Open-Ended Video Games: A Model for Developing Learning for the Interactive Age

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With *Grand Theft Education: Literacy in the Age of Video Games* gracing the cover of *Harper's* September 2006 magazine, video games and education, once the quirky interest of a few rogue educational technologists and literacy scholars, reached broader public awareness. The idea of combining video games and education is not new; twenty years ago, Ronald Reagan praised video games for their potential to train "a new generation of warriors." Meanwhile, Surgeon General C. Everett Koop declared video games among the top health risks facing Americans.[1] Video games, like any emerging medium, are disruptive, challenging existing social practices, while capturing our dreams and triggering our fears.

Today's gaming technologies, which allow for unprecedented player exploration and expression, suggest new models of what educational gaming can be.[2] As educational games leave the realm of abstraction and become a reality, the field needs to move beyond rhetoric and toward grounded examples not just of good educational games, but effective game-based learning environments that leverage the critical aspects of the medium as they apply to the needs of a twenty-first-century educational system. We need rigorous research into what players do with games (particularly those that don't claim explicit status as educational), and a better understanding of the thinking that is involved in playing them.[3] We need precise language for what we mean by "video games," and better understandings of how specific design features and patterns operate,[4] and compelling evidence of game-based learning environments. In short, the study of games and learning is ready to come of age. Researchers have convinced the academy that games are worthy of study, and that games hold potential for learning. The task now is to provide effective models of how they operate.[5]

This chapter offers a theoretical model for video game-based learning environments as *designed experiences*. To be more specific, it suggests that we can take one particular type of video game—open-ended simulation, or "sandbox" games—and use its capacity to recruit diverse interests, creative problem solving, and productive acts (e.g., creating artwork, game

mods, or using games as tools for modeling, i.e., for building digital models of phenomena, such as world civilizations). It ties together studies of gamers "in the wild," within school, and in afterschool programs designed specifically for learning. It concludes with an investigation of how we might use such games to develop players' *productive* literacies, their ability to use digital technologies to produce both meanings and tangible artifacts.[6]

Earlier research has shown how *targeted* games (i.e., games focused around particular concepts) might be used to create conceptual change.[7] With *Supercharged!*, for example, working with Physicists at MIT, a team of MIT researchers and I created a simulation game in which players "entered" a world of electromagnetism. Based on our studies of how physicists thought about electrostatic forces (and similar to more detailed studies by Eleanor Ochs and colleagues), we developed a game that modeled a key aspect of how experts think about physics, specifically how they adopt the perspective of charged particles in thinking through problems. The game allowed students to also "think like a particle" by traveling through mazelike spaces where they had to place charged particles strategically in order to propel themselves through the space (using real-time strategy-type mechanics). Our studies of students playing *Supercharged!* revealed that they developed more robust conceptual understandings of physics.[8]

More importantly, they developed a better understanding of *why* scientists use visualizations to describe forces. As one student commented, "before they were just lines in a book, but now I understand why that they are there . . . to help you see the forces."

Over the course of a year, we piloted the game in a variety of contexts, ranging from middle schools to high schools to MIT courses.[9] We found that the game was most successful for two types of students: MIT students who were struggling to understand the concepts behind the ideas they were learning in their textbooks (which were typically represented through physics formulas), and secondary school students who were struggling readers disaffiliated with school. High-achieving MIT students resisted the game somewhat, suggesting that it was a "crutch" of sorts for those who could not "hack" harder problems. Secondary school students generally responded favorably, and in our tests, on average, did better than those learning via traditional means (including experiments and visualizations). We saw the highest gains, however, with those students who were struggling readers, and who traditionally reacted negatively to the experiments (e.g., they saw experiments as a chance to goof off in class, and were usually off task).

The data from these studies suggested to us that *Supercharged!* was successful in helping students build more robust conceptual models of physics, but left few directions for players to go after playing the game. The game did little (outside the cut scene) to suggest to students how these concepts related to electricity or magnetic phenomena seen in the world around them. Similarly, the game did little to suggest what a successful player might do to extend this interest *beyond* the game, such as in science career. We felt that, although successful, at its core *Supercharged!* was still a targeted conceptual game, designed to teach students a very specific way of thinking about physics. It was less effective at reaching other domains (much like a puzzle game—such as *Bejeweled*—involves patterns, but doesn't necessarily push one to pursue a career in Mathematics). Of course, the game was designed to be aesthetically pleasing, to enthrall students with some of the interesting and nonintuitive aspects of physics, and generally to raise students' interest in physics, which—by all accounts—it did. Still, at its core, we saw the game as having relatively little potential for leading players not already interested in science into life trajectories in which they would become affiliated with science, without significant out-of-game curricular materials.

In addition to targeted games are professional role-playing games—games that situate learners in the roles of engineers, biologists, or forensic scientists in the process of solving complex scientific problems. These games offer an intriguing mix of sociocultural and constructivist learning theory. As a sociocultural learning theorist might want to see, they set up roles for players to inhabit, and all problem solving, game play, and argumentation take place within the service of those roles. Within commercial entertainment games, *Full Spectrum Warrior* is an excellent example of such a game, as players lead a squad of soldiers who behave according to army doctrine.[10] The nonplayer characters and narrators all speak to the player as if he or she is the character in the world, allowing the player to become initiated into the discourse of the military. For many educators, role-playing games—especially the more open-ended, simulation variety (such as games produced by Irrational, e.g., *SWAT4*, and Looking Glass Studios, e.g., the *Thief* series)—serve as excellent models for how we might build learning games.[11]

Epistemic games[12] are still another example of games that situate players in professional roles. Shaffer argues that, through closely studying the professions (urban planners, science journalists), we can create gamelike experiences that re-create the practicum. We can use games as a way to provide simulated field experiences, experiences that eliminate some of the less efficient, or exploitive elements of apprenticeships and focus, instead, on practices most central to the domain. Building on Schon's work[13] on reflective practitioners, Shaffer argues that we can develop generative ways of thinking through these games, ways of thinking that transfer into other domains.

Augmented reality role-playing games—such as *Pirates* (a game played on cell phones in which players seek to raid one another's ships by positioning themselves effectively in space)[14] and *MAD Countdown* (a game created by Steffen Walz and colleagues in which players try to locate a bomb hidden in London)—offer an additional spin on the professional role-playing games developed at MIT and the University of Wisconsin–Madison. Like epistemic games, these games seek to use digital gaming technologies to re-create field experiences for participants. However, these games are less concerned with re-creating the *epistemic frame* of the professional practice and more concerned with using gaming devices, mechanics, and modes of interaction to situate the learners in meaningful learning experiences that prepare them for participating in twenty-first-century society. Specifically, they seek to immerse players in complex problem-solving spaces in which they must think creatively and collaboratively with a suite of digital tools.

The MIT/Madison team (led by Eric Klopfer and me) has produced several iterations of alternate reality role-playing games, using them to teach high school earth sciences, undergraduate environmental engineering, undergraduate scientific writing, and various middle school topics. These games seek to place learners in roles in which they confront authentic challenges central to the domain, providing them access to authentic resources and tools that extend their cognition. All tools and resources are situated within game-play mechanics designed to produce collaboration that scaffolds and supports scientific thinking. In these games, for example, players might try to ascertain the cause of a mysterious death of a friend thought to be caused by environmental health problems, or try to solve a contemporary fictional urban planning dilemma by traveling back in time to interview residents of a neighborhood (see Squire et al.).[15]

These games employ several game-play mechanisms to support learning. One such mechanism is *differentiated roles*, which has kids playing different roles, all with differentiated access to information. While one student may play as a water chemist (gaining access to

the data, tools, and resources that a chemist might have), another might be a governmental official (with access to special documents and other data not available to the public). Another mechanism relies on the concept of *contested spaces*, the idea that games are (in part) spatial mediz, and good game contexts can be created by finding spaces that are under contestation (such as places that have experienced urban renewal).

One of the questions driving this line of research is: Can quasi-fictional contexts relating to one's physical place create the kind of engagement one finds in fictional games? In other words, could asking "What would be the health effects of a TCE spill on one's college campus?" create an emotionally compelling, educationally productive learning context? Emerging research suggests that these quasi-fictional contexts can be emotionally engaging.[16] Although these pilot tests are still relatively limited, lasting two to four hours in duration, evidence gathered in game play and shared in postinterviews suggests that players willingly adopt the roles of water chemists, environmental scientists, or investigators in game play. None of the players expressed any hesitancy in adopting fictional roles, or in entering the fictional context, and indeed reported that they enjoyed doing so. As one student commented, the learning experience was actually *more* authentic than school, as it allowed him to get a semirealistic view of the profession. Much like entertainment RPGs, players found the opportunity to enter roles where they participated in interactive narratives composed of sequences of problem-solving tasks fun and challenging. In particular, these games seemed to offer productive contexts for engaging students in scientific argumentation. Just as *World of Warcraft* players debate the merits of particular character builds and strategies as a part of their game play, players in our games debate problems of a scientific nature, arguing over the causes of problems introduced in the game, weighing theory and evidence, and judging the merits of counterarguments. These early studies suggest that such narratively driven games can engage kids in problem solving that overlaps with academic content in a productive manner. Of course, there are other factors involved (in particular, the fun of leaving the classroom or making cognitive connections between academic content and local place).

Open-Ended Simulation Games

The previous examples suggest the potential of targeted and role-playing game formats to support learning. We might also consider two other relatively unexplored genres: (1) massively multiplayer online (MMO)—or persistent world—games and (2) open-ended simulation games. Neither genre has been particularly explored for use in education, even though several educational projects—typically billed as multiuser virtual environments (MUVEs)—use some of the key features of MMOs. Virtual worlds, such as *River City*,[17] include fully 3D worlds with multiple avatars copresent, along with the ability to communicate via text-based chat. *Quest Atlantis*[18] uses similar technologies, although *Quest Atlantis* is designed explicitly as a *transmedia* property, using playing cards, novels, and various other digital and nondigital media to present the world. Further, *Quest Atlantis* attempts to tie in-game challenges to out-of-game experiences and—critically—is available 24/7 so that players can log on from anytime, anywhere, making it closer to a true "persistent" world than any other system discussed so far.

Rather than focus on MMOs, this chapter tackles the second category mentioned: open-ended simulation games (or sandbox games)—games that have open-ended worlds, through which there is no one single, correct pathway. Sandbox games are known for their status as contexts for creative player expression, with multiple solution paths (their quality is judged

according to their ability to deliver such an experience) as opposed to their ability to create a more-or-less common experience. As a rule of thumb, if a game has many spots where a player can say to another, "remember where you did *x*," then the game is a role-playing game, not a sandbox game. Many targeted games, such as abstract puzzle games with a high degree of emergence, also have this particular quality.

In this chapter, I will consider two games, *Civilization III* and *Grand Theft Auto: San Andreas* (hereafter called *GTA* when referring to a game in the series generically, and *GTA: SA* when referring to the *San Andreas* title specifically). Admittedly, these games are typically classified in different genres (perhaps the action/adventure and turn-based strategy categories). However, from a design-for-learning standpoint, they share several critical qualities. Both require over one hundred hours for anything close to "completion." Structurally, completion isn't an operative term in *Civilization*, as most players continue playing and replaying the game until they get bored. Similarly, one can finish a *GTA* game, but few actually do. And when they do, picking the game up to run races, orchestrate chase scenes, or generally muck about town are commonplace events.

