CHAPTER **23**

Video-Game Literacy
A Literacy of Expertise

KURT D. SQUIRE
UNIVERSITY OF WISCONSIN-MADISON

Why Video-Games Literacy?

"Reading" competence is at risk, or so reports (in the United States at least) from the National Endowment from the Humanities (NEA; 2004), popular press, and news reports would have one believe (Sanders, 1995). Authors of the NEA report *Reading at Risk* write, "If one believes that active and engaged readers lead richer intellectual lives than non-readers and that a well-read citizenry is essential to a vibrant democracy, the decline of literary reading calls for serious action" (p. 9). The assumptions behind this message are clear. The world can be divided into two types of people: the readers and the nonreaders, with literary readers holding the highest status. Nonreaders, who lead "lesser lives" than readers, are threatening the state of democracy. In an influential *New York Times* article, Solomon (2004) described this "crisis in reading" as a "crisis in national health." Note that critics like Solomon and the NEA are concerned not that millions *cannot* read; it is that people are *choosing* not to read. Ironically perhaps, proponents of this (perhaps hegemonic) position are especially concerned that citizenry read the *right* kinds of "literary" texts (presumably not the lyrics of rapper, 50 Cent, or the manga series, *Sailor Moon*), lest the health of democracy suffer. The message underlying these critiques is clear: The rise of popular media in the digital age is at the heart of this decline (cf., Sanders, 1995).

639

As critics lament the "decline of the book" (with Harry Potter presumably not counting as literature), those few scholars who have touched video-game controllers are noting that games are surprisingly long, difficult, and complex, requiring and developing new digital literacies (Gee, 2003; Johnson, 2005; Squire, 2003). The term *video games* is used throughout this chapter as an umbrella term that covers a wide range of digital-gaming media, including computer-based games that are downloaded from the Internet or contained on a storage media (e.g., CDs or DVD), free and subscription-based online games, handheld electronic games and console-based video games played on televisions. Psychologists have long noted that video games require fine-motor skills and sophisticated navigation skills, but recent studies have focused on the games' complex problem-solving requirements, much as an earlier generation of scholars studied checkers or chess (Greenfield, 1984; Kim, 2002; Rosser et al., 2004; Squire, 2003; Steinkuehler, in press-a). Video games incorporate both closed-ended and open-ended problem-solving tasks, require navigation across complex systems, productivity with digital media, and collaboration with others (Squire, 2002; Steinkuehler, in press-b). As one example among many, some video games, like the award-winning role-playing game, *Star Wars: Knights of the Old Republic*, actually include classic cognitive-psychology problems such as Tower of Hanoi that require a pyramid of three disks to be moved from one peg to another using two additional pegs between the starting and finishing points. Indeed, research comparing video-game playing practice to traditional academic literacy and technology standards suggests that gaming *is* thoroughly a literacy practice, requiring players to produce meaning with texts and become expressive with technology in multiple forms (Steinkuehler, 2005). As a generation of kids raised on games and the Internet enters the academy—not as students, but as tenure-track faculty—our understandings of literacy are changing as well.

Those unfamiliar with games (frequently "baby boomers," those born in developed countries during the 1950s, as well as older people) are usually surprised to learn of the developments in game technology and design over the past 35 years (cf., Williams, 2005). When most people think of video games, they think of *Pac-Man* or *Pong* (the latter, coincidentally, was released in 1972, the year I was born). Today's games have evolved far beyond early stand-alone, purpose-wired arcade games, which were (necessarily) designed to be played by anyone with a coin in his or her hand and in a relatively short time (the time factor was deliberately kept short in order to increase the number of games that could be played in a day, which in turn increased profits). For an amusing illustration of this, see "Kids Review Classic Games," published by the *Electronic Gaming Monthly*, which features transcripts of today's kids reviewing the games their parents played. The following exchange typifies these young reviewers' (who are purported to be real children) responses to *Pong:*

> *John:* I'd sooner jump up and down on one foot. By the way, is this supposed to be tennis or Ping-Pong? *Becky:* Ping-Pong. *Gordon:* It doesn't even go over the net. It goes through it. I don't even think that thing in the middle is a net.

With the appearance of the Atari home entertainment system and personal computer in the mid-1970s, games began diversifying. Games soon included genres spanning action, adventure, sports, role playing, movie tie-ins (most notably, *E.T.* in the early 1980s), and puzzles, with games like *Pac-Man* and *Donkey Kong* introducing Japanese-made games into the global gaming marketplace. On the PC around this time, games took a more cerebral tack than did their console-based counterparts, with games like *Zork* aspiring to a form of interactive fiction (with similar games later done with graphics), and a host of role-playing games inspired by offline, dice-based Dungeons and Dragons role-playing games.

While we can see traces of today's video games in these early titles, they were incredibly simple by today's standards. They were usually designed and programmed by one person and took up less than a few kilobytes of storage space (roughly the size of one image file on a contemporary Web page today). These early games also lacked key features characteristic of current games—such as the ability to "save" partly played games. Indeed, in 1984, poor-quality games and consumer disillusionment caused a collapse of the games industry, and it did not fully recover until the Nintendo Entertainment System (NES) began gaining in popularity in the late 1980s (Herman, 1997; Kent, 2000; Sheff, 1994). The fast rise of the NES, a console product made by Nintendo, a Japanese games and toy manufacturer, and its many commercial tie-ins surprised and concerned many parents. As Hertz (1997) described, Nintendo pioneered many business practices common today, including its aggressive marketing of ancillary products (e.g., lunchboxes, snack items) along with company-owned "companion" media, such as the Nintendo-owned *Nintendo Power* magazine and its 1-900 call-in phone lines. The result of all of this was that Nintendo largely captured the hearts of a generation (born more or less in the early to mid-1970s and also referred to as the "Nintendo generation"). By 1992, for example, Mario (Nintendo's flagship character) was more recognizable and popular with American children than Mickey Mouse (Sheff, 1994).

It is fair to say that a major driver in the growth of the games industry has been the Nintendo generation itself. As this generation grows older and begins to enter middle age, members of this generation are bringing their video games with them. The average age of video-game players is now over 30 years old (10 years ago, the average age of video-game players was 16 to 18 years). It is this generation that played the much maligned *Mortal Kombat* as preteens, and bought PlayStations as they entered high school and college in the 1990s.

