free research and development lab” for innovation.

Mobile Gaming Platforms

Not only input devices, but *new mobile gaming platforms themselves are changing our gaming practices* which should have a dramatic impact on education. Already, we see how smart phones are reconfiguring our relationship to information and social networks, and perhaps putting pressure back on schools. Stories about kids taking pictures of tests on their phones, emailing them, and looking up answers over lunch are just the beginning. With google in the pocket of every iPhone or gPhone user, it seems self-evident that schools will (someday) need to rethink the contemporary social organization of schools.

With today’s technology -- most of which students will have in their pockets whether schools purchase them or not -- students will be able to access not just information sources such as google, but their social networks. If they do not know an answer to something, they can do what any smart person does -- ask someone. Already, studies of students working with instant messenger describe a new form of social interaction, something called persistent social presence

whereby people fluent with messenger technologies maintain loose co-present ties with their entire buddy list, at all times, whether through a desktop computer or cellphone (see Little, Eisenstadt, & Denham, 2007). In a case study of supporting games literacy through playing *Sid Meier's Pirates!* (Squire, 2005a), I was surprised to find that middle school students touring Firaxis' game production facility were most impressed by the fact that knowledge workers used IM programs regularly as a part of their routine practice, whereas teachers were generally unaware that such programs existed. This data point is but one example of the disconnect between schools and contemporary technologies, which are only certain to intensify as tools such as the iPhone become more widely adopted.

Such mobile devices open up intriguing new opportunities for games and game-based learning. To some extent the success of "Edutainment" games on the Nintendo DS already speaks to the attractiveness of portable games for learning played anytime, anywhere on a personal computing device. There seems to be something pleasurable about having a personalized tutor, set of lessons, or learning environment (which could be networked) carried in one's purse or pocket. Consider how *Brain Age* offers a "tutor or mental workout in a pocket", or the way that *Nintendogs* offers "a pet in your pocket", or *Animal Crossing* enables a "an entire village, connected to other villages, creating essentially a massively multiplayer game" in your pocket. These games show how creative design innovation can replace high-end graphic quality and enable good games, making this an interesting arena for research.

Within my own work, I've collaborated with Eric Klopfer (2007) in designing mobile games that seek to take advantage of the core affordances of handhelds. Rather than port old games to smaller computers, we have sought to leverage the portability, social interactivity, context sensitivity, connectivity, and individuality of these machines to support new kinds of gaming experiences. This work has resulted in a variety of games across each of our labs which seek to exploit these various affordances.

One type of pedagogy that this technology makes possible are place-based games for learning (Squire et al., 2007). This approach seeks to explore how technologies enable designers to layer a virtual layer of data over the real world, and then create educational experiences that are inextricably linked to place (see Grunewald, 2003). These games allow learners to "see" the history of a neighborhood, solve virtual science mysteries, or explore the consequences of redesigning a local park. There are limitations of this approach in that students have to be permitted to go outside to play (something surprisingly difficult to do in many American schools). Other games, played any time, anywhere may open other kinds of new game experiences.

New Forms of Multiplayer Gaming

The runaway success of *World of Warcraft* has turned many educators' attention to the power of **massively multiplayer online (MMO) games** for learning. Such games enable many forms of learning, perhaps most powerfully, joint collaboration among novices and experts with unique

expertise, allowing for distributed knowledge sharing and production (Steinkuehler, 2005). As a result, one frequently hears calls for massively multiplayer style games to teach particular skills.

Certainly, MMO style games are worth exploring, and interventions such as *River City or Quest Atlantis* already suggest how design features such as differentiated roles might be leveraged for learning. To use MMOs as a model for learning, however, requires that we take seriously the features that make them so engaging for players and potentially powerful for learning. Most of these features, such as the availability of a persistent world, the ability to customize an avatar to express an individual identity, the ability to use a variety of skills to influence and act upon a world, the ability to form ad hoc social groups with their own values, and perhaps most importantly, the ability to engage in direct head-to-head competition are not present in many of these worlds. The kinds of identity transformation described by Steinkuehler (2004), whereby players spend years developing an identity as a leader of a guild, and then change career paths are simply not available in most educational interventions of this type (nor should they be, necessarily).