Open-ended games typically place one in a role of sorts (such as the leader of a civilization). Despite this, the game is less about assuming a particular type of identity (say a SWAT team member, or a science journalist in an epistemic role-playing game), and more about inhabiting a world from a general perspective, which the player can play out in whatever manner suits his or her taste. In these games, learning resembles a process of coming to understand a system, experimenting with multiple ways of being within that system, and then using that system for creative expression, usually enacted within communities of other players. The game structure is less about reproducing a particular way of thinking and more about creating spaces for knowledge creation and discovery. This chapter seeks first to understand how open-ended games work, in order then to design learning spaces based on their qualities and characteristics.

Secondly, this chapter seeks to link research and theory on how open-ended games operate (taking the *Civilization* series and *GTA: SA* as its starting points) and then works to build theories of game-based learning environments on them. This is not, nor should it be, the only theory of game-based learning. In particular, I will argue for similar theories for targeted (or conceptual) games, role-playing games, and persistent world games (see table 1). Key variables differentiating these genres might include time to completion, replayability, and degrees of open-ended problem solving (i.e., is there one right solution or are there multiple acceptable solution paths?). Notice that this is not a traditional genre grouping in that it does not distinguish by content (science fiction vs. elves and orcs, for example).[19] This framework tries to sidestep many of the debates in game studies by acknowledging that there are substantial differences between and across game genres (as depicted in table 1), and that different theories may be required to explain how learning operates in each domain.

Several aspects of this framework are worth noting. First, it seeks to outline the typical *timescale* in which a player plays the game. Targeted games typically are played for one to eight hours, consuming a week or so of game time (with *Tetris* or *Bejeweled* being perhaps exceptions in that many players have spent hours upon hours with them). In contrast, a sandbox game such as *Civilization* operates more like a hobby (to borrow from Will Wright's excellent taxonomy), in that players invest hundreds of hours in them and come back to them over the years, playing them multiple times, using them as content creation tools or as spaces to revise continually.

As a result, this chapter argues that open-ended simulation games function as *possibility spaces* for their players to try on, inhabit, and ultimately develop new identities with

Table 1
Framework for examining different games

Game genre	Time to completion	Timescale	Open-endedness	Modes of creative expression	Educational examples
Targeted games (puzzles, minigames)	1–4 hours	Weeks	Low	Style of completion; level creation	*Supercharged*
Linear games (*Viewtiful Joe*, *Ninja Gaiden*)	20–40 hours	Month	Low	Style of completion, machinema	*Full Spectrum Warrior*; epistemic games
Open-ended, sandbox games	100–200 hours played over multiple months	2–24 months	High	Style of completion, multiple solution paths, modding	*Civ*, *Sim City*
Persistent worlds (*WoW*, *Everquest*)	500+ hours	6–48 months	High	Modding, social engineering, game play	*Quest Atlantis*

trajectories for participation that extend out of the game world and into new spaces. The games themselves are not stories, nor just abstract rule systems, but *worlds* built according to (implicit or explicit) values, visions, and ideas, which I call *ideological worlds*. Players develop knowledge through performances in them, the meanings of which are then reflected upon, negotiated, and given legitimacy through participation in *interpretive communities*. These interpretive communities range from the small and informal (like families and friends) to large and highly structured (like Apolyton University, which will be discussed later in this chapter). As learning contexts, these sandbox games function as design *possibility spaces* for people, spaces wherein they can develop along trajectories of experience into new ways of knowing, learning, and being in the world. Critically, they contain multiple trajectories of experiences, offering multiple trajectories into the space, multiple modes of interaction within the space, and multiple trajectories outward (see figure 1).

In order to understand more fully the details of this model, a general theory of learning for sandbox games must be put forth, which also suggests a model of instruction. That is a primary goal of this chapter, one I will meet by first examining the meanings that groups of game players make around one sandbox game (*GTA: SA*), specifically by investigating how players make meanings around depictions and race in the game. This analysis suggests how differences in play style, prior experience, and participation in interpretive communities function to legitimize and support interpretations of play, and how game experiences become models-to-think-within players' lives. Second, I will review early attempts to build a game-based learning program around *Civilization III* in school-based settings, emphasizing both how sandbox games can function as a model-to-think-with in academic domains and how these learning experiences are mediated by social norms (perhaps for the worst as school cultures intervene in learning). Third, I will describe a cognitive ethnography of Apolyton University, an online community of game players dedicated to furthering their knowledge
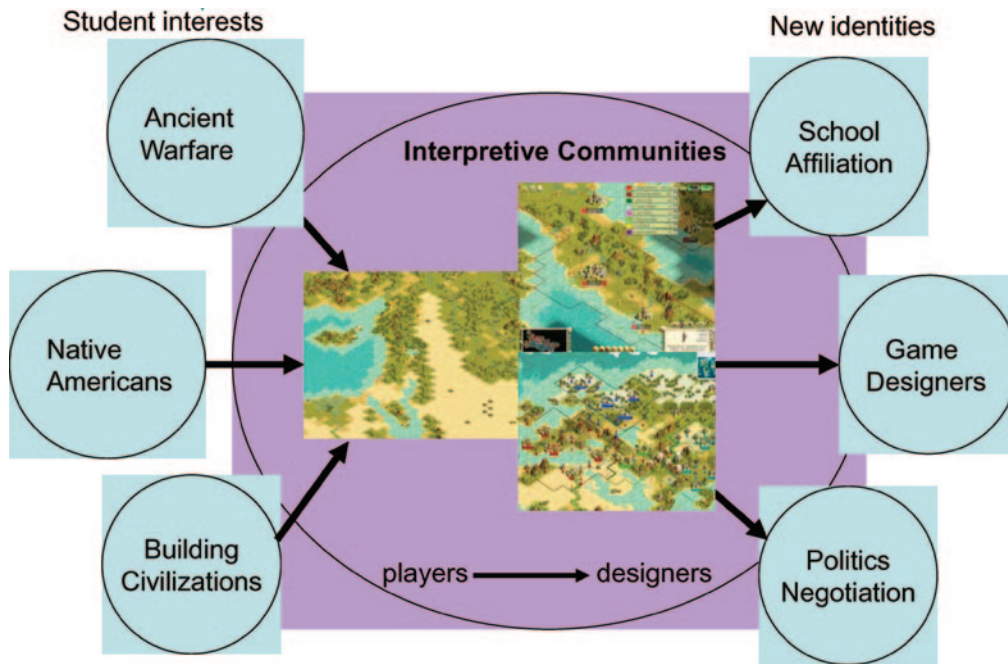
Figure 1

Depiction of students' movement into and through "Centers of expertise." The first phase involves the game activating an interest in players/students. The three interests included here are typical, although other common ones include caring for people, competitive gaming, and geography. We have adopted a model in which all students begin with the same initial scenarios, mapped to traditional academic standards (e.g., early civilizations), designed to appeal to broad interests. As players progress through our program, they encounter any number of games. (Students who enter the program "mid-semester" typically start by playing with friends or just joining whatever game is in progress.) Often, the game scenarios are designed by the students themselves, either to try out ahypothetical concepts ("What if I give the Scandinavians iron and horses?") or just to entertain their friends ("I thought Levi would like playing as the Russians in this one"). Interpretations of game events happen in situ, within the community, both during game play (e.g., "You don't want to give the Egyptians horses because of their war chariots") and afterward (e.g., "You should have never given up Europe to the Romans"). Because these interpretations are built on histories and ideas that have a "life" of their own (e.g., everyone in this program knows that Roman legionaries will dominate the middle part of the ancient scenario), this is referred to as an interpretive *community*. The process results in kids filtering out of the program with new identities, which include school affiliations and interest in advanced game design.

of *Civilization III*, emphasizing the underlying mechanisms that drive this community and suggesting particular models for how online communities might function in the future. Last, I will examine my current work designing afterschool programs for *Civilization*-playing students, seeking to tie together these themes into an integrated model of instruction appropriate for the digital age. Underlying this approach is an attempt to tie together studies of gamers and gaming culture, game design work modifying commercial computer games, and educational design research orchestrating social events around them.

Playing Race, Gender, and Class in *GTA: SA*

I want those diamonds. My people need the bling!

                                   —Honovi, a twelve-year-old African American youth describing his efforts to obtain gems while playing *Civilization*.[20]

After hearing Honovi describe his efforts to obtain diamonds for his people, I realized he and I were not playing the same game of *Civilization*. Whereas I saw such luxuries as tools for appeasing my people, Honovi's language reflected a vivid visualization of material wealth. Perhaps Honovi's interest in "bling" even reflected the role of jewelery in his African American community in communicating wealth and status. Either way, this exchange and others like it suggested important differences in the kinds of experiences that Honovi and I might find compelling in a video game. Our research team became interested in what games he played outside of school. As with most of the poor, African American kids with whom I have worked, *Civilization* is not something that they typically have at home (although many have *Age of Empires*). When asked what he played, Honovi enthusiastically responded, *GTA: SA*. We asked what Honovi liked about *GTA: SA* and his response surprised us. Honovi didn't mention the ability to steal cars or commit crimes, but rather the way he could design cars and race them throughout the streets (perhaps a power fantasy relating to his personal lifeworld). To find out just what kinds of game experiences Honovi enjoyed, and what kind of meanings he took away from them, particularly as they relate to controversies surrounding violent game play, we decided to interview Honovi and his friends about their game experiences with *GTA: SA*.

GTA: SA is the fifth game in the *GTA* series. The game is set in the 1990s, in three regions mapping roughly to Los Angeles, San Francisco, and Las Vegas. The player inhabits the character of Carl Johnson, a black man who is returning to *San Andreas* to attend his slain mother's funeral. The player is handed a bicycle, which he is told to ride home. After the first mission, however, the players are more-or-less free to do as they please (although most of the verbs available involve shooting or driving). To be sure, there is a particular version of LA depicted in *San Andreas*; the streets of *San Andreas* are violent places ripe with gang warfare. Certain actions—for instance, hitting a drug dealer—are rewarded with money, while others—such as having a conversation with him—are not. One is generally safe in his or her own territory—on home turf in the hood. But as the game progresses and one develops a reputation, other factions become violent toward the player. To survive in *GTA: SA*, players need to learn to read these elements and their interactions as part of the underlying rule systems that make up the game.

Whose Game Are We Playing? Open-Endedness and Multiple Modes of Game Play

Over the next year, Ben Devane and I[21] interviewed Honovi, several of his friends, and other groups of *GTA: SA* players about their experiences with the game. We were particularly interested in how they would respond to recent political controversies surrounding the game. In interviews with us, Honovi described his game play as extending his interests in hip-hop culture and automotive design—a practice he valued both socially (he had friends who had pimped-out cars) and economically (as a future profession). Honovi made extensive use of the car customization features in the game, and for Honovi, *GTA: SA* was a space where he could pursue an interest, develop expertise, and show off his skills to his friends. Honovi also made wide-ranging use of cheats, as they enabled him to pursue these interests without

the "artificial" limitations of the game design rules (i.e., you need complete missions to earn money to buy car parts). For Honovi, the game was as much a "car detailing simulation" as anything.