Q4

This same generation also made the GameBoy the best-selling gaming platform to date, ringing up sales of over 100 million of these handheld devices worldwide. The late 1980s and early 1990s witnessed a range of developments and innovations in the PC industry, including the rise of PC-simulation games (like *Flight Simulator, Sim City,* or *Civilization*), the birth of Internet-mediated multiplayer gaming via the PC (like *Modem Wars,* released in 1988), the continuing maturation of narrative-driven games, and the birth of 3-D gaming with *DOOM* and *Ultima Underworld.*

As the Nintendo generation grows up, markets for games appear to be only expanding in order to meet demands brought about by the rising average age of game players and the corresponding rise in the number of game players overall, the increasing number of women playing games, and the increasing globalization of the games marketplace. Gaming developments over the last decade, which are largely the focus of this chapter, might well be described as a phase of maturation and consolidation with some diversification thrown in for good measure. For certain, the core features of games as we know them today (e.g., 3-D graphics, simulated worlds, Internet connectivity, distributed game play) were established during this time, but it is during this same time period that the SONY Corporation released the PlayStation, a new and eminently affordable console-based video-game player. The PlayStation was remarkable for bringing real-time 3-D-interface rendering to the masses and for solidifying the market for games targeted at the 18- to 30-year-old market. In 2002, Microsoft entered the fray with its Xbox machine, turning the video-game console wars into the war over the entertainment system (and software) that runs the living room. At the time of writing this chapter in 2006, the Nintendo Revolution, Sony PlayStation 3, and Microsoft Xbox 360 are all jockeying for first position as the entertainment console that will become the centerpiece of living rooms around the world.

Over the past decade, the popular press, media scholars, and now educators have been paying closer attention to computer and video games (hereafter referred to as video games; Hertz, 1997; Cassell & Jenkins, 1998; Poole, 2001). Creatively, video games push the boundaries of interactivity, immersive environments, community design, and digital storytelling. Technologically, games push the boundaries of consumer-grade real-time simulation and artificial intelligence. Culturally, they are changing the way we play, learn, and interact and quintessential sites of broader shifts in knowledge consumption and production (de Castell & Jenson, in press; King, 2001; Scholder & Zimmerman, 2003; Squire, 2003). Games are in a transitional phase of cultural status, and it is no longer unusual to see game exhibits at art museums or university courses on gaming. The last 18 months have brought us dozens of academic, government, and industry conferences focused on the academic study of games, a substantial portion of which are dedicated to games and learning. It is beyond the scope of this chapter to identify all the major con-

ferences related to games currently running each year, but noteworthy U.S. industry conferences include the biannual Serious Games summits held in Washington, DC and in conjunction with the Game Developer's Conference, and the Education Arcade, held in conjunction with the Electronic Entertainment Exposition. Although the latter was founded in the United States, there are or have been similar conferences in Europe, Japan, and Australia. Academically, there are at least a dozen relevant conferences every year including the regular meeting of the Digital Games Research Association (DiGRA), and the University of Wisconsin-Madison's annual Games, Learning, and Society Conference. The Games and Learning research centers at the Massachusetts Institute of Technology, the University of Southern California, the University of Texas-Austin, and the University of Wisconsin-Madison are becoming more established, and are formalizing into degree programs at the undergraduate, master's, and doctoral level (for more on such developments within academia, see Carlson, 2003; Schiesel, 2005).

Games are one—although perhaps *the* quintessential—site for studying digital literacies as a medium of *interactivity,* both with respect to the human-computer interface and among constellations of users. Video games are the medium of the computer, and in understanding them, we can understand what it means to think, act, and learn in simulated worlds (cf., Starr, 1994). However, researchers are only beginning to theorize how games operate and understand what the medium will mean for learning, schooling, and society. Key questions that currently shape this growing field of studies include (a) What are the implications of an interactive medium for literacy? (b) How does access to globally distributed communities change traditional notions of meaning making? (c) How will a gaming generation react to traditional schooling with its grammar of teacher text as authority and student as product, when outside school this generation relives historical eras, lead civilizations, conduct forensic investigations, or can earn a real wage by buying and selling virtual currencies (Castronova, 2001; Shaffer, Squire, Halverson, & Gee, 2005; Squire, 2003; Steinkuehler, 2004, this volume)? Q9

This review of gaming research begins by examining the study of *games as artifacts*, and discusses the assumptions academics have made about and approaches they have used to study games. This section is followed by an examination of studies of *game playing as a social practice*. This focus encompasses research that investigates gaming in communities and social contexts. The final section of this review explores the implications of games for literacy, learning, schooling, and education writ large, and focuses in particular on studies of games in educational contexts. Across all three sections, I argue that games are an experiential, interactive medium where we participate (and cocreate) new worlds. Although these worlds are synthetic, simulated worlds, they are worlds constructed to provide particular kinds of experiences, which might be called *designed experiences*. Games literacy can be defined of as

developing *expertise* in designing rewarding experiences for oneself within a gameworld (particularly within the game's semiotic and rule systems). Notably, there is no one rubric by which expertise can be judged, and through studies of gaming communities, we see how different meanings are created, negotiated, and given legitimacy. Like video games themselves, gaming communities are interactive in nature, frequently functioning as spaces for participating in social practices with a life beyond the boundaries of the game itself. To date, efforts to create such programs in schools have shown some successes, but have fallen short of creating the kind of participatory culture that characterizes the contemporary popular culture landscape.

Games as Artifacts: Synthetic Spaces for Action

Q10

Video games' interactivity presents major challenges for literacy researchers. This includes asking how we can best treat authorship in a medium in which players have *agency* in creating the unfolding of events and in changing the very symbols and representations that comprise the game on screen (Jenkins, in press; LeBlanc, 1999/2006; Robison, 2005). In other words, without the player, there literally is no game. This leads to a core challenge for literacy researchers: How do we study a phenomenon that cannot exist without its players? For example, in the case of *Grand Theft Auto: San Andreas,* a first-person shooter game, the much publicized example of a player stealing a car, hiring a prostitute, and running her over is an emergent property of interacting rules; however, most players may never explore this aspect of the game and certainly would not use it as a regular strategy. Choosing a single set of interactions in a game for scrutiny is unproductive and disingenuous although it is a common tact of mainstream media reporting of games. Yet, clearly, there is a difference between *Grand Theft Auto* and *Sim City.* Just how to categorize, conceptualize, and understand the characteristics of games and particularly has been a core concern in games and literacy research.

Perhaps not surprisingly, then, much of the early (and current) theoretical work in video-game studies has aimed at defining what a game is and how games ought to be studied. The core organizing debates have centered on whether games should be studied from the perspectives of media studies (this orientation has been characterized as "narratology") or as a form of play (this orientation is often called "ludology"; cf., Frasca, 1999). These theoretical issues take on practical significance as researchers deal with questions concerning violence and media in games like, *Grand Theft Auto: San Andreas.* While media theorists tend to emphasize the importance of characters in a game and the narrative (and rule-based) consequences of game actions, ludolo-

Q11 & Q12

gists tend to emphasize the psychosocial dimensions of play (cf., Wadrip-Fruin & Harrigan, 2004; Frasca, 2003).