A future trend, I believe will be a variety of games that use the particular design affordances of MMOs, without necessarily committing \$10,000,000s to creating and maintaining large scale worlds that support tens of thousands of players interacting in real time. The Nintendo Miis are an excellent example of a low tech design that enables players to create and customize avatars, which can have performance data linked to them and linked to other games. This kind of persistent character data across experiences is very similar to how avatars work in *World of Warcraft*, but they are achieved in a much simpler, and cheaper way. (For the ultimate example of this, see Justin Hall's passively multiplayer games, pmog.org).

As an example of this kind of innovation (and another example of why games are an interesting thing to “keep an eye on” for educational technologists), consider the *PlayStation Home*. The *PlayStation Home* is a community-based service where players create an avatar and “home apartment,” which they can outfit with objects, or display their achievements. Sometimes called a “*Second Life* killer” the idea is that *Home* will enable players to create a persistent avatar / identity that functionally accomplishes many of the things that a *Second Life* or *World of Warcraft* avatar does in, but through linking players' performances in many games to a central persistent avatar. Within this “metaworld” players will be able to chat, meet friends, build and display an identity, and create and manipulate objects. One could imagine building similar systems for school based around this model.

Creative Production Within Game Worlds

To date, many games for learning have focused on the medium's capacity to simulate or immerse players in highly graphical worlds. The *productive* capacity of the medium evident in *simulation* games where players build civilizations, cities, or railroad networks, in *design games* where players build towns (*The Sims*) or skate parks (*Tony Hawk Underground*), or *interactive world* games where players conduct a variety of creative acts within an interactive world (*Black &*

White) have been less commonly exploited. This element of educational games may be missing for a variety of reasons, ranging from the recent emergence of consoles, which are constrained by hard drive space and / or input devices, to the standardization demands of school, which privileges learning processes and products that more or less look the same.

Design games are one genre that leverages the design and simulation capacity of the computer in compelling ways and seems to have potential for learning. Certainly, there are signs of this in terms of the work I and others have done with *Civilization* or *Sim City*, or Steinkuehler's work, which suggests the potential of **modding** for supporting academic learning. More work with such titles (particularly if /when *Spore* is released) seems like a productive path for investigation.

A second path is to design games that are specifically built around design as a form of game play. Some little-known games such as *Pontifex: Bridge Builder* or *Mind Rover*, both illustrate this potential well. Within our local augmented reality games, we have sought to integrate design into game play, as players redesign a local park or waterfront. Shaffer's (2007) **epistemic games** also often involve a degree of design, such as in redesign a local shopping district. These design games leverage the simulation capacity in particularly interesting ways, enabling participants to see the consequences of their actions on a system.

One reason for pursuing this route is that games can foster productive identities with technology (Gee, 2007). Gamelab's **GameStar Mechanic** takes this form of game play to another level, exploring the potential to make "a game about game design". The explicit goal behind this project is to leverage the kinds of interesting intellectual practices that go into game design (thinking about systems, designing experiences), and to develop a sort of design expertise in players. Researchers are currently investigating how it prepares players to think about other situations as "design" problems. This sort of design project, where gaming tools are tools to create games about phenomena seems like a particularly fruitful area for exploration.

Games That Span the Real and Virtual

There is an emerging connection between design games and games that span the real world and the computer. Whereas we commonly think of games as entirely contained within the computer, a variety of games (ironically perhaps in the educational space) suggest suggest the potential for games that span across real and play objects. *Mind Rover* is an excellent example of a game where players *design* programming routines on the computer (through an iterative series of game levels), and then are able to deploy these scripts on robots. *Mind Rover* is but one example, but one can imagine other games built on a similar model. For example, virtual gardening games could come with starter plants (which have been used in biology classes), enabling players to use the virtual game as a prototyping environment for their "real world" plantings. As more and more ordinary objects in our environment have processing and communication capabilities, one can imagine a variety of other games that are played in a hybrid real-fantasy environment.