But when grouped with friends, Honovi's responses to our question differed. Honovi talked about the game as a space for performing impressive (often violent) feats, pulling off stunts, driving erratically, or "capping" people, which he did while playing with his friends. When surrounded by older males, Honovi's retelling of his game play was a performance of American urban masculinity. In the telling, Honovi showed relatively little interest in the missions or storyline, but rather seemed to use the game as a way of participating in a discourse of masculinity. Honovi and his friends enjoyed swapping tales of daring do, whether it be pulling off a difficult driving stunt or completing a difficult mission. When queried, Honovi and friends had little concern for questions about race or violence, and little interest in discussing it. Retelling game exploits within the company of friends and adults generated a discourse of adolescent male gaming performance.

For Honovi, the game was a sandbox, a set of representations and behaviors with which he could play and which he could use to express himself. Game play itself was a performance, one that arose in context, shaped—in part—by the other participants in the gaming experience (such as those who might be huddled around the television watching). When played alone, the iconography and experiences presented allowed Honovi to perform an identity of an automobile designer, an identity that affords status within his community and ties to identities to which he aspires. When played socially, the same iconography was leveraged to display other aspects of his identity. These experiences suggest that, for players, there is no *one* game that is played. Different game-play models and experiences are activated by play in different contexts. Similarly, discussions of game play are activated by different discourses. As researchers, parents, political leaders, and journalists attempt to study games, it is critical that we remember that games are not texts, but contexts that emerge from the intersection of representations in the game, players' goals, and the social contexts in which they are embedded. Significantly, *how* people talk about their game play depends on these variables as well.

Games as Competitive Spaces: The Differing Cultural Models of Games

To better understand how different groups of players make sense of their game play, we conducted a series of interviews with fourteen- to fifteen-year-old avid *GTA: SA* players (all of whom were white) from a working class neighborhood located a few miles away from where Honovi lives. Inspired by how Honovi played *GTA: SA*, our goal was to learn how different kids from different social groups thought about race, class, and violence in their game play. All of the players were serious fans of the series, with each having spent at least one hundred hours playing the game. Like Honovi, play of the game was used as an opportunity for performance and expertise; unlike Honovi, their performance privileged gaming skill, particularly as manifested through an ability to complete missions by driving and shooting with accuracy. They also valued encyclopedic knowledge of various locations, names, and features in *GTA: SA*. In short, this was a gaming culture of *expertise*.

We asked these gamers about their impressions of race and violence to see if they were any more concerned about violence than Honovi and his friends had been, looking to see if perhaps their particular backgrounds affected their read of the game space. When asked about the violence in the game, these players responded that they were a little concerned that

other "crazy kids" may play the game and become violent, although they were personally unaware of anyone who would be at risk. They were more concerned about racial depictions in the game, particularly around stereotypes. The following exchange typifies their discourse.

Gamer 1: Your main character just got out of jail, a black dude in LA joining back up with a gang. All the gang members the skinny guy and the fat guy smoking bowls and passing shit. It's so stereotypical.

Gamer 2: Dude all the other *GTAs* are stereotypical. They're about Italian Americans and stuff. I heard that *Vice City* had one line that was really controversial. Kill all the Haitians. He was being like "genocide." It wasn't bullshit that they threw in there. There was controversy between those two groups in New York. When I played *Vice City*, it was like being in the movie *Scarface*. Same movie, same city. They are all the same ones in *Scarface*. You pretty much live in the same house it's all down to the detail. When I played *SA*, the first movie I thought of was *Menace to Society*. All their names are all brought from those characters.

Here we see a relatively sophisticated discourse surrounding racial representations. They see and identify stereotypes in the game borrowed from media, and perhaps even enjoy finding them. They read the game off of previous films in a similar genre, and—in short—enjoy their role as sophisticated media consumers.

As the conversation continues, the players talk about the game, this time in regard to design issues, within the context of the game as a competitive space:

Gamer 3: They've taken the storyline, characters, the way they act and the surrounding area and made it into a game. They're trying to sell games. . . . Each gang person has, they have their own colors so that you can see a group of people. Like, if I run over there, I can kill those people but not another. Gangs are more represented by the colors than race.

Gamer 2: They do it more so it's obvious to the player. They're not sneaking things in.

For these players, interpretations of representations of race and violence were ultimately filtered through their understanding of the game *as a competitive space*. Gangs, colors, and ethnicities were largely "window dressing" (cf., Koster)[22] designed to facilitate game play. From a game design perspective, one might say that they saw racial representations serving as mechanisms providing clear feedback on the state of the system to players. Through these passages, we see how their interpretations of the game experience are rooted in the design of the game as a rule system, designed to provide feedback to players about their actions. We can also see how these meanings are interpreted and negotiated through social interaction, as the players' experiences are colored by participation in an interpretive community of gamers.

Identity, Experience, and Interpretation in Game Play

We interviewed a third group of high school gamers, all African American working poor, and all dedicated *GTA: SA* players. These players played in a variety of ways, unlocking missions, using cheats, and discussing specific points in the game. They were somewhat reluctant to talk with us, and would do so only after we demonstrated (through talk) that we had played hundreds of hours of *GTA* ourselves. There are many reasons this could be, but we believe that this may be because playing games, particularly *GTA: SA*, is usually looked down upon by adults and the politically contentious. As other games researchers have reported,[23] revealing

one's gaming experience seems like an important step in gaining trust with gamers around games that are socially marginalized. Race and class differences between us—as researchers and participants—only exacerbate these issues. Having knowledge of the game gave us a context for understanding comments, and allowed us to follow up with participants to probe areas, such as asking them if they got to the "model airplane" mission that occurs late in the game. Although these guidelines are typical for participant observers in qualitative research while doing ethnography, they may extend to interview-type studies with gamers.[24]

The third group of players expressed even less concern than the other groups about the game violence, and—in fact—were more concerned about the "real" violence in their neighborhoods. For them, *GTA* was "realistic" in mapping ethnic, economic and social segregation onto space, and they were happy to see a game speaking to their cultural landscape. In particular, these gamers enjoyed the references to hip-hop music and fashion. The gamers spoke favorably about the game's choices in radio stations, cars, and characters. As one player commented, "It's got great radio stations and awesome cars." Interestingly, the early 1990s hip-hop that forms *GTA: SA*'s core culture is as much the music of their parents as it is theirs.

Unlike Honovi or the second group of gamers interviewed, this group was particularly attentive to the *structural* forms of racism in the game, raising critical questions about how easily one could become economically mobile in the game, buying a house and moving out of the ghetto. When asked what was unrealistic about the game, they responded that the way that blacks could save to buy a house and eventually move to the suburbs was the "most unrealistic." They were particularly concerned that white kids might develop false impressions about economic mobility for African Americans in the United States. As one participant said, "A black man can't just save a few dollars and go buy a house in a white neighborhood." They did appreciate how the game modeled racial and ethnic tensions by neighborhood. "You drive your car in the wrong neighborhood, like in Sherwood Hills [an affluent suburb near them], and you're going to get pulled over or in trouble," one reported. To what extent these assertions are true in Madison, Wisconsin (or anywhere), is beside the issue; for these kids, a game about race, violence, and car culture was tremendously exciting and provided an interesting framework for talking about very real social issues.

These same kids were very *uninterested* in talking about violence in the game. They perceived game violence as unrealistic, at least compared to the violence they experience in their neighborhoods. As one said, "Stuff like that happens, you know. The game isn't going to make you do anything like that." These kids knew of both youth and adults engaged in various forms of violent crime, and to them, it was almost insulting to suggest that access to a video game about violence, race, class, and material goods (i.e., cars), rather than *actual* ethnic tensions, widespread access to guns, and segregation and poverty, was causative of violence in their real lives. In other words, these kids found it somewhat bizarre that we would ask them about violent video games (and their parents' attitudes toward them) when there were clearly many more tangible causes of and forms of violence in their lives (i.e. poverty, drugs, lack of economic mobility). Part of what we found fascinating about *GTA: SA* is that these players seemed able to construct a fairly serious critique of the current socioeconomic order in the United States, developing *through play* seedlings of a structural theory of how race and class are reproduced in contemporary America (tied to property values) that could be explored further.

These three groups of gamers illustrate how interactions among players' identity, expertise, desires, and game play manifest themselves in game experience. *GTA: SA* spoke to gamers' desires for achievement, game experiences in their cultural landscape, pursuit of hobbies

and interests (e.g., car customization), and display of masculinity. Each of these desires contributes to the emergent meaning of the game experience, making the player himself, in a very real sense, a part of the game experience and the resultant meanings. Examining them, it's evident that with a game like *GTA: SA*, there is no *one* game out there that anyone plays; in fact, even within groups, participants reported finding new things to do with the game and new ways to play it. This notion—that there is no "one" game out there to be played in open-ended sandbox games like *GTA*—presents both opportunities and challenges for educators seeking to use such games for learning.

Open-Ended Games Functioning as Possibility Spaces

Following this model, games can be thought of as possibility spaces, spaces in which we can live, experiment, and play for different reasons and with different outcomes. Even the most "open-ended" of games are imbued with potential meanings instantiated in rule systems and representations. Players learn the rules of the system, using them as a backdrop to play off of, a context to perform within, rather than as a stable system of meaning that they're "inculcated" with. The specific meanings of any play experience are negotiated within interpretive communities, which overlap and extend into broader cultural discourses. To understand the meanings of game play, within both open-ended and other forms of games, we can't just look at the rules; we need to look at players' performances and understand *their* understandings of them. This suggests that a mature theory of communication and media in gaming will draw on performance theories as much as on traditional media theory. From these players, we can see how meaning making occurs in relation to their experiences and lifeworlds; interpretations build off and extend their own concerns.

For those with an interest in educational experiences via games, we see that educators and game designers share some common characteristics. Both are tasked with an interesting second-order design problem: How to create spaces that ultimately exist for people to do interesting things?[25] Good games are vehicles for player expression. From this perspective, designers face the task of choreographing the rules, representations, and roles for players— in other words, the contexts in which players can generate meaning.[26] Educators attempt to establish worldviews that we want students to understand, be they those of a scientist, Maori tribe member, or ancient Roman. But if much of the interpretive work occurs within interpretive communities, then a challenge for educators is how to design social structures that effectively support students' learning, in much the same way that many game developers design in features that produce socializing. A potential paradox arises as educators seek to reconcile game players' multiple ways of and reasons for being engaged in games, with the divergent learning outcomes that are likely to occur as a result.

Thus, an interesting set of opportunities and tensions emerges. On the one hand, open-ended sandbox games appear to be a productive space for studying and designing game-based learning environments. On the other hand, the particular learning outcomes that result seem to rely heavily on players' experiences. We might consider *why* they're playing and what kinds of interests they bring into the game world color their experiences of it, along with the particular kinds of interpretations they draw. The *GTA* example showed how working-class white students focused on racial representations, while a group of working poor African American students focused on structural issues of race. Drawing on the example of Honovi, we see these interpretations not necessarily as the only ones to be drawn from the game, but ones that were activated through social interactions with researchers and

peers. Imagine what kinds of productive dialogue might result from a dialogue across these groups.