The so-called narratology/ludology debates have been unfortunate, since the interaction between "narratology" (taken here to mean characters, backstory, and symbols) and "play" (fantasy, removal of everyday rules and constraints, goal-driven activity) is just what makes games so intriguing (Juul, in press; Squire, 2005; Squire & DeVane, 2006). To continue with the case of *Grand Theft Auto: San Andreas,* part of its playful and theoretical allure is that it is a stylized representation of a ghetto; a representation that codifies symbols such as gang colors and allegiance into game concepts such as loyalty, respect, and giving players a set of symbols and icons to play with. Reports of research focusing on players suggest that gamers do wildly different things with the worlds available to them with this game and, in fact, appear to conceptualize the worlds and themselves within them according to their own lived histories (Squire & Devane, 2006; Vargas, 2005). One player interviewed by Squire and Devane used the game as little more than a "pimp your ride" car-customization kit (he wanted to pursue a career in car customization), one used the game as a chase-scene simulator as a relief from school, and another as fantastical escape from the suburbs. Thus, both technologically and conceptually, it is the (usually) seamless blending of agency, interactivity, narrative, semiotic domains, and expansive worlds that makes video games so interesting (Gee, 2003; Mateas, 2004; Murray, 2004; Perlin, 2004).

Q13

Games as Spaces

Jenkins (1993, 2004) argued that one useful way to understand games-as-interactive objects is to study them as spaces. Writing about Super Nintendo's *Mario* games, Jenkins and Fuller (1995) argued that the narrative structure of video games is like those of travel narratives. A game such as *SuperMario* is organized around exploration; the core game pleasures involve visiting exotic lands, meeting unusual characters, and unlocking secret passages. Jenkins and Fuller argued that structurally, this kind of exploration game shares much in common with John Smith's travel writing:

Q14

> Nintendo®'s central feature is its constant presentation of spectacular spaces (or "worlds," to use the game parlance). Its landscapes dwarf characters who serve, in turn, primarily as vehicles for players to move through these remarkable places. Once immersed in playing, we don't really care whether we rescue Princess Toadstool or not; all that matters is staying alive long enough to move between levels, to see what spectacle awaits us on the next screen. Most of the criteria by which we might judge a classically constructed narrative fall by the wayside when we look at these games as storytelling systems. In Nintendo®'s narratives, characters play a minimal role, displaying traits that are largely capacities for action: fighting skills, modes of transportation, pre-established goals.

Thus, while many cultural critics may look at Nintendo's games and see impoverished potential for interaction, Jenkins and Fuller reminded us that not all "classic" literature is as taught in freshman English; different narrative forms have served different purposes and taken on different forms/interpretations across different times. For example, in the early 1700s, most fiction novels of the time were regarded as having dubious quality, or, as in the case of Daniel Defoe's *Robinson Crusoe* (1719)—which was described as a "true history" and not a novel—as having little value as a resource to be used in schooling children.

According to Jenkins and Fuller (1995), the task for games scholars is not to argue *how* games necessarily fit within traditional forms, but to better understand how games are *transforming* previous forms. Taking (and fueling) the narratology/ludology debate, Jenkins (2004) argued that many games do, in fact, aspire to tell stories, but they do so by means of "space." Jenkins saw a basic contradiction between the linearity of traditional narrative structures and interactivity, which leads designers to telling stories through the arrangement of space so as to produce compelling narrative moments—or *experiences*. Jenkins found four ways that games use space to create narrative: (a) evocative stories (stories that reshape based on previous characters and media), (b) enacted stories (stories where players enact specific plot points), (c) embedded narratives (games where narrative events are embedded in artifacts in the world), and (d) emergent narratives (narrative experiences that emerge as the result of simulation). Jenkins situated his argument for understanding stories and games within a *pragmatic* framework that tries to account for how games are designed and played, drawing on interviews with game designers as well as a close read of video games.

In "The Art of Contested Spaces," Jenkins and Squire (2002) expanded on this notion of understanding games through spatial terms, describing different aesthetic approaches for creating *conflict* within space. Responding to critics who want to see a theory of digital games rooted in play and games (e.g., Eskelinen, 2004), Jenkins and Squire described how *contestation* is at the core of game design. Many video games, such as *Civilization,* remediate board games, while others, such as sports games, are about contestations of space on a metaphoric or strategic level (e.g., a basketball team that uses floor spacing well or defends the lane well). Enemies, puzzles, and a character's inability to move or affect the world obstruct access to space. Much of game play can be seen as "opening" new spaces—both physical ones (levels) and abstract ones (possibilities, or new experiences within the same physical space). Jenkins and Squire also emphasized the social space surrounding the machine, arguing that interfaces and game mechanics from the guild-user interfaces in the medieval-like *Asheron's Call* to the hand-held maracas in the music game, *Samba de Amigo,* are designed to promote social interaction. A critical feature of these spaces for Jenkins and Squire was that they evolve in response to users' actions. In role-

playing video games like *Morrowind,* players' actions open new lands, social networks, and possibilities for action (cf., Hayes, 2005; Kadakia, 2005). In snowboarding games, the camera, snow, and crowds all respond with exaggerated feedback on players' actions (e.g., crowds will cheer or moan according to the quality of the gamer's turn, slide, jump, etc.; the camera follows the player as she makes decisions about which downhill run to take and how to complete it). Or, perhaps most dramatically, in *Black & White,* the physical features of the world literally evolve in response to players' actions, potentially becoming everything from a tropical paradise to a barren desert, making the world a physical manifestation of players' actions.

Game Time: Games as Dynamic Systems

Games are dynamic systems, operating similarly to simulations, which begin with a particular set of initial conditions and then evolve through time in response to players' actions. Of particular interest to game theorists has been how game players reported transformations of their experience of time while engrossed in game play. Csikszentmihalyi (1990) described this phenomenon in terms of flow; the condition under which a player's skill level is optimally matched with the level of challenge faced, creating conditions in which the participant reports a feeling of being in the zone. Researchers such as Bowman (1991) have shown how video games are especially good at inducing and maintaining these flow states by adjusting complexity in response to users' actions. Myers (1991, 1992) sought to extend this hypothesis concerning play and time, and posited that game play unfolds through *semiotic transformations;* transformations where players' goals and oppositional structures iteratively evolve, resulting in an emergent, semiotically more complex self over time.