Reversing this set-up, games such as *Building Homes of Their Own* or *Shark Runners* tie the real-world with games by integrating real-time data into the game system. In *Building Homes of Their Own*, players design and build homes with a design simulator which culls data from online catalogs, meaning that players can determine the real cost of their homes. Similarly, Discovery Channel's *Shark Runners* enables players to track sharks in real time over the Internet, and players attempt to earn money and build a crew throughout their voyages. One can easily imagine a much broader range of games where participants bring the real world into the game, perhaps enabling designers to use the *gamers* as the prototyping environment to investigate strategies.

A third type of connection between the virtual games that connect to 3D printing services, enabling players to create items virtually in 3D and then “print” them out on 3D object printers. Services such as Fablectory allow participants to design objects in 3D on their Nintendo Wii or in Second Life, and then print them and send them to end users for a fee. The potential of educational applications of such an application are not even scratched, but one can imagine this technology having immediate uses in science, art, or architecture, for example.

Bite- Sized Gaming

With all of their complexity and polish, it is easy (and perhaps good) to be swept away by the potential of large-scale, high production polish games for learning. Indeed, to date we still have yet to see educational games with a fraction of the development budget, tools, or techniques of commercial entertainment games. Hopefully, this area will be explored in upcoming years. However, another emerging trend is bite-sized gaming, gaming experiences that are smaller (often built in Flash) and provide more discreet, targeted game experience.

Designers such as Ferry Halim (<http://www.ferryhalim.com/>) have shown how compelling games can be made in environments such as Flash and deployed over a web-browser. Admittedly, these games, due to their duration if nothing else, contain fewer of the design principles identified by Gee (2003) or Squire (2003). However, one can imagine stringing together such games within a world that is linked through a persistent avatar system (such as *PlayStation Home*), and put together a more seamless gaming experience that, if designed together well, could integrate many of these properties.

Such **bite-sized games** are interesting in that they could overcome many of the traditional obstacles of games in schools, including time and difficulty to play, diverse player interests, and technological problems deploying games in schools (Squire, 2005b). The ability to play games in a browser alone makes this an intriguing area for development, as browser based games are now playable on computers, consoles, and soon phones. The trick for designers will be how to create other curricular experiences that tie together these smaller doses of game play into a coherent, designed experience for meaningful learning (Squire, 2006).

Integrating **Assessments** Into Game Play (Embedded Assessments)

A final trend is integrating more assessments directly into game play. In his analysis of *Rise of Nations*, James Paul Gee (2007) describes several key features of how games provide feedback, including information to be used in the service of learning and future action and multiple modes of information and feedback. Gee emphasizes how in games such as *Rise of Nations*, these are forms of diagnostic feedback for players, feedback and **embedded assessment** mechanisms designed to improve learning and performance (formative feedback) rather than provide summative **assessments** of performance.

In our studies of **Civilization** communities (this volume, see also Squire & Giovanetto, in press), pouring over these data to learn about performance also becomes part of the play. Players enjoy using data to reconstruct events and develop theories about how the game system works, what strategies are effective, and to plan future action (see also Gee, 2007). This last idea, that **embedded assessments** exist in order to improve future performance is particularly endemic to games and should be of interest to educators. One can imagine this framework being exploited within formal learning environments, connecting exercises, activities and tests to future actions. This suggests one interesting challenge for educators: Because little time or energy is spent nurturing and cultivating students' interest in topics, so that most school-based activity is what Perkins (1992) calls *ritualized*. With most secondary schooling being preparation for more tests or further schooling, it's hard to imagine what future activities most students would be dissecting the results of their pre-algebra tests in order to prepare for, other than future tests.