The next section of this chapter focuses on efforts to design learning systems around such open-ended games, particularly the *Civilization* series. It focuses on what kinds of interpretations players make from the game, and the use of the game as a model to think about history *and* the design of social systems around the gaming experience. In both cases, games function as possibility spaces for students. We can think of these possibility spaces in at least two ways: (1) as *intellectual* play spaces where players can explore the interplay of historical ideas, much as the *GTA* players used *GTA* as a way of thinking through race and class, and (2) as *identity* play spaces where players develop new identities as game players. These identities may include status as expert players, competitive players, members of guilds, teams, and other social roles, such as modders or machinema directors. The section closes by arguing for open-ended game-based learning environments as productive for deeply transformative learning, learning where one develops a new identity that can impact one's identities in school and in the home as well.

Designing Gaming Communities for Learning

Over the past five years, several colleagues at the University of Wisconsin–Madison and I have been investigating the potential of the *Civilization* series to support learning in social studies (particularly geography, politics, and history). In *Civilization*, players lead a civilization from 4000 BC to the present. Players utilize natural resources, build cities, trade, and—of course—wage war, giving rise to situations such as civilizations negotiating (and perhaps warring) over scarce resources such as oil. As such, the central features of the game system present an argument for the fates of civilizations as largely governed by geographical and materialist processes, an argument also made by Jared Diamond[27] in his Pulitzer Prize–winning *Guns, Germs, and Steel*, but perhaps with a greater emphasis on political negotiation.

Pedagogically, the game offers an interesting reframing of history from one organized around "grand narratives" to one marked by themes and patterns, a method of teaching world history advocated by an increasing number of educators.[28] In fact, the geographical and materialist underpinnings to the model serve as a healthy contrast to those made available at school, where most students are presented a story of the steady march of Western liberty, democracy, and rationality.[29] In contrast, *Civilization III* can offer a story of advantageous geographical conditions that provide access to global trade networks, resources, technologies, and limited opportunities for population expansion. The game also offers opportunities to think about broad domestic decisions (e.g., guns vs. butter) and foreign policy decisions (e.g., isolationism vs. trade).

A number of educators and critics have raised valid concerns that what players learn from games is not the properties of complex systems, but simple heuristics, such as always keep two spearmen in every city. The fear is that, without access to the underlying model, students will fail to recognize simulation bias or the "hidden curriculum" of what is left out.[30] Which biases, or aspects of the game's ideological system, do players interpret, and which parts do they fail to notice? In *GTA: SA,* we saw that players' different experiences of race and class influenced how they interpreted the game systems. What basis do players use to make these distinctions? These concerns point to theoretical questions core to learning sciences and game studies, in terms of how players interpret game experiences, what they might learn from these experiences, and how they make judgments in applying them back to the world.

**Multiple Forms of Engagement and Diverse Practices
in Open-Ended Games in School Settings**

In my dissertation, *Replaying History*, I used *Civilization III* both in a high school class and in an afterschool setting to investigate these questions. The goal of the project was to help students use 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. Ross Dunn[31] has called this approach to world history the "patterns of change" model, whereby world history is presented as patterns of human activity across broad timescales, as opposed to traditional national or "western civilization" history.

How students became drawn into the game space was a complex phenomenon, occurring at the intersection of personal goals and fantasies, the possibility space of *Civilization III* as a simulation, a desire to learn world history through the game, and at times, the social pressure to complete the presentation for the other classes. Whereas some players readily took to the game as a fun and interesting way of learning world history, others were motivated by a desire to compete with others or impress friends, while others simply wanted to do whatever it took to get good grades. Most of the players *did* become engaged with the game at some point. Different "hooks" worked with different players, including a desire to explore, to build, to maximize the game rules, to nurture their civilizations (much like pets), and to transgress the rules of history and school, in part by playing in antisocial ways.

Specific game practices differed among these players as well. Some players spent hours opening maps and exploring new territories; others were in constant negotiation with other civilizations. Some students turned the game into a colonial simulation, investigating the forces contributing to cross-Atlantic colonization. Others used the game as a global historical simulation, enjoying playing events and then comparing them against historical accounts. And as we saw in the play of *GTA: SA*, these different play styles seemed to emerge from the players themselves, as they played the game. One girl, for example, was primarily interested in protecting her people, the Egyptians. When the Greeks settled in Northern Africa, she was forced to learn more about the military aspects of the game, which led her to learn about economics (she needed to research new technologies to stay ahead), and eventually geography, as she realized that she needed to locate Greece on the map, create a military force to enter its borders, and negotiate from a stronger position. Perhaps ironically, this self-avowed pacifist ended up mostly engaging in war. Another student took great interest in the colonization of Australia, and enjoyed examining how well the game did or did not simulate European–indigenous interactions. Most of the students approached the game with vague goals and interests, and then developed deeper interest in particular areas. For example, another student became interested in the geography of Alaska as a result of emergent phenomena in game play.

For other players, game play was largely a social experience, and they explained the pleasure of gaming as largely one of socializing with friends. Other groups (particularly middle-school girls) used the game as a context for competition, comparing which player had the most money, allies, cities, or percent of the globe explored. These girls became expert political negotiators, understanding aspects of the political system unknown to the teachers and researchers. (As an example, they realized that one could determine the relative advancement of a civilization by seeing its clothing.) Cedric, a talkative, easily distracted student, was an excellent example of this style of play. He spent much of his time walking about the room,

examining different students' games. When asked what he was doing, he usually framed his answer in terms of another student's game, saying things like, "trying to keep up with Dwayne" or "trying to get cavalry like Tony." Much like Bartle's (1996) socializers, Cedric was frequently a conduit for information, sharing knowledge about Dwayne's game (such as effective military strategies) with students like Tony. Much as other game theorists have argued that game play is social, for each of these kids, their game-play practices could only be understood as socially situated practices, being affected and constituted by their local contexts.[32]

The fact that any player's particular interest in a game often emerges once play begins raises important questions for educators, as it suggests that a core value of open-ended games for learning could be their capacity to open up *new* academic interests, rather than relying on prespecified, standardized teaching objectives. Although most of these *Civ* players could now pass a test on basic geography (especially the "explorers"), not all could. Some students engaged in intricate diplomatic maneuvering, luring allies into war and manipulating historical enemies for their own gain. These students developed strong understandings of political negotiations, which might serve as excellent preparation for a political science course, but not every student investigated these aspects of the game.[33] If open-ended games like *Civilization* open many new academic interests for their players, part of this success is due to the fact that they enable players to explore different aspects of the simulation game according to their own interests. While this can be seen as a strength, it also creates problems for learning contexts requiring fixed objectives.

Identity, Experience, and Interpretations of World History

Many students ultimately turned *Civilization III* into a colonial simulation, which affected the kinds of questions students asked of the civilization (e.g., could Native Americans have "discovered" China, changing global politics?), thereby affecting their observations and interpretations of history. Students interpreted from the game model that civilizations conquered others due to particular geographic properties yielding military advantage, access to global trade networks, access to key natural resources, and particular diplomatic strategies (e.g., trading is generally better than isolationism), not due to specific cultural or genetic traits. As people marginalized within the narrative of Western progress typically taught in schools, this interpretation certainly spoke to them.

Surprising to the researchers, these students already held fairly materialist views of world history. In preinterviews, they were asked to read critiques of U.S. foreign policy arguing that it was historically motivated by a desire to secure natural resources and create alliances to protect these interests, rather than any interest in spreading democracy. Every student who participated in interviews agreed with these statements, with most citing the conquest of Native Americans and the war in Iraq as examples of American imperialism. Playing *Civilization III* gave them a better sense of how, where, and why these resources gained importance throughout history. As an example, students were surprised to learn about the historical importance of rubber. A few enjoyed "replaying" American imperialism as they sought to colonize South America for access to rubber. For these students, all of whom identified themselves as marginalized by traditional historical narratives, there was a transgressive pleasure in reenacting imperialist American foreign policy under the guise of "spreading democracy." As one student commented, "I *owe* it to these savages to conquer them. Think how happier they'll be in my civilization." The class laughed aloud at the obvious satire, particularly in light of current events with the Iraq War.

There was no evidence, however, that these game experiences *changed* students' ethical beliefs about war. In postinterviews, some stated that the game taught them that war was always futile. A majority of students held onto prior beliefs about the ethics of war and colonization. For example, most maintained that the Europeans were basically "evil," and—in contrast—Native Americans were essentially pacifists. Notably, the game does nothing to confront these naive beliefs about civilizations, nor particular historical events (although in class, we did discuss the atrocities committed by the Spanish conquistadors, which perhaps underscored these sentiments).

Indeed, 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, students reported what it is they learned through playing *Civilization III*:

Dwayne: Unifying Africa made us powerful . . . . Politics and geography. I got all of these resources then I could trade them with other countries. So it made my politics stronger.

Tony: It makes more production. Everyone can work faster and more efficiently.

Teacher: [Leading the organization activity] Where should we put that; In what pile?

Tony: Well, in some ways, they're all related to each other. [General nodding]

Teacher: That could be one thing we learned. How would you write that?

Tony: Well, money is the key . . . money is the root to everything. With money you can save yourself from war, and that also means that politics . . . with money, that ties everything together. Luxuries buy 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 played the game and discussed it in class, they began to recognize its underlying ideological framework—one that privileges geographic location, access to trade networks, technology, and negotiation. (One might also argue efficient management. See Friedman, 1999 for a good analysis of *Civilization* as a designed artifact and game experience.) For Tony, the model proffered by the game offered a good explanation of why Native American civilizations were conquered by Europeans, rather than vice versa.

Open-Ended Games Remediating Historical Understandings

However, open-ended games also remediate games in ways that educators ought to consider more deeply. When asked to describe what he learned from this unit, Tony commented, "I learned that, no matter how it plays out, history plays by the same set of rules." To paraphrase McLuhan, if the medium is the message, then the message for Tony was that history could be treated as the results of a rule-based simulation—the rules of which are the underlying "content" of history, not the subsequent events. This idea, while foreign to most historians, is actually the core intellectual enterprise of world historians, who seek to identify broad patterns across thousands of years of history.[34] Other students said that ultimately they were

learning about management. "We're learning about managing civilizations . . . You worry about how much you spend on science compared to how much on money."

For these students, it was impossible to achieve any success in the game without learning some basic relationships between politics, economics, and geography. Tony described the interactive nature of *Civilization* as a game. (The fact that it pushes back on their understandings through consequences tied to their actions was central.) "Playing the game forces you to learn about the material. It actually forces you to learn about other civilizations in order to survive." Tony explains his impression of what he learned from the game:

Interviewer: Do you think that playing *Civilization* taught you anything about social studies?

Tony: I think it did. I always knew that certain locations helped certain people; but with this, I have a better understanding of it. In some ways, I have a better idea of, like, if you're in the middle of a forest. Sure there's a lot of things there, but your civilization doesn't grow that quickly and money is hard to come by. That affects population, the mood of your civilization, and food . . .