Q17

More recently, some researchers have begun to use *time* itself as an analytic axis when examining games and game playing. Jesper Juul's (2004) project, for example, has been to build a descriptive theory of digital games that uses time as one lens for examining game aesthetics. Juul was especially interested in how players interact with the *game state* over time. Juul used the term, "game state," to describe how the "game" may be static code on a computer, but as game play unfolds dynamically, the game and player together generate unique game situations. Sim City, for example, consists of no actual city, but rather a virtual parcel of land, a set of nouns (e.g., land, road), a set of actions (e.g., zoning), a rule set describing relations among these things, and the ability to watch these relations grow and evolve over time. Juul categorized games in terms of how game *play time* (time experienced by the player) relates to *game time* (whatever chronological system is employed in the game). Juul's work suggests that there is no one "static" game to be studied, only game *states* that emerge through the interaction of preset rules and player choices. Indeed, replaying a video game never unfolds exactly the same way as it did originally; therefore, issues concerning author, audience, and meaning making

are only amplified in game studies (Church, 2001; LeBlanc, 1999/2006; Robison, 2005).

Interactive "texts." This lack of a stable "text" poses one of the greatest challenges for educators. Designers of educational games, such as Aldrich (2004), have observed that the single biggest obstacle to creating educational games is moving from linear to dynamic content. Aldrich's model for designing educational games is built around *cycles of action* (cf., Games-to-Teach Team, 2003; Salen & Zimmerman, 2002; Squire, 2005). These cycles of action comprise of feedback loops whereby the player iteratively develops goals, takes an action, experiences feedback on that action, and shifts goals and actions accordingly. Similarly, Betrus's (1995, 2005) chainsaw model was another time-based approach to understanding games that emphasizes the cyclical, recurring nature of game play (see Figure 23.1). Betrus' model—which is particularly appropriate for action games—focused on the relationship between relatively short events (e.g., moves), sets of moves (e.g., sequences), and entire levels. Betrus used this model to examine the ways in which these elements were linked together by means of a theory of how they unfold over time. For Betrus, games were marked by small, repeating challenges punctuated by more difficult challenges that require a consolidation of previous skills (see Figure 23.1). This chainsaw model suggested how games are designed for learning; the player begins with small, relatively easy challenges, which are paced to produce automaticity. These regular events are punctuated with more challenging sequences, which serve to both disrupt and then strengthen or add to players' knowledge (cf., Gee, 2005).

Figure 23.1 A screenshot of Betrus' Chainsaw model. (Image used with permission from the author.)

Good games build on themselves by taking these smaller units and combining them to create increasingly complex situations that coalesce to become a holistic experience for the player-as-game-character. Gee (2004), described in Sheffield (2005), examined *Ninja Gaiden* as one such game that is designed to produce mastery. Gee showed how the first hour of *Ninja Gaiden* is constructed as a *de facto* tutorial, teaching the player how to read the game environment, perform isolated skills, perform sequenced skills, and finally, produce mastery by the first boss battle. Gee argued that *Ninja Gaiden,* when taken as a piece of instruction, is artfully constructed to produce learning, learning that is not just of any sort, but in this case, teaches the player to play like a ninja (as opposed to like Rambo).

Q24 & Q25

Cycles of choices and consequences.   Games are driven by these overlapping, interacting cycles of action; as legendary game designer Sid Meier (n.d.) has widely been quoted as saying, "Games are a series of interesting choices." Most any game—from turn-based strategy games such as *Civilization* to massively multiplayer games such as *World of Warcraft* (worldofwarcraft.com)—can be analyzed in terms of overlapping cycles of choices and consequences (Salen & Zimmerman, 2003). Games such as *World of Warcraft* excel at just this type of play phenomenon; players are constantly developing overlapping goals, so that a player begins a quest with the idea of earning experience points, but midway decides to gather materials needed to create a new weapon, as well. Once the quest is completed, the player might have nearly enough raw materials (e.g., a certain amount of copper) to craft a new weapon, so she keeps playing in order to gather what is needed in order to meet her "new weapon" goal. Just before she gathers enough copper, however, she discovers a new land that she wants to explore. These overlapping cycles of choices and consequences are in part what make games so "addictive." In *Civilization,* as another example, players report a "just-one-more-turn" phenomenon, whereby a player develops a web of interlocking goals that overlap in such a fashion that she stays playing for hours on end, hoping to experience the results of one set of decisions (e.g., completing a quest to obtain new equipment), but in the mean time, becomes engrossed in experiencing another (e.g., collecting flowers to raise herbalism skills). In this fashion, many good games are specifically designed so that players always feel as if they are on the verge of "doing something interesting." Roughly translated, this means being put in a novel situation with the opportunity to think creatively while solving a problem (McKenzie, 2005; Shaefer, 2004). This need to keep the player in a constant state of "nearly doing something interesting" is what drives game designers to constantly iterate and reiterate game designs through play testing, so as to achieve a fluid game experience for the player.

Games remediating music. Emerging from this work on games and time is a sense that games are a deeply *rhythmic* medium that may share as much with music and dance as they do with visual storytelling. This is not to suggest that there is no rhythm in storytelling (e.g., oral storytelling is especially rhythmic), film editing, visual composition or theater. It does however, persuade us to go beyond games' graphics and consider them as experiences that are fundamentally multimodal (cf., Lemke, 1998).

Q26   Squire (2001) and Squire and Smith (2005) connected games with a tradition largely overlooked in game studies: virtual soundscapes. Building on Jenkins' notion of narrative architecture, Squire and Smith described games as a sort of *sonic architecture,* operating much like music, which, in the words of Ong (2002), places the listener at the center of the world. Like music, the aesthetics of many games is less about the unfolding of a plot than it is about the *feeling of being* somewhere. Games from *Samba de Amigo* to *Quake* operate through aesthetics of *rhythm* and a feeling of empathy with the game system (cf., Gee, 2005). For example, in *Arcadia,* a Web-based game developed by gamelab, players play simplified versions of four "classic" games simultaneously, each of which has its own distinct rhythm, producing a polyrhythmic sensation in the player. Friedman (1999) argued that a primary pleasure of playing Civilization is entering the system, developing an almost cyborg relationship with the computer whereby the game world is one that we inhabit via the game controls, which, in turn, become an extension of the self. Even though *Civilization* is a turn-based game, its turns and overlapping cycles of interaction have their own cycles rhythms, producing a particular kind of feeling (which notably, the designers have sped up in the current version, *Civilization IV).* Gee (2005), as well as Jenkins, Squire, and Tan (2004), have argued that designing video games where we can enter physical, biological, or social systems is a promising future for the design of educational games, as in the case of *Supercharged!*, a game developed at MIT where players can literally enter the world of electromagnetism, thereby gaining a sense for how scientists think.

Not coincidentally, the Holy Grail for many game designers has been to create "interactive jazz," whereby players can spontaneously act and react in meaningful ways with the computer (or one another via the computer). By giving the player access to the controller, games place the player as both a listener and a participant in the orchestra. Indeed, at first glance players may seem to be largely constrained by game interfaces, but examinations of rhythm/action/dance players shows how players use the space outside of the game to be creative, constructing elaborate dance moves with their hands, arms, and heads, treating the game as a *performative* space. On at least some level, to be literate with games means being competent, if not good with them, as games are ultimately something one does. When we study games, on some level we are also studying the game performance.