A mature game-based curriculum might tie together multiple forms of game play so that one reason students analyze data about their performance in a scientific role playing game is to some day excel at an epistemic game, in a multi-user virtual world, or perhaps ideally, in some activity outside the walls of the classroom. Here the kind of work we have been exploring with place-based augmented reality games for learning. These games, played on mobile digital devices take place out in the community. Specific game features, such as seductive details about local history or scientific issues are designed to elicit further questions about the environment which can be the seeds for inquiry activities. In game characters are role models for forms of scientific and literacy activities and identities that players might aspire to (such as fiction writers, business developers, outdoor enthusiasts, or naturalists). Thus far, reaching these goals (getting students to ask questions and become more interested in key local issues) has been quite successful, as this pedagogical goal seems to work naturally in place-based games.

Multiplayer games where players collaborate in joint endeavors, such as **World of Warcraft** are particularly intriguing contexts for looking at assessment. As social games, they inherently reflect the social nature of assessments, and we see how communities use a variety of tools for gauging their own and others' performance. In **World of Warcraft** for example, damage and threat meters (which are mandatory in many guilds) enable players to monitor in real-time their relative performance, or how well they are doing in a group. It is intriguing to note how these tools were actually created by the community itself as a way to improve learning, performance, and hold one another accountable. Although they were not included with the original game, players

themselves filled this void by creating tools for assessments. The tools are used in a variety of ways -- including high stakes kinds of situations such as raids, or low stakes situations like informal groups. Because these tools are instantiated and used in collaborative, community contexts, they are interesting models to think through the potential of today's technologies and the challenges that will be faced when educators start to integrate similar tools into games. An issue surely to arise is how to balance the need for a "freedom to fail" in games, with the high stakes demands of schools, and in games such as *World of Warcraft*, we can see players already working through these issues.

It is not hard to imagine, for example, players having a variety of tools that monitor their in game performance in real time, as well as social tools that they could use to monitor one another, recognize excellent performance, and confer status within the community. Peer rating systems, reputation systems, and social networks are all tools commonly used across gaming and other digital contexts, but not yet in educational software in many ways. Imagine for example, that a group has just completed a mission where they investigate a murder mystery by a lake. Players might review their decisions to see where mistakenly interpreted data or followed an ineffectual conversational path. Afterwards, players might rate one another along any number dimensions, which would contribute to a profile that would affect their ability to find a group next time. These are just a few simple examples of design features *already* working in commercial entertainment games. A project now for educational technologists will be to integrate them into educational games.

CREATING COMPELLING MEDIA

It has always fascinated me that if one were to review the history of media and education, it seems that materials developed for commercial entertainment have most frequently had the largest impact. With film and television, series such as *NOVA*, *Donald Duck in Mathmagicland*, or the *Bell Labs Science* films were used for decades in classrooms. With computers, few applications have had the broad adoption that *Oregon Trail* has (with all of its flaws and so on). In fact, one could go through the history of games and see how educational interventions have mapped pretty closely to what is happening in the commercial / entertainment space, albeit a few years behind.

I have argued here that if you want to predict the future of education and games, the best route may be to look at what contemporary commercial entertainment games are doing right now. New genres of gaming appear to be emerging, with innovations in input mechanisms, forms of multiplayer play, game play that spans the virtual and the real, game play broken into smaller time frames, and integrated assessments all point positive future directions for gaming. Looking across the landscape of contemporary games, it is indeed quite surprising just how despite all of the attention payed to games for learning, how few of the contemporary developments in commercial entertainment games are being exploited. With *Sim City*, 3D real time graphics, realistic physics, networked game play, and even *MMOs* each being over 10 years old now, the lack of games for education that take advantage of any of these affordances is surprising.

Fortunately, many of the advances we see being made in contemporary games (such as new input mechanisms) appear to ease some of the production and distribution barriers games have traditionally had.

Although this chapter has argued for the importance of attending to what artists are doing with the medium, I do not want to suggest that instructional designers or learning scientists have no role in the future of the medium. As the first generation of “edu-gaming titles” emerge, if anything, it is clearer that designers with a background and training in learning and education are required to create compelling titles for learning. For the field to move forward and for truly compelling educational materials to emerge, interdisciplinary teams consisting of educators, content area specialists, and game designers -- each with at least a basic familiarity with the work of the others -- are required. As a new generation of students enters the field, many of whom are coming back to graduate school after working in the industry, or who are game designers by calling but who have an interest in learning enter the industry, hopefully these sorts of collaborations and cross-functional teams will become the norm, rather than the rarity and we can finally begin to explore the untapped potential of the medium.