Interviewer: In class, you said that geography affects politics, which affects history. Could you talk more about that?

Tony: Well, if you're next to the ocean, that's a good place for any city to be: It has food, water, the climate would be moderate, and that's a good place for a city to flourish. If you have luxuries around water, that brings in trade—brings in money, so that you can talk with other Civilizations. If you have enough money, you can buy a lot of things and you can sell a lot of things.

Tony: Geography is the main game. Because if you're in the mountains . . . In my other game I started next to the mountains and next to the water as well, and the water was the only thing sustaining me was in the water. I'm secluded from everything else, but the barbarians snuck in, and everyone else sort of hates us because we're weak people and they won't share whatever they have. They only come in when I find something good. Then they start calling me. Do you want to trade this?

Tony: When you're isolated, it's good and bad. In some ways it's good because you don't really have any enemies; you flourish. It's kind of bad because you develop at a slower pace.

As players experienced events in-game, they developed narrative accounts of events (e.g., "My cities died because I didn't have access to enough food"). Through extended play across several games, coupled with debriefing, these narratives became more like theories of the game system (e.g., cities flourish near water resources). Players were later able to discuss the utility of this theoretical model in more abstract situations and apply it to thinking about historical situations and current events—such as the Iraq War—but time limitations prevented querying these understandings further. As such, a key cognitive value of such open-ended games may be in giving players models with which to think.

Civilization III suggests how an open-ended game designed according to particular ideas—in this case a geographic materialist view of history—can function as a model that players use to think with. Because they are performing within that system, actively building and testing ideas about its nature, players are able to build robust theories of how it behaves—theories far more sophisticated than the sorts of simplistic understandings characterized by others in the literature.[35] As students build and discuss these interpretations in social contexts, they reflect on their understandings and mobilize them as tools with which to think. In much the same way that the meanings ascribed to *GTA: SA* by players were transformed by the context of play, the meaning of *Civilization* for players was shaped through its play. It is important to note that this was a designed context, one in which students were encouraged to ask particular questions to their games, compare results, and build theories of game play.

However, students' desire to share stories about their games seemed almost innate. Whereas video games have the reputation of being socially isolating, it is worth noting that, in these cases at least, students were incredibly social, sharing stories about their games; they were also eager to learn from one another's play.

Part of what makes *Civilization* a *game* (rather than a traditional simulation) is that it recruits their interests, passions, and identities as participants, doing so within a context in which they develop expertise at manipulating the forces of history. In short, they were engaged emotionally and experienced success in manipulating complex variables. *Civilization III* gives players concepts with which to think, while also offering them a very real, tangible sense that they could be *good* at something related to school-based history. In our study, disengaged students failing in school were successful at mastering a complex game, developing historical understandings in the process. In postplay interviews, the participating teachers stressed the importance of this outcome for students like Dwayne, who refused to participate in most school-based activities. As one teacher commented, "Dwayne shows up for less than half of his classes, and even when he does, he doesn't do much. This gave him and a few others like him the chance to shine. It might be the only thing he looks forward to all day." *Civilization III* recruited his identity as a hardcore PC gamer (he played a lot of *Diablo II* and *Age of Empires*), allowing him to channel expertise developed in gaming into a productive school-based identity. In this way, games could be an excellent bridging mechanism for disengaged students, particularly adolescent boys, many of whom are labeled ADHD and causing many problems in schools.[36]

Despite these successes, our research revealed several (perhaps predictable) challenges to implementing *Civilization* in school-based scenarios. First, with the time necessary for setup and debrief, the game is difficult to run in forty-five- (or even seventy-five-) minute time blocks. Second, different students had different interest levels in *Civilization*, and the game takes dozens of hours to learn. Third, the divergent play styles and divergent learning outcomes were not necessarily congruent with the demands of school. Finally, learning through game play involves learning through failure (i.e., learning when one loses), a condition that was not always motivating to students.

Finally, the biggest limitation may have been simply that learning history through *Civilization* in this context may have missed the biggest educational potential associated with the game. As I left the study, a number of students seemed to be just scratching the surface of what the game could do. Tony was developing an interest in geography. Wade was interested in designing his own games with the editor. Dwayne was beginning to attend camp regularly, showing his first interest in an academic subject area all year. The teachers commented that, in general, a small group of students was beginning to develop deep, specialized knowledge that they hoped could continue throughout the year.

If we think of games as designed experiences, experiences that are constructed out of performances within ideological worlds interpreted within communities, we have to also acknowledge the *social systems* encompassing game experiences that constrain and shape them. In essence, the designed experience of school—which mandates that students all work at the same pace, where learning is organized by topic area occurring in forty-five-minute blocks along uniform learning outcomes, and where breadth of "exposure" to content is privileged over depth of understanding—greatly shapes the learning that ultimately takes place. Reflecting on the expertise that Tony, Dwayne, Norman, and their classmates were developing with *Civilization III*, it became apparent that perhaps a learning program that offered even more powerful learning trajectories would be valuable. What if Tony were given

opportunities to play (and create) different historical scenarios in and out of school? What if he could play games in conjunction with other history assignments? In essence, how might the model of "open-ended" game play be used to design a learning system for an interactive age?

Learning Systems for the Interactive Age

I began looking for new models of what a *Civilization*-based learning program might look like, and soon found it in Apolyton University, a community of *Civilization* players based at Apolyton.net. Formed about a year after the release of *Civilization III*, Apolyton is an informal community of players—not an accredited university—founded to extend players' interest and learning while playing *Civilization III.* While many Apolyton students have met one another offline, all official "university" business is conducted online.

Apolyton University seeks to help players to become more expert *Civilization* players, while also serving to develop in them a sort of *design expertise* whereby players understand how changing particular elements of the game has an impact on other components of the system. Here players are parsing not only the underlying rule system of the game, but the complex set of interrelationships which make up this rule system. Players dissect the game system, modify the underlying rule set for various purposes (usually to improve the game balancing), design their own scenarios to communicate particular ideas, and run their own courses on specific ideas. Given work in literacy studies that argues that the chief goal of education ought to be to create learners with a *design orientation* toward reading, writing, texts, learning, and technology, Apolyton University seemed like a fruitful site for extended study.

In 2004, Levi Giovanetto and I began a year-long ethnography of Apolyton University, in order to understand how it worked formally and socially, so that we could design afterschool programs based on its underlying logic. Specifically, we sought to understand how expert players used *Civilization III*, how interpretive gaming communities functioned within it, and the potential use of its model for learning in educational settings.

Apolyton University: Participatory Education

Apolyton University is run entirely by students and for students, making it even more intriguing. After only two years, Apolyton had generated roughly 23 courses, supported by approximately 100 core members, with an estimated 1,500 lurkers. The core mode of participation took place in forum discussions: Players played a series of collective games of *Civ* at the same time, and posted reflections as they played. This process quickly evolved into the During Action Report (DAR), a mechanism for formally reporting and reflecting on game progress. This format enabled players to reflect while engaging in joint activity with experts, a form of apprenticeship that is known to be especially effective. Players not only gained access to expert cognition, but gained it just in time and when needed on the same tasks.[37] The DAR generated 19,000 posts and boasted a median response time of two to five hours between posts.

The following exchange, occurring in the middle of a discussion about a game scenario, typifies a typical DAR exchange. Earlier in the exchange, Newbie posted a screenshot of his game, qualitative and quantitative descriptions of his game scenario, and a synopsis of how he interprets the current state of his game. He left with a seemingly simple question, asking if he should upgrade his units from knights to cavalry so that he will have an attack strength

of "5" compared to "4." (The community had previously identified an "exploit" in the game with knights, which—in the original "stock" game—had a strength of "6," making them overpowered.)

Newbie: (Should I upgrade knights to cavalry) 5/3/3 versus 4/3/2??

Theseus: I'd upgrade in a New York minute. I would upgrade, the question is would I want to research the tech. Remember you will soon be in the next age and have the better units. Especially if you are a scientific civ. Largely the AI will not be a big problem for you at this point with the knight type unit. Of course you will have some games that make that strategy wrong, that is what is good about civ, you cannot do the same thing in all cases. Anyway, I am not presenting this as a sure thing, only as a food for thought, a consideration.

Stuie   I think the a-5 still makes the beeline an option, it just won't be as attractive an option, thus opening up other possible avenues for approaching the Middle Era tech tree. As is, I *always* do the beeline to Military Tradition. Reducing the attack by one will force me to consider other options depending on circumstances in my game.

Theseus responded that "yes," of course one would want to upgrade. However, the deeper question is whether it is worth investing the resources in researching the technology required to do so. He contextualized the decision in terms of the broader flow of the game, and then acknowledged some contingencies to be considered, promoting flexible knowledge about the system. Stuie then interjected that upgrading is still a legitimate strategy, and suggested how making this change now simply balances the choices in the Middle Era.

Many students of Apolyton University entered as competent players with advanced understandings of the game system, and left with a design understanding of the underlying rules (see figure 2). The process roughly works as follows: Players enter as advanced (some would say expert), with knowledge of the basic game concepts, terms, and strategies. As advanced players go through the community, they begin identifying exploits, such as the cavalry upgrade. They experiment with various changes to the official stock game rules, such as using the game editing tools to lower the advantages of cavalry, identifying superior strategies. As a community, they formalized these strategies, developing names for particular approaches, like "Alex's archer rush." Next, players mod game play by changing entire rule systems, which takes place in particular courses. Within a course players would remove entire systems, such as the military combat system, or create other rule systems designed to change the game experience radically. For example, in the "Give Peace a Chance" course, players are prohibited from starting wars or going to wars—including committing acts of aggression designed to "irk" the computer-controlled civilizations so that they attack.

If the "designed experience" of school is one built around mass-producing students with "mastery" over a uniform curriculum (or set of standards), the learning system exemplified by Apolyton University is one designed to produce independent, creative problem solvers with an ability (and expectation) of developing new knowledge. In short, as learners, participants of Apolyton's "curriculum" are not just consumers of information, but knowledge producers as well. Further, the university is open to anyone, regardless of age or credentialing. Advanced learners and newcomers learn side by side. The learning space is organized not just around transmitting information, but also around discovering *new* information. Everyday, participants have opportunities for taking responsibility for the learning of the group, in the form of proposing changes to the stock game rules (or curriculum), or even entire courses.
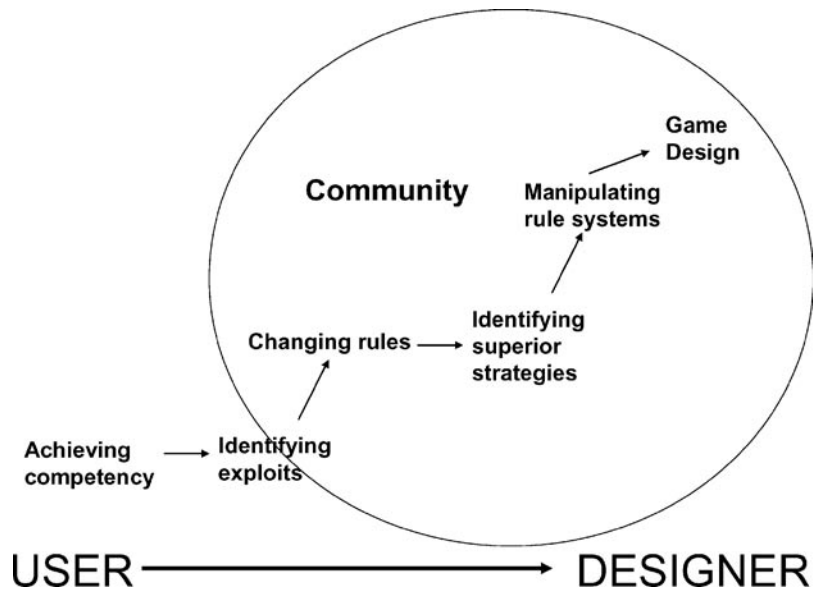
Figure 2
Trajectories of player experience. This diagram represents the process that we have seen occurring both within Apolyton University and within our *Civilization* programs. It stresses the gradual shift from player to designer, blurring distinctions between the two. Much like Salen (Salen and Zimmerman, 2003) we find that players frequently change the rules for their own enjoyment, a process that for some gradually evolves into creating mods, scenarios, or even new games.