Game as performance.   Fundamental to any notion of a game-based literacy is that the player is actively engaged in producing not just meanings, but tangible actions on screen and in real spaces. To be literate in the gaming medium means to be able to do things with games; one cannot imagine claiming to be "literate" with games, yet never have finished a game (or substantial portion thereof). Squire (2005) noted that this emphasis on performance permeates much of gamer discourse, drawing on analyses of the forum-listed Frequently Asked Questions (FAQ) for *Viewtiful Joe* to argue that underlying many games' community discourses is a *functional epistemology,* whereby *doing* in the game world organizes all accompanying literacy activities (game cheats, FAQs, and discussion). Gee (2003, 2004, 2005) contrasted this notion of literacy with the ones found in school; imagine a science classroom where students first do scientific investigations and then read books, research cheats, and discuss with peers to aid their "doing" science. Games push our theoretical notions of learning and literacy, firmly unseparating knowing from doing.

As evidence of this performative, functionalist nature of games, Clinton (2004, analyzing *Prince of Persia*) noted that the first thing gamers do when picking up a new game is to press different buttons on the game controller (e.g., console control or computer joystick), seeing what each character (or other player role) *can* do in the world, because it is through what we *do* in game worlds that we come to know them. Also analyzing *Prince of Persia,* Davidson (2005) described this opening portion of game play as *involvement,* where the player is generally involved in the unfolding of action but is yet to be immersed, invested, or really controlling the action in a meaningful way. Through the careful, ever increasing orchestration of obstacles, narrative events, rewards, and new capacities, games usher the player into a state of immersion and eventual completion. Davidson observed that the final stage (perhaps most interesting for educators) is one of *investment,* where the player has been immersed in the game world, has committed to being the character for a sustained period of time.

Transformations over time.   Gee (2005) argued that it is these transformations into "player as game player" (e.g., "James Paul Gee as Lara Croft") that are of most interest to educators. As discussed earlier, the timescales of video games are interesting themselves and are tied to a player's investment in the game. A board game (like a book or film) might be played in a few hours; however, a common commercial single-player video game such as *Viewtiful Joe* is usually played over a number weeks. Strategy games such as *Civilization* or action games such as *CounterStrike* are more akin to hobbies or sports and are played over months and even years (cf., Wright, 2001). Similarly, the average massively multiplayer gamer plays any one title for 6 months to a year, on an average for 20 hours a week (see Steinkuehler, this volume). Timescales may be a production notion for educators who seek to understand the transformations

that occur through game play, as they suggest how different game experiences might create different learning trajectories (Lemke, 2005; Squire, 2005).

Indeed, Lemke (2004) argued that games are especially interesting laboratories because they allow us to examine learning over timescales, zooming from the microaction to macroparticipation in communities of practices. As we shift the timescales of game activities, we see different trajectories of participation. On the microsecond level, we can analyze a specific move within a game environment (e.g., a kick or punch in a fighting game). Building on Lemke's (2002) framework of learning over timescales, we can see how any particular game practice (e.g., a executing a kick or punch) forms through the affordances of actions occurring at smaller intervals timescales (visual perception of data in the environment, muscular movements manipulating the controller), as well as broader encompassing systems (the duration of a battle or fight). Video games are intriguing combinations of closed and open systems; game systems are ultimately hard coded and knowable, but their emergent properties are so complex that they are for all practical purposes open-ended problems (Steinkuehler, 2005).

Summary

Video games are constructed worlds, worlds that are built according to particular sets of rules that allow certain types of action. As such, they are *ideological spaces;* worlds constructed by particular viewpoints that tend to lead toward the expression of particular ideas (Squire, in press). However, they also are participatory in that they invite players to *inhabit* characters that have particular capacities in those worlds and that are designed to elicit particular performances or "ways of being." These performances are situated within communities of players that also remediate the game experience. As an example, compare different groups of *Quake* players. Highly competitive Quake players consider the game a competitive match of skills, even turning down (or off) graphic features to maintain a competitive advantage by speeding up their frame rates (the rate at which the computer displays the game state). Casual players may enjoy the graphics and character designs, whereas machinima players—those who use the game engine to create movies—don't particularly care about the game play at all. Indeed, different game communities construct gaming very differently, and have competing ways of framing game play, which may eventually stabilize into accepted systems for "reading" the technology (cf., Bijker, 1995). At the current moment, however, games are noteworthy for their interpretive flexibility, with different game meanings tied to different game communities.

Game Communities

Literacies are enacted and legitimized through participation in communities (Gee, 1990; The New London Group, 2000). As with any literacy, it is not

enough to generate meanings from texts; interpretation occurs within communities that legitimize particular perspectives and ways of knowing while marginalizing others. As Squire (2005) pointed out, we see this same phenomenon in game communities, the meanings of games are argued and debated in various communities, with each interpretive community generating its own criteria for what constitutes a compelling game, how games ought to be read, and what a game such as *Grand Theft Auto* is "about" (Weise, 2004). These arguments range from whether "story" is a legitimate ground for critiquing a game, or the extent to which game sequels remain faithful to the original property. Critiquing texts without considering the interpretive frames in which they are studied/used is problematic in any context because it privileges the interpretive systems of academics, cultural critics, and politicians over those who have an investment in the media itself. In short, studying games as texts without taking into consideration what players actually *do* with them is problematic for a number of reasons. Some of these are discussed next.

Mirroring the history of media research more broadly, game scholars have been relatively slow to study games communities, first studying game boxes, then games, and not until recently, actual people playing games (Provenzo, 1992; Squire, in press). Perhaps for obvious reasons, the most comprehensive and well-studied examples of gaming communities to date are of massively multiplayer gaming space (cf., Steinkuehler, this volume). Massively multiplayer games feature thousands of people interacting in real time from around the globe. Although massively multiplayer online games are not the focus of this review, research on these games connects to research on more traditional gaming communities in at least two major ways. First, guilds or clans—a key community unit within massively multiplayer online games—are a social structure that frequently spans and crosses both massively multiplayer online games and traditional games (Steinkuehler, 2005; Jakobsson & Taylor, 2003). Second, game literacy practices that characterize massively multiplayer online game plays are frequently core to single player games as well. For example, in Sweden, where the video game *CounterStrike* is the third most popular sport, companies that sell and maintain server software that supports game communities reported that players spend 4 hours using community features (chatting, participating in forums, reviewing film clips) for everyone 1 hour they spend playing (Squire, 2005).