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Example Indexing Template

Indexer Reference List for: Handbook of Research on Effective Electronic Gaming in Education

Editor: *Rick Ferdig*

Chapter Title: *Artists in the Medium*

Author: *Kurt Squire*

Term 1 –*Massively Multiplayer Online Game*

- **Also known as:** *MMO, Massively Multiplayer Online Role Playing Game, MMORPG, persistent world game*
- **Similar to:** *List other terms that your word is similar to, but NOT also known as. This is where you would list a generic term if your term is specific. For example, if your term is MS Excel, you would list “database” or “spreadsheet” here, so the indexer knows where to place it in the index.*
- **Associated in the manuscript with:** *World of Warcraft, Quest Atlantis*
- **Notable appearances of this term can be found on:**
 - Page 1: *example of gaming*
 - Page 8:
 - Page 12:

Term 2- World of Warcraft

- Also known as: *WoW*
- Similar to *massively multiplayer online game*
- Associated in the manuscript with: *massively multiplayer online game*
- Notable appearances of this term can be found on:
 - page 1: *example of modern game*
 - page 2: *impact on industry*
 - page 3: *educational implications of*
 - page 8: *learning principles behind*
 - page 12: *learning principles behind, assessment*

Term 3- Civilization

- Also known as: *Civ, Civ3*
- Similar to *n/a*
- Associated in the manuscript with: *modding, scenario design*
- Notable appearances of this term can be found on:
 - Page 3–*educational implications of*
 - Page 9 –*and modding*
 - Page 11 –*and assessment*

Term 4- epistemic game

- Also appears in text as:
- Associated in the manuscript with David Shaffer
- Notable appearances of this term can be found on:
 - Page 5: example of a gaming genre
 - Page 6- and collaborative research
 - Page 9- and design

Term 5- Game Star Mechanic

- Also known as: n/a
- Similar to n/a
- Associated in the manuscript with: modding, production
- Notable appearances of this term can be found on:
 - Page 9: and design

Term 6- Input Device

- Also known as: inputs, controllers
- Similar to input
- Associated in the manuscript with: haptic device
- Notable appearances of this term can be found on:
 - Page 6: and innovations

Term 7- River City

- Also known as: n/a
- Similar to Quest Atlantis,
- Associated in the manuscript with: Quest Atlantis, MMO
- Notable appearances of this term can be found on:
 - Page5: Multiplayer gaming
 - Page 8: and massively multiplayer online games

Term 8- Serious Games

- Also known as: educational games, games for learning, edutainment
- Similar to edutainment
- Associated in the manuscript with:
- Notable appearances of this term can be found on:
 - Page 2: problems facing
 - Page 2: and pedagogy

Term 9- Design games

- Also known as: production oriented games
- Similar to: n/a
- Associated in the manuscript with: Civilization, epistemic games

- Notable appearances of this term can be found on:
Page 9: learning principles behind

Term 10- Mobile Gaming Platforms

- Also known as: persistent gaming, alternate reality gaming, augmented reality gaming
- Similar to:
- Associated in the manuscript with:
- Notable appearances of this term can be found on:
Page 7: described
Page 7: implications of

Term 11- Modding

- Also known as: n/a
- Similar to: scenario design, game customization, game creation
- Associated in the manuscript with: Civilization
- Notable appearances of this term can be found on:
Page 9: type of gaming trend

Term 12- Bite-sized gaming

- Also known as: mini-games
- Similar to: Flash-based games
- Associated in the manuscript with:
- Notable appearances of this term can be found on:
Page 10: type of gaming trend

Term 12- Embedded Assessments

- Also known as: assessment, assessment mechanisms
- Similar to: measurement
- Associated in the manuscript with:
- Notable appearances of this term can be found on:
Page 11: type of gaming trend

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