Developing a Productive Orientation to Knowledge and Media

One can tease from this process an interesting approach to developing players with a *productive* or *design* orientation toward games. First, it is critical to acknowledge the importance of developing a mastery over a game system—understanding the interrelationships among its rules and their consequences before one ever attempts to design. This may seem simple, and perhaps even obvious: How many people would set out to write a song without having listened to a few, and hopefully, enjoyed some to the point of dissecting their composition to understand song composition? Whereas many approaches to game-based learning have emphasized design, perhaps it has been at the expense of understanding the value of *playing*.[38] Presented here is a gradual continuum whereby one enters as a player, begins identifying and exploiting rules, and graduates having participated in a redesign of the system. Here, designing is a natural outgrowth of playing, with one's desire to create emerging from experiences (satisfactory or otherwise) of play. A parallel can be made with the way players of *GTA: SA* (discussed earlier) moved from *players* to *producers* of their own meanings within the game system. Honovi and the other boys studied developed rich and rigorous interpretations of the game as it related to their own lived experiences only after they had entered the game as players. Each exited after having designed his own experience of play, and leveraged the meanings of this design within an interpretive community.

Design is also a deeply social experience. Members of Apolyton University are designing their "courses" for specific audiences and for specific purposes. Each design has a specific

objective, including testing particular ideas or getting the player to experience particular things. This model offers an intriguing approach to game design in that one might compare these design challenges to specific design exercises one might do in a class. Perhaps most importantly, all of these activities are situated within a culture of inquiry, whereby the goal is for both the participants and the community to improve their skills and knowledge.

After roughly two years of activity, the community died off. In interviews, participants attributed this death to an exhaustion of the number of possible topics; the game was tested and perfected to the point where there was little need to continue. Most players were taking a break, waiting for the release of *Civilization IV*. The Apolyton community itself developed a wish list/alternative design document—hundreds of pages long—for the developers of *Civilization*. In fact, the most active of members of the community were recruited by the lead designer of *Civilization IV*, Soren Johnson, to participate in the *Civilization IV* design process. Roughly, 200 participants from Apolyton and other rival sites spent nearly two years testing ideas and making mods to the game, in effect running their university before the game came out. Eventually, a few participants were even hired by Firaxis to work as scenario designers. In effect, the community provided a trajectory of experience for these participants that literally resulted in them becoming professional designers.

Designing Learning Systems for the Interactive Age

In the summer of 2005, Levi Giovanetto, Shree Durga, Ben Devane, and I[39] began designing afterschool world civilization clubs based on the design principles of Apolyton University. The goal of the program was to create a modding community of practice around *Civilization III*. We sought to give students the experience of participating in and designing their own site of collective intelligence, which would hopefully result in them developing a design orientation to media that would also open trajectories to other valued practices. Specifically, we wanted to facilitate the formation of a learning community like Apolyton University, but one that allowed them to learn academic content of world history through a thematic series of historical scenarios. Perhaps more importantly, participation in this community of practice would also allow them to develop problem solving and creative thinking skills with technology, such as model building, game design, and community organization. Indeed, one of the theses that we are investigating is that core to meaningful participation in the twenty-first century is the ability to seek out, create, and participate in affinity spaces that further one's interests.

We began work with twelve fifth and sixth graders, mostly African American, all of whom were from lower socioeconomic backgrounds. The following exchange with two students typifies their orientation toward media at the beginning of the program:

Interviewer: Would you like to learn how to do game design?

Malcolm: No, it's too hard.

Monroe: No, that's not something I could do.

Most of the students had little technological background and very low self-efficacy toward technology. None of them could navigate a Windows PC file structure. In fact, on one occasion the most technologically savvy student took home a CD ROM to play at home and was surprised that his games were not saved to the CD ROM when he returned to school. They were all far from having any design knowledge of games.

Most of the students also had little interest in school, as typified by this exchange.

Interviewer: Do you like school?

Jason: I don't really like school, unless there's something fun going on, that's the only time there's actually something to do. You just sit there going [puts hand on head as if to sleep]. That's all you ever do really.

Interviewer: How do you feel about social studies?

Jason: Umm social studies can be fun depending on what you're doing. Last year we made a mountain out of graham crackers and we made it stuck together out of frosting and in the end we got to eat it.

Throughout the year, we regularly asked students what they were studying in school. Most reported that they were studying "culture." In the initial months of the project, few could locate the ancient civilizations on a map or identify many countries outside of the United States on a world map.

Creating an Academic/Gaming Culture

Over the next year, we designed and implemented an afterschool program for kids designed to initiate them into a gaming community of practice, that is, a community organized around a key practice (e.g., becoming good *Civ* players).[40] We designed a series of custom scenarios making the game easier to learn and easier to play. These custom games were designed to speed game play, allowing players to have the kind of rapid game-play analysis/replaying of games that was core to the Apolyton community. Students were encouraged to play with partners, and most players kept close ties to friends' games throughout the first week. Finally, we decided to have adult gamers play alongside the students, in order to better model the kind of thinking in which we wanted students to engage, such as modeling advanced game play or using maps and other resources as tools for game play. As the adults achieved successes (and losses), they shared their strategies with students, in part in an effort to emulate the kinds of thinking occurring at Apolyton University.

By the third week of camp, we introduced the possibility of playing multiplayer games to the kids, and they responded positively. These gaming sessions had a profound impact on the culture of the lab, transforming the space from a collection of single-player experiences to that of a shared, collaborative space focused learning, much as the shared games—games where community members would download and play a common saved game file—transformed the Apolyton community. Players began using game terms with each other while negotiating game vocabulary. For example, during negotiations over control of southern Europe, the Persians, Greeks, and Romans almost *always* engaged in debate over the control of iron and the impending military of Romans legionaries. In another example, players also claimed, "You should be worried about Egypt attacking you so they can get your horses so that they can build war chariots." Specialized language (legionaries, war chariots) flowed naturally in this context and became useful tools for communicating among players. Here, having adults playing alongside (and in teams with) kids also allowed for more cognitive apprenticeship opportunities as they shared and debated strategies in context.

These mentoring interactions took any number of forms, but generally stemmed out of having adults playing alongside students, with the adult, expert players unabashedly playing as experts. The adult players modeled how to negotiate with younger players, asking them what technologies they had, what they needed, and so on. They also "read aloud" the game

screen for kids, examining the status of the game board (where key resources were, where strategic military points were, and predicting how the game might play out), essentially providing access to an expert view of the game system.

The second way that experts mentored students was by opening trajectories of experiences to students. For example, when a player liked a particular scenario, mentors asked him if he wanted to know how it was made, and explained to him how it was designed, effectively "lifting the hood" of the simulation. If a student wanted access to horses, the mentor might open the editor to show him how extra resources could be added to the game board. On almost a daily basis, mentors attempted to open new trajectories for students, showing them how to change their saved games, create new maps, change underlying game rules, or—in an extreme case—even show them how to do a total conversion mod, using the game tools to create a *Lord of the Rings* game.

Over the summer, these students developed a level of game play in *Civilization IV* similar to that of the students reported earlier. All could locate the major ancient civilizations on a map, could name key historical military units, and could make arguments about the growth of cities in particular geographic areas. Students were routinely succeeding in the game on more difficult levels, and a few began playing against other kids and adults online. The program culminated with a multiplayer game in which the students attempted to devise a takeover of the adults. One of the kids explains:

We (Korea and Japan) saw how close Greece was and figured that Australia had to be closer, so we got out maps. I have this big map, and we built a galley with settlers, and were going to create a civilization and research to sail to Greece to make a secret attack on Levi.

The idea, while interesting, was ultimately ineffective as, by the time they developed the requisite sailing technologies, the game was largely lost. The group discussed the strengths and weaknesses of this strategy, a type of debriefing that typically resulted from the summer's multiplayer game sessions. Immediately following big events in the game (such as someone losing a city), players would jump out of their seats, run to one another's computers, and start constructing narratives of what happened and why. They would retell their strategies (e.g., researching sailing-oriented technologies to launch a secret attack on a distant civilization), and then argue over which strategies might have countered this strategy.

From Game Players to Creators

By the Fall, each student had developed a particular interest in history and gaming strategy, as the following quotation illustrates:

Interviewer: Who are you playing as today?

Jason: Scandinavia like always . . . Because I get berserkers . . . I put them on the galleys and any cities close to the shore, I can just go off and use them to attack whoever is in the city . . . .

Interviewer: So do you think that is like the real Vikings?

Jason: Actually it is, because the berserks would take this stuff which they made called wolf-bane . . . . like with Ivan the Boneless, which is my name in the game.

Interviewer: Where did you learn this?

Jason: It's from a book I'm reading. It's a fantasy, but all the land and stuff is just like real Europe. They have Iceland on the map, and the long ships.

Interviewer: So have you read about this at school at all?

Jason: No . . .

Jason, like every student who participated in the camp, began reading books on his favorite civilizations, checking books out from the library related to his game play, and doing extra background research related to his game. Jason was also an early adopter of the scenario design software, which he used as a tool to explore his interest in Scandinavian history.

Interviewer: So what is the scenario you made?

Jason: Well, I am Scandanavia, and I have the island that I really wanted, or that I had to get to if I wanted to win the game because it has every resource. Every island has horses and iron and the basic stuff . . .

Like most students, Jason was initially attracted to the scenario tool to experiment with exploits. In this case, he gave his civilization horses (which they did not have) as well as extra supplies of iron. We queried Jason on the historical accuracy of this hypothetical scenario.

Interviewer: So what do you think about that historically? Were the Vikings sort of isolated, were they on an island?

Jason: Well, Vikings were up in the Netherlands, but then they also controlled Iceland and the northern tip of the United Kingdom. They were kind of isolated, and if you saw them in battle or if they came to your town you were very unlucky because—well you were kind of lucky and kind of unlucky because they don't really attack a lot. If they are sailing, they go to different islands, and if there are no people there, they will leave guys there to start building up cities. Then they'll just have more people come to the city. They'll just keep on taking over the land. If there is a village in their way, they will destroy the village.