Studies of gamer communities suggest the importance of not just focusing on games, but looking at gamer *discourse* to understand emerging digital literacies. Thus far, much of the academic work on games literacy has focused on the construction of games more than the social interactions surrounding them, which is understandable given that games are the leading consumer applications of artificial intelligence, real-time simulation, and interactive narrative. Studies of games and their attendant social structures suggest, however, that although digital literacies are driven by technological shifts, they

are instantiated and then promulgated through social institutions and structures such as guilds, clans, forums, affinity spaces, and self-organizing learning systems like Apolyton University (cf., Squire & Steinkuehler, 2005). These sites are critical expressions of games culture, sites where gamer discourse is formed and maintained.

Games as Liminal Spaces

Talmadge Wright and colleagues' research on *Half Life* and *CounterStrike* communities is one of the longest-running studies of gamer culture (Wright, 2002; Wright, Bouria, & Breidenbach, 2002). *Half Life* is one of the most commercially successful and critically acclaimed video games of all time. *CounterStrike* is a fan-produced modification for the game that has attracted a dedicated following of millions of players, and for years was the dominant competitive multiplayer squad-based shooter game. As Wright (2002) noted, at first glance, *CounterStrike* is an incredibly violent game with juvenile-discourse patterns. Wright and his colleagues' studies revealed not anarchy, but rather, a complex social world with rules and social conventions organized around an ethos of "having fun." This core feature of *CounterStrike* communities is constituted through creative-player actions, which include players' verbal banter and one-up-manship, creative reappropriation of game actions (such as committing suicide in a humorous manner to amuse one's peers), and production of original art that can be viewed in-game. Wright (2002) argued that the meaning of *CounterStrike* is generated by its players who have created a set of mores that are socially reproduced and handed down from one generation to the next. Player *production* is at the core of this community, and the ability to entertain and amuse is held in highest regard.

Player production was also the focus of Zhan Li's (2003) master's thesis research: *The Potential of* America's Army *as Civilian Public Sphere. America's Army* is the controversial $8 million video-game/recruiting tool built and distributed by the U.S. Army. The goals of the project were to "support Army recruiting efforts, particularly of teenagers with high-tech aptitude and skills; raise the positive profile of the Army as an interesting, high-skilled organization; and to promote the revival of military-civilian grassroots contact" (Li, 2003, p. 8). Li's ethnography examined how the activities of three exceptional gamer groups— (a) real-life soldiers and veterans, (b) Evangelical Christians, and (c) hackers—intersected with the stated and unstated purposes of the game.

Li (2003) found that *America's Army* functions as neither propaganda for the state, nor as a site where hacker culture wholly subverts the culture of the game, but rather as a (contested) *liminal* space that where everyday relations can be (and are) reconfigured for the purposes of play. Li's notion of liminality differs somewhat from Wright and colleagues (2001), in that whereas Wright's notion of liminality was largely about activity within the game space,

Li situated player's activities within other social spheres (i.e., military service, religious). Even though the formal game-play elements of *CounterStrike* and *America's Army* are essentially the same, the forms of play that unfolded in each were quite different. Li argued that *America's Army* functioned as a space where the "rationalities" of the state, military, commodity, and people's lived experiences are in collision. For example, Li observed that many players stayed away from *America's Army* during the initial phases of Gulf War 2, wanting to preserve the "gameness" of the space; that is, they did not want the seriousness of the actual war to be compromised by "playing at war." Similarly, Li described soldiers and veterans gamers in the *America's Army* community as soldiers acting at playing soldiers. That is, these soldiers and war veterans were using *America's Army* as a context for inhabiting stylized identities as soldiers. Li used the lens of army, Christian, and hacker groups to show how the space of *America's Army* is a peculiar mix of both the intentions of its designers (a military-owned space for civilian/military relations) and the ideologies of its inhabitants.

These studies suggest that games' most potent social value may be their *liminality,* their capacity to function as contexts within which participants can play with new identities and ideologies. As role-playing game designer Warren Spector (2001) has argued (building on the work of Frederick Turner), every culture has provided spaces where the dominant social order is temporarily reshaped, and people have (at least temporarily) the ability to pursue experiences with reduced (or removed) social consequence (cf., Jenkins 2005a). Li's (2003) study suggested how games are coconstructions of the designer and participant, in that emergent activity reflects the goals of the participant constrained within the parameters of the game spaces, which are the residue of designers' goals. In *America's Army,* for example, it matters greatly that the representations, symbols, game rules, social rules, and capacities for action are based on those of the military. However, as researchers, we know little about their meanings until we examine how they are taken up by players.

Q42

Q43 & Q44

Games as Affinity Spaces for Learning

Gee (2003; 2004) argued that video games are powerful models for learning. We can examine the technical design of games, how games are *designed as experiences* to produce certain feelings, skills, and knowledge; games can also be studied as social *spaces;* spaces where people congregate to learn. Examining forums for *Age of Mythology,* Gee (2004) proposed that games are affinity spaces, spaces where learners congregate based on personal interests rather than on race, class, economic status, or background. Gee described several key features of such forums: (a) participation is open to any user; (b) newbies and veterans share a common space; (c) participants have the power to shape and transform the environment; (d) knowledge and expertise is distributed across players; (e) multiple routes for participation, success, and status are presented;

Q45

Q46

and (f) participation in the affinity space reshapes the "attractor" (i.e., game) itself. Gee contrasted these affinity spaces with communities of practice, arguing that affinity spaces are much more common to today's digitally mediated society where technologies make social boundaries permeable, participation open, and knowledge production decentralized.

As such, affinity spaces are more than just intriguing places to spend our off hours; they are exemplars of the social organization in the modern digital world, which are changing contemporary notions of literacy. Gee (2004) connected the rise of affinity spaces to broader patterns in the new capitalist world (cf., Squire, 2004); others (e.g., Jenkins, in press) have described similar trends cutting across entertainment, political, and educational media. Today's digital consumers do not have a stereo or piano; they have a suite of digital tools where they can "rip, burn, mix," and then publish their creations via the Web, using digital services to even turn a profit if their work is good. Core to such affinity spaces are opportunities and expectations for *participation*. The rise of digital production and communication tools make participants producers, not just consumers of media, and games are a leading technology for such changes (Squire & Steinkuehler, 2005).

Self-organizing communities for learning.　These studies of affinity spaces beg the question of how to design learning systems for a digital age. Although substantial learning occurs in such affinity spaces, these spaces are not designed explicitly for learning. What might a game-based learning system build on these principles look like? To better understand this, Squire and Giovanetto (in press) have been examining Apolyton University, an online community of game players that has evolved to teach other players to become expert gamers. Squire and Giovanetto argued that unlike most other institutions of higher education, the system is driven by *learning,* with class practices, courses, and administrative structures all taking a backseat to the demands of learning. The core practices driving the community are playing *Civilization III* and (a) redesigning a common game modification to improve its playability; (b) conducting During Action Reports that capture participants' cognitive activity and serve as the basis for discussions, and (c) proposing and developing new "courses" for the community. As players create and change courses, they create custom game modifications to illustrate their arguments about the game, and collaboratively build a "master" curriculum/game file.