Here we begin to see a stark contrast between Jason at the beginning of the camp, when he was uninterested in game design and largely disaffiliated from school, and Jason now, where he is checking books out from the library, reading about history, and designing games for his own play. He is learning geography and historical terminology far beyond what is expected in school, and is even beginning to build micronarratives of historical events. This background knowledge is just the sort that has been shown to be critically important for academic success, as students attempt to make sense of more complex history texts that assume a basic background knowledge most students lack.[41] By the spring of 2006, these same kids were now regularly creating their own game files for camp. They experimented with different starting points for civilizations, different rates of game play, and the allocation of resources. Students would hold sleepovers in order to create new scenarios, and held informal competitions with one another to see who could create the best games. Researchers began fielding calls at home asking about the intricacies of the editor, or answering requests to play competitive games over the Internet. For these students, the desire to modify games was not an abstract goal, but arose as a natural outgrowth of their gaming practices, especially, a desire to entertain their friends, a desire to express themselves, and a desire to achieve status in their community.

By the end of the year, each student had undergone easily identifiable transformations, taking on new roles in the community and developing new identities. The following conversation, initiated by Monroe, suggests these changes:

Monroe: This whole game has changed my life. Yep.

Facilitator: This Rome scenario or CIV?

Monroe: I mean like the game, ever since I played it.

Facilitator: How has it changed your life?

Monroe: Well like, most of the other videos games are boring, but this isn't.

Facilitator: And this one isn't?

Monroe: Yeah, and my family plays it.

Sid (brother): No they don't.

Monroe: Mom and dad want to, my mom does.

Around this time, Monroe began seriously pursuing the game editor. As a part of a *Civilization* camp competition, he created a scenario depicting the Gulf War. Monroe started with a realistic map he downloaded from the Internet, and began extensive research (about forty hours) identifying important countries, their positions on the Iraq war, struggling with how to model the complex global events given the constraints of the editor. Around this time, Monroe shared that he "wants to become a senator some day" as a result of playing *Civilization.* As a school project, Monroe created a model of the American Revolution, which he was expanding and completing at the time of this writing.

Naturally, a causal claim that "playing *Civilization* will make a child want to become a senator" based on this (or any other data) is impossible to make. However, this kind of transformation is the sort that we believe is possible as the result of a comprehensive program designed to leverage students' interest in gaming toward other ends. For educators, one key outcome may be that, rather than shunning their students' interest in games, perhaps a more productive route would be to capitalize on the transformative power of the games to engage students in new experiences. Across all of our participants, we identified trajectories whereby students entered as novices and developed interest, knowledge, and skills related to world history and/or game design. Nearly all of them developed models of history with which they can think. From here, they naturally gravitated toward identifying and leveraging exploits, which we have been able to transition into a natural desire to modify games. In the context of our program, those who enjoy playing *Civilization* naturally seem to progress to a desire to create their own scenarios as well.

Conclusions

We are still in the early stages of creating theories of game-based learning environments, but I believe that open-ended, sandbox-type environments (exemplified here by *GTA: SA* and *Civilization*) are excellent places to start. The style of play afforded appeals to a broad range of students, provides opportunities for creative performance in game play, and offers multiple trajectories of participation. Here, I have attempted to outline an approach to designing game-based environments for learning, based on opening trajectories of experience for students. I have called these environments "designed experiences," in an attempt to capture a sense that the environment itself is designed to give players a series of experiences that they can take with them into new endeavors. The idea is to develop worlds that are worth understanding, which support multiple readings mediated by interpretive communities of practice, developing multiple compelling trajectories through the space, and supporting

students in identifying new kinds of experiences in which to take part (see figure 1). As educators, we can nurture, develop, and extend students' participation within the game environment beyond the specific context of play.

Figure 1 depicts this process, and shows how students enter these designed worlds with divergent knowledge, interests, and skills. As they become "players," they develop new and divergent knowledge, interests, and skills, moving along a continuum toward becoming experts, wherein they develop a design-type understanding of the game space. As players gain expertise, their experience of the game space becomes more unique; they begin exploring different aspects of the game system, playing different game scenarios, and experiencing more and more diverse aspects of the game system. Players may begin at a relatively common starting place (similar tutorials, missions), but then diverge further in their interests. Unlike schools, within the type of learning system discussed here, players are encouraged to develop specific areas of expertise, separate from one another and perhaps even from the adults/facilitators. As students progress, they develop new interests, which then propel them out of the community of practice toward new areas of interest, such as game design or ancient history.

Figures 2 and 3 highlight two key processes: Induction into the community and propulsion out of the community. At first glance, one would think that induction into communities would be simple: Which media has a stronger attractor than video games? However, we have found that this is not always the case. Students do not always "see" (or even value) the roles available to them, such as becoming an expert *Civilization* player. In our early studies, it was not uncommon to have a student question whether participation in a game-based learning program would help them in school or on standardized tests. Identifying and promoting examples of expert gaming identities, ideally in the form of advanced participants who already embody them, may be an important step in induction. This point also highlights the importance of such communities being multiaged, fostering significant opportunities for interaction between novices and experts—something rare in most schools but common to learning outside of schools.[42] The second process is that of propulsion out of the community toward new communities of practice. Although mentoring is critical in all phases of this process, we see mentoring as especially critical during this last phase. As Jason and Monroe began developing an interest in new activities, facilitators (expert players, teachers, and parents) helped nurture these emerging passions to open new paths for participation in new kinds of practices. Sometimes creating such a pathway was as simple as opening up the editor and suggesting that a student take a look at a new feature; at other times, it meant encouraging Monroe to investigate politics further through reading books. One pathway that we made available to students is helping the adults run the camp. Monroe, in particular, has shown great interest in recruiting and teaching other kids to play. Jason, however, is less interested, and would probably rather pursue a more competitive type of gaming environment. As participants begin developing interests and expertise, it is critical that new pathways be opened for them. We also hope to be reflective about *this* process, helping kids understand that they can "teach themselves to learn" via the formation of learning communities, once the camp is over.

Part of what makes open-ended games intriguing for educators is their ability to nurture, sustain, and develop participants' interests for years (much like a spiraling curriculum might). At the time of this writing, we see participants periodically "checking out" and coming back to our program, as they develop new academic interests. Monroe, for example, renewed his interest in *Civilization III* while reading about European colonization in school. Over the
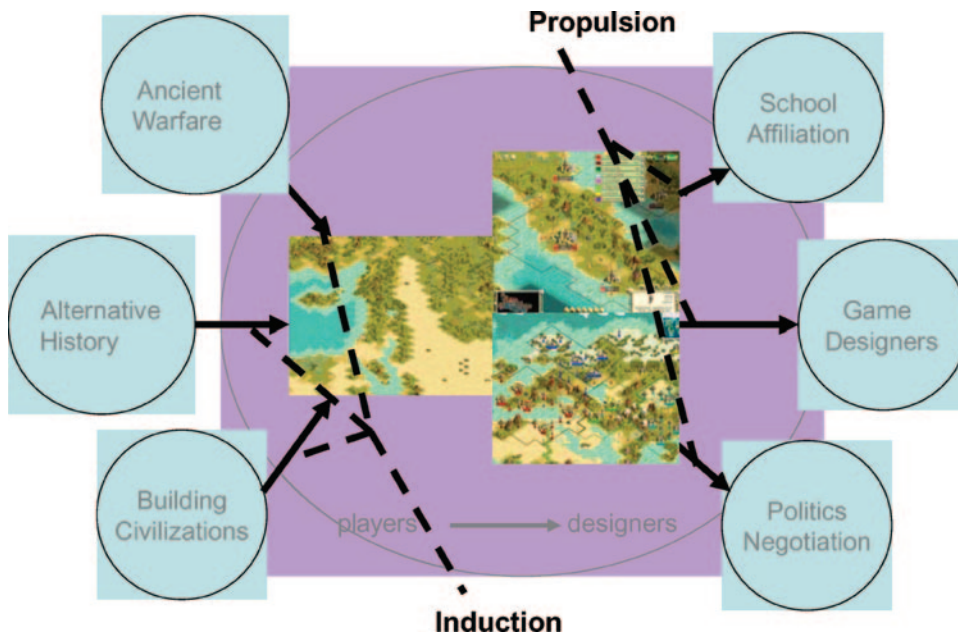
Figure 3
Induction and propulsion. This figure shows induction, the process by which players "get turned on" to *Civilization*, usually as something in the game captures their imagination. Like many games, this often represents a failure of some sort, as students want to achieve particular goals but perceive obstacles (like wanting to expand Egypt across Northern Africa, but Greece settling the shores of Egypt). We use the term *propulsion* to describe how playing *Civilization* serves as a propelling mechanism out of the community into new practices, although students frequently come back with renewed interests in new aspects of the game and new game-play/design practices.

last few weeks, he has taken to "replaying" specific historical moves in an effort to simulate historical events (even going as far as to having his textbook out while he plays). Much as expert *Civilization* players report *Civ* playing as feeding into a lifelong interest in History,[43] perhaps other open-ended games could give players experiences from which they draw from throughout their lives.

This model around the learning potential of open-ended sandbox games attempts to link sociocultural approaches to learning with more traditional constructivist/constructionist game-based approaches by suggesting how learning occurs through both individual and social game play. Certainly, interactions with the game are crucial to learning. At the same time, game play in these contexts is unequivocally a social experience wherein the desires to play and to produce both stem from social experiences. Players' desire to game, becoming experts or game producers, was thoroughly social. Unlike what we see in some social learning theory models, this model instead emphasizes that players do learn important skills, knowledge, and attitudes from open-ended sandbox games. Specifically, they develop models of the game system, which include basic facts, concepts, and relationships among them. Good players develop systemic knowledge of how changes in one factor (say the economics of a civilization) will affect its political negotiations.

At the same time, open-ended sandbox games may result in a more diverse range of learning outcomes than targeted or professional role-playing games. Certainly, these game-based learning models also have the potential to turn learners on to a range of different areas.[44] However, whereas one would normally describe *Supercharged!*, *Mad City 2020*, or *Full Spectrum Warrior* players as more or less playing the same game, advanced *Civilization* or *Grand Theft Auto* players engage in activities that other players—even after hundreds or thousands of hours of play—will never experience. With open-ended sandbox games, players enter the game with divergent interests, take divergent approaches and pathways through the game experience, have interpretations mediated by different interpretive communities, and embark on different trajectories out of the game space.

I argue that the interpretive community is the site wherein people develop even deeper meanings—including design-based understandings and understandings of how and when these are applied to other phenomena. In the *Grand Theft Auto* example, we saw how different interpretive communities make sense of issues such as race and violence, although further ethnographic work examining how these processes unfold is needed.[45] There are surprisingly few studies of how such social interactions function within single-player games. (With multiplayer games, we know that much of this apprenticeship and learning to "value" the world in particular ways occurs through joint collaborative activity such as group hunts.)[46]

One hypothesis emanating from the model proposed here is that "single-player" game play at any deep level is significantly mediated by interpretive communities as well; our interviews with *Civilization* and *GTA* players show that most kids and adults learned to play their first games in a genre from a friend and still regularly game with friends.[47] Indeed, players see gaming as a fundamentally social phenomenon. However, consistent with Gee,[48] I would argue that such social configurations probably function as *affinity spaces* as often as they do *communities*. Affinity spaces, such as Apolyton.net (not Apolyton University), feature less rigid participation structures, more transient relationships, and freer access to information. Consistent with Gee, I believe that such spaces may also hold important clues for developing learning, although for the purposes here, I have chosen to pursue communities as a framework of analysis.