Squire and Giovanetto (in press) argued that participating in Apolyton University is a process of transitioning from a game player to a game producer. Players enroll as advanced players, having spent dozens, if not hundreds of hours with the game and having mastered its basic rules. As players begin to identify and exploit loopholes, they propose and implement changes to the games' rules, identify superior strategies, and invent new game-rule systems,

Q47

Q48

Q49

Q50

including custom modifications and scenarios. In one course, lead artificial intelligence designer for the game, Soren Johnson, joined the discussion to correct a misconception about how the game's artificial intelligence works. As a result of the ensuing discussion, several players from the community were recruited to participate in the game play testing and balancing, completing the cycle from game consumers to producers.

Self-organizing learning environments are unlike traditional online learning environments in that they are open systems with permeable boundaries (Squire & Giovanetto, in press; Wiley & Edwards, 2002); participation by participation is open to anyone and the "classroom" activities are both transparent to outsiders and expected to have an impact on broader social practice. In the case of self-organizing game communities such as Apolyton University (but there are other ones, including Civfanatics, Madden Football forums, or specific sites within the Warcry network) sites of learning spontaneously organize around authentic, meaningful questions and typically result in changing the design practice, effectively reshaping the context of their learning (which Gee would call the "reshaping the attractor"). As such, self-organizing learning communities share much more in common with cutting-edge research communities than with formal classrooms. Their existence suggests both an implicit critique of schools: Why should I study computer science or writing classes in order to get a job in the entertainment industry, when I can participate in learning communities that offer trajectories of participation where I might enter the industry? Game-based self-organizing learning systems are intriguing to educators for how they are at the cusp of participatory media culture; in today's digitally mediated media environment, meaningful participation involves opportunities for participating in the *production* of media. These examples also suggest design patterns for the design of game-based learning environments, which will be discussed in the final section.

The consequences of participation in gaming practice for literacies.   Studies of digital-gaming communities as liminal spaces (e.g., Li. 2003, affinity spaces (e.g., Gee 2004), and self-organizing learning systems (e.g., Squire & Giovanetto, in press) suggest how games are more than a technology; they are a maturing medium with attendant social practices. The preceding studies suggest profound shifts in participants' relation to knowledge, media, information, and social institutions (cf., Squire & Steinkuehler, 2005). These practices include (a) *producing* as well as consuming information, (b) the strategic use and critique of digital spaces that promote their particular values, (c) the ability to produce meanings across multiple representational forms (i.e., texts, visuals graphs, charts, game modifications), (d) texts that circulate within and across communities, (e) trajectories for participation in social systems, including game journalism, design, and criticism, and (f) the repositioning of written texts from objects of

Q51

Q52, Q53
Q54

authority to resources that are used in support of (digitally mediated) practice. The lasting social consequences of these shifting practices are only beginning to be understood.

Preliminary survey work on the games' generation suggests that these discourses are powerful, shaping our notions of learning, literacy, and expertise. Surveys of gamers show that they have an increased appetite for risk, a greater comfort with failure, a stronger desire for social affiliations, a preference for challenges, a capacity for independent problem solving, and a desire to be involved in meaningful work when compared with nongamers (Beck & Wade, 2004). Underlying Beck and Wade's argument is a notion of changing literacies; gamers have grown up with a medium built on assumptions unlike those in print cultures (e.g., a game engine can be tinkered with, a text is not necessarily print based or defined by book covers); game players are coauthors along with game designers, coconstructing the game-as-text through their own action (cf., Robison, 2005). Gamers have grown up in simulated worlds, worlds where anything is possible, and where learning through trial and error is expected, information is a resource for action, and expertise is enacted through both independent and collaborative problem solving in self-directed tasks (Simpson, 2005).

How students will react to traditional schooling in this digital era is a question of increasing importance that digital-literacy scholars are beginning to ask. Kevin Leander and colleagues investigated the in and out of school literacy practices of one gaming youth, finding that texts and literacies operate quite differently in and across these contexts, and which actually serve to bring down traditional home/school conceptual divides in education research (Leander, 2005, in press). Using Actor Network Theory, Leander and Lovvorn (in press) found that multimodal texts in gaming environments function as resources for action. These texts come from official and nonofficial sources and different media (strategy books, Web sites, in game text and nontext resources; cf., Squire & Steinkuehler, in press; Steinkuehler, 2005). Within a game environment, the meaning of texts (and their legitimacy) arises in response to their efficacy for action. Leander and Lovvorn contrasted this type of meaning in texts with those in classrooms, where texts are given authority by their *distance* from the student; the teacher's notes (wherever they came from) and published works are given the most authority, and students' work is to effectively reproduce those notes for legitimized authority. In contrast, texts in game cultures are "lively," flowing across boundaries and borders as they serve social functions, texts in classrooms are remarkably *static*, designed for a student or teacher's consumption, but having little impact outside of the classroom. Leander and Lovvorn showed how in the case of one typical student (Steve), text (and all of its associated artifacts, e.g., notes) is prepared and produced exclusively for a teacher's consumption, and its life ends abruptly when the teacher grades it, having no discernable impact on the field, the teacher's thinking, other students' thinking, or Steve's life.

Q55

Q56

Q57

The preceding studies of gaming cultures suggest how emerging game literacies are a product of both games-as-designed-artifacts as well as the game cultures in which they are created and enacted. Indeed, the values that are expressed in the design of games do not emerge from thin air; they are the product of particular technological cultures that spawned them, which, as Stephen Levy (2001) argued, can be traced principally to hacker cultures in terms of origin. Games are then enacted in cultural contexts, where such values are promulgated. Through sites such as Apolyton University or Game FAQs, we can see examples of gamers creating social structures that initiate newcomers into these cultures. The affinity spaces that Gee (2004) described are the result a co-evolving structure of emerging technologies (games and modification or "modding" software, the Internet, wiki software, online-community software) and the communities that spawn them. If the games themselves serve as attractors, then educators may benefit by studying learners' trajectories through these spaces, focusing on how values and identity emerge in practice. To date, there are still comparatively few such studies, but future literacy scholars might benefit by examining how participants learn through participation in these structures.