Our next steps are to begin supporting distributed communities of practice of game players over the Web. Can we create distributed centers so that kids can play with and against other students from around the world, much like Apolyton University? How will making our *Civ* Clubs part of an International effort affect how kids use and make sense of the game? We hope that having more diverse play styles and interests will deepen players' experiences of the game and open entirely new avenues for participation. Having the chance to interact with expert *Civilization* players from different socioeconomic classes could open these students to practices unavailable in their local settings.

Notes

1. Walter Holland, Henry Jenkins, and Kurt Squire, Theory by Design, in *Video Game Theory Reader*, eds. Bernard Perron and Mark Wolf (London: Routledge, 2003), 25–46.

2. Ibid.; David Shaffer, Kurt Squire, Richard Halverson, and Jim Gee, Video Games and the Future of Learning, *Phi Delta Kappan* 87, no. 2 (2005): 104–11.

3. Constance Steinkuehler and Marjee Chmiel, Fostering Scientific Habits of Mind in the Context of Online Play, Paper presented at the 7th International Conference of the Learning Sciences, Bloomington, IN, 2006.

4. Doug Church, Abdicating Authorship, Presentation made at the Annual Meeting of the Game Developer's Conference, San Jose, CA, March 2000; Games-to-Teach Team, Design Principles of Next-Generation Digital Gaming for Education, *Educational Technology* 43, no. 5 (2003): 17–33; and Staffan Björk and Jussi Holopainen, Games and Design Patterns, in *The Game Design Reader: A Rules of Play Anthology*, eds. Katie Salen and Eric Zimmerman (Cambridge, MA: The MIT Press, 2005).

5. Jim Gee, *What Video Games Have to Teach Us About Learning and Literacy* (New York: Palgrave/St. Martin's, 2003); and Henry Jenkins and Kurt Squire, Harnessing the Power of Games in Education, *Insight* 1, no. 3 (2004): 5–33.

6. Games, Learning, and Society, *Games, Learning, and Society*, in *Report to the Spencer Foundation*, ed. James Paul Gee (Chicago: Spencer Foundation, 2006).

7. Kurt Squire, Michael Barnett, Thomas Higgenbotham, and Jamillah Grant, Electromagnetism Supercharged! Paper published in *The Proceedings of the 2004 International Conference on the Learning Sciences* (Los Angeles: UCLA Press, 2004).

8. Ibid.

9. Henry Jenkins, Kurt Squire, and Philip Tan, You Can't Bring That Game to School! Designing *Supercharged!* in *Design Research*, ed. B. Laurel (Cambridge, MA: The MIT Press, 2003), 244–52.

10. Jim Gee, *Language, Learning, and Gaming: A Critique of Traditional Schooling* (New York: Routledge, 2004).

11. Kurt Squire, Cultural Framing of Computer/Video Games, *Game Studies: The International Journal of Computer Game Research* 1, no. 2 (2002). http://www.gamestudies.org/0102/squire/. Accessed January 15, 2007.

12. David W. Shaffer (2005). Epistemic Games. *Innovate* 1(6). Reprinted in *Computer Education* (in press). http://www.innovateonline.info/index.php?view=article&id=79.

13. D. A. Schon, *The Reflective Practitioner: How Professionals Think in Action* (London: Temple Smith, 1983).

14. Jennica Falk, Peter Ljungstrand, Staffan Björk, and Rebecca Hansson, Pirates: Proximity-Triggered Interaction in a Multi-Player Game, *Extended Abstracts of Computer–Human Interaction (CHI)* (Seattle: ACM Press, 2001).

15. Kurt Squire, Mingfong Jan, James Matthews, Mark Wagler, John Martin, Ben DeVane, and Chris Holden, Wherever You Go, There You Are: Place-Based Augmented Reality Games for Learning, in *The Educational Design and Use of Computer Simulation Games*, eds. B. E. Shelton and D. A. Wiley (Rotterdam, The Netherlands: Sense Press, Forthcoming).

16. See, for example, E. Klopfer & K. Squire (in press). Developing a platform for augmented reality gaming. To appear in *Educational Technology Research and Development*.

17. B. Nelson, D. J. Ketelhut, J. Clarke, E. Dieterle, C. Dede, and B. Erlandson, Robust Design Strategies for Scaling Educational Innovations: The River City MUVE Case Study, in *The Educational Design and Use of Computer Simulation Games*, eds. B. E. Shelton and D. A. Wiley (Rotterdam, The Netherlands: Sense Press, Forthcoming).

18. Sasha A. Barab, Miriam Cherkes-Julkowski, Rod Swenson, Steve Garrett, Robert E. Shaw, and Michael Young, Principles of Self-Organization: Ecologizing the Learner-Facilitator System, *The Journal of the Learning Sciences* 8, nos. 3 and 4 (1999): 349–90.

19. It could be argued that this "open-ended" category is similar to Will Wright's "hobby" category, which is probably correct. Although we have examples of players using these games competitively and

enjoying the story (in the case of *GTA*), the game itself would fall somewhere closer to the hobby end of Wright's continuum.

20. In this chapter, I use the term *Civilization* to refer to Sid Meier's *Civilization* series, and unless noted otherwise, specifically his *Civilization III* (the third installment of the franchise). *Civilization* is a strategy game in which the player rules a civilization sometime between 4000 BC and the present, or perhaps in a different time frame, depending upon the scenario. The game is based on a geographical-materialist game system in which players build cities to gather natural resources (food, natural resources, and commerce). Depending on how one plays, there is a robust political negotiation system as well.

21. B. DeVane and K. D. Squire, Pimp My Ride: Analysis of Grand Theft Auto: San Andreas Playstyles. Keynote presentation delivered to the Media, Cultures, and Communications Special Interest Group at the Annual Meeting of the American Educational Research Association, San Francisco, CA, April 2006.

22. R. Koster, *A Theory of Fun* (Scottsdale, CA: Paraglyph, 2005).

23. Constance Steinkuehler, R. W. Black, and K. A. Clinton, Researching Literacy as Tool, Place, and Way of Being, *Reading Research Quarterly* 40, no. 1 (2005): 7–12.

24. Sherry Turkle, From Powerful Ideas to PowerPoint, *Convergence*: *The Journal of Research into New Media Technologies* 9, no. 2 (2003): 19–28.

25. Alice Robison, The "Internal Design Grammar" of Video Games, Paper delivered at the 2004 Annual Meeting of the American Educational Research Association, San Diego, CA, April 2004.

26. Marc LeBlanc, Tools for Creating Dramatic Game Dynamics, in *The Rules of Play*, eds. Katie Salen and Eric Zimmerman (Cambridge, MA: The MIT Press, 2004); Alice Robison, The Internal Design Grammar of Games. Unpublished doctoral dissertation (Madison, WI: University of Wisconsin, 2005); Salen and Zimmerman, *The Rules of Play*.

27. Jared Diamond, *Guns, Germs, and Steel: The Fates of Human Societies* (New York: Norton, 1999).

28. Ross E. Dunn, Constructing World History in the Classroom? In *Knowing, Teaching and Learning History*, eds. P. N. Stearns, P. Seixas, and S. Wineburg (New York: New York University Press, 2000).

29. Ibid.; and Patrick Manning, *Navigating World History: Historians Create a Global Past* (New York: Palgrave MacMillan, 2003).

30. Paul Starr, Seductions of Sim, *The American Prospect* 5, no. 17 (1994); and Sherry Turkle, From Powerful Ideas.

31. Ross Dunn, Constructing World History.

32. See Katie Salen and Eric Zimmerman, *The Rules of Play*, for an excellent discussion of games as social and cultural phenomena.

33. For a good, critical discussion of the politics embodied in the game, see David Epstein, Not Just Child's Play, *Inside Higher Ed.*, November 2005. http://www.insidehighered.com/news/2005/11/28/civ. Accessed January 15, 2007.

34. For an excellent discussion of this, see Ross Dunn, Constructing World History.

35. E.g., Sherry Turkle, From Powerful Ideas.

36. Joseph Tobin, *Good Guys Don't Wear Hats: Children's Talk About the Media* (New York: Teachers College Press, 2000).

37. A. Collins, J. S. Brown, and S. E. Newman, Cognitive Apprenticeship: Teaching the Crafts of Reading, Writing, and Mathematics, in *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser*, ed. L. B. Resnick (Hillsdale, NJ: Lawrence Erlbaum Associates, 1989), 453–94.

38. As an example of this, see Mitchel Resnick, Amy Bruckman, and Fred Martin, Pianos, Not Stereos: Creating Computational Construction Kits, *Interactions* 3, no. 5 (September/October 1996): 40–50.

39. Kurt Squire, Levi Giovanetto, Ben Devane, and Shree Durga, From Users to Designers: Building a Self-Organizing Game-Based Learning Environment, *Technology Trends* 49, no. 5 (2005): 34–42.

40. Jean Lave and Etienne Wenger, *Situated Learning: Legitimate Peripheral Participation* (New York: Cambridge University Press, 1991). I use the term *communities of practice* here to emphasize the relatively close-knit nature of this group, and to contrast this with Gee's notion of affinity spaces (Jim Gee, *Situated Language and Learning: A Critique of Traditional Schooling* [London: Routledge, 2004]).

41. Isabel L. Beck, Margaret G. McKeown, and Erika W. Gromoll, Learning from Social Studies Texts, *Cognition and Instruction* 6, no. 2 (1989): 99–158.

42. Jean Lave and Etienne Wenger, *Situated Learning*.

43. Kurt Squire and Levi Giovanetto, The Higher Education of Gaming, *E-Learning*, forthcoming.

44. For an excellent description of this within epistemic role-playing games, see David Shaffer, Epistemic Games. *Innovative* 1, no. 6 (2005). Reprinted in *Computer Education* (forthcoming). http://www.innovateonline.info/index.php?view=article&id=79. Accessed August 23, 2007.

45. See Anna Everett and S. Craig Watkins, The Power of Play: The Portrayal and Performance of Race in Video Games, in *The Ecology of Games: Connecting Youth, Games, and Learning*, ed. Katie Salen (Cambridge, MA: The MIT Press, 2007).

46. See Constance Steinkuehler, *Cognition and Learning in Massively Multiplayer Online Games: A Critical Approach*, Unpublished dissertation (Madison, WI: University of Wisconsin-Madison, 2005); and T. L. Taylor, *Play Between Worlds: Exploring Online Game Culture* (Cambridge, MA: The MIT Press, 2006.)

47. See Reed Stevens, Tom Satwicz, and Laurie McCarthy, 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*, ed. Katie Salen (Cambridge, MA: The MIT Press, 2007).

48. Jim P. Gee, *Why Video Games Are Good for Your Soul: Pleasure and Learning* (Melbourne: Common Ground, 2005).