Games in Schools

Thus far, the discussion of games and learning has focused largely on learning and literacy outside of classrooms. As Warschauer (this volume) observed, emerging literacy scholars have generally sought to understand (a) how literacies are changing in response to emerging technologies, frequently with a focus on how traditional schools are failing to respond to these changes (b) the power structures and dynamics behind literacy regimes, and (c) how literacy can be improved (or the impact of media on learning). The incongruency between emerging game and school-based literacies has meant that necessarily, the bulk of the research on games literacies has taken place outside of classroom contexts. There are, however, examples of research programs where game literacies are examined in classroom contexts, usually occurring with a design-based research framework. Design-based research studies seek to posit and test hypotheses by creating learning contexts and then examining the processes by which they function (Barab & Squire, 2004; Cobb, Confrey, diSessa, Lehrer, & Schauble, 2004; Design-Based Research Collective, 2004). Studies of games in classroom settings suggest that game play can be the basis of meaningful academic learning experiences, but the epistemological assumptions of learning through game play are at odds with those of schooling. This suggests a need for radical transformations of schooling to meet the needs of a digital age (Squire, 2004).

Games, simulations, and play have a long history in education and the study of human learning more generally. Legendary game designer Chris Crawford (1984) remarked that games are "the original" educational technology,

reminding us that most mammals learn through play—creating and play-ing within spaces set apart from the every day. This rhetorical framing of game—such as, play as development—is but one of many rhetoric of play. In his magnum opus, *The Ambiguity of Play*, Sutton-Smith (1997) argued for the centrality of play in human experience contending that play has been con-ceived primarily along seven or so rhetorical lines: the ancient four, (a) fate, (b) power, (c) communal identity, and (d) frivolity, and the modern discourses of (e) progress, (f) imaginary, and (g) the self. Sutton-Smith used this notion of rhetoric to describe the different theoretical frames that we bring to a phenom-ena that then determines what we count as play (particularly how much of a context we count as play; i.e., is it an individual or an individual in context, or an entire society), how we interpret play (what counts as potential outcomes of play), and so on. As an aside, Sutton-Smith's work has been most closely asso-ciated with the work of the ludologists within video-games research, although those associated with the "narrative" camp also draw from his work, which suggests Sutton-Smith's work cannot be confined to a single theoretical orien-tation. Indeed, after a lifetime of studying play, Sutton-Smith seems to be most fascinated by the malleability of play, how psychologists, sociologists, anthro-pologists, and media scholars attach their own rhetorical frames or stories to play. For example, Piagetians might look at a child playing with blocks and see an individual's cognitive-development trajectory, whereas a Vygotskian might look at the broader social context of play (who gave the child the blocks, what is she building, why, and so on). "Play" is such an ambiguous term that the ways in which it is used and interpreted usually reveal more about the observer and their theoretical framework than the phenomenon itself (Squire, 2003; Sutton-Smith, 1997).

Although Sutton-Smith (1997) was writing about nondigital games, these same rhetorical lines operate when digital games enter popular discourse as well. In particular, they are evoked when social issues around games—such as games as an educational medium or the consequences of violent game play arise. These rhetoric were evoked in the United States, for example, in the wake of the Columbine High-School massacre (cf., Jenkins, 1999, 2000). As the public searched for ways to make sense of these tragic events and debated the role that video games may or may not have played in the teenage boys' development into mass murderers, games (particularly DOOM) were (once again) cast in socially threatening roles in order to describe how they might be affecting "gullible" youth (cf., Anderson & Bushman, 2001; Anderson & Dill, 2000; Bushman & Anderson, 2001; Gentile, Lynch, Linder, & Walsh, 2004). Indeed as Williams (2003) concluded, video games are a lightning rod for social and technological change, drawing out fear of technology and youth culture from those unfamiliar with them. Similarly, Squire (2003) argued that games are a Rorschach test for educators usually revealing as much about

authors' optimistic or pessimistic view of technology and social reform as about the technology itself.

Fostering Games Literacies

One approach to fostering game literacy is to build educational programs where students develop games literacies through playing, studying, and designing games. Buckingham (2002, 2003, 2004) and Sefton-Green (2003, 2005) raised the question of how to consider games literacy in the context of the other digital/electronic/media literacies that exist (cf., Willett, 2003). Through projects such as *Shared Spaces* and *Making Games,* students analyze, categorize, and understand games with digital design tools. Buckingham (2005) emphasized critical and cultural literacies as the key literacies to foster through games. In a similar vein, Squire (2005) raised issues concerning both what constitutes games literacies and who legitimizes what literacies (e.g., game developers, different constituencies of players, academic researchers). If one were to take the most extreme position, few outside the gaming industry—certainly few academics— would be literate in how games are designed and constructed. Further, given the interpretive flexibility of video games, academics run into thorny issues around whose interpretations of these games are legitimized. Critical and cultural approaches to games are certainly important, but to date most critical approaches have reflected the norms, value systems, and sense-making apparatuses of baby-boom academics rather than gamers themselves (cf., Provenzo, 1991).

Q68 & Q69

Q70

Q71

Q72

Q73

Squire (2005) argued that a fruitful approach to fostering games literacy is to use historical role-playing games, such as *Pirates!* as the focus of inquiry-based units where students develop media-literacy skills. Squire used Firaxis' *Pirates!* with middle-school students to investigate how games are made, how they represent history, and how they connect to other disciplines such as art, music, or computer programming. Historical role-playing games take abstract issues such as authorship, narrative, choices, and consequences and root them in particular historical eras, making consequential issues such as representation, interactivity, and meaning. In this program, developed in conjunction with Firaxis studios, students play *Pirates!,* critique the game for historical accuracy and inaccuracy, and interact with game developers, learning how the game was made, including the particular roles (i.e., 3-D programmers, AI programmers, interface programmers) available at game studios. A critical component of this program is identifying specific learning, career, and identity trajectories for students to adopt. Indeed, Squire argued that in one classroom, the most important learning was not any particular historical insight or media skills, but rather the realization that their indigenous literacy practices (e.g., using an instant messenger to contact colleagues, using Google.com to look

up unknown information) were core to life in an information-rich knowledge-based economy, even if they were prohibited in school.

Jenkins and colleagues (2005b) used competitive game-design workshops as another model for creating digital-games literacy. Working with SONY Imageworks and other game and media programmers, Jenkins et al. described a program where students are given the task of identifying an existing media property, creating a game design and pitch materials, and then doing a 20-minute design brief before a team of experts from academia, industry, and business. Existing properties are chosen because they reduce the stress of writing an original story, minimize the dominance of one team member, encourage a close analytic read of the property, and rethink how that property would work as a game. Students listen to lectures from inside and outside the industry on contemporary trends, the design of effective game characters, and market research. Groups are interdisciplinary and structured to include participants with media, business, and design expertise. Core to this project is the students' real-life approximation of an actual "pitch" session, so that the criteria for an effective project are aligned closely with those institutions outside of school (for-profit game companies, nonprofits, and foundations).

These three sets of examples are but three examples of games literacy projects that attempt to blend close, critical read of games with transitioning students from thinking as media consumers to media producers. Combined, they pose interesting questions for media literacy: How far do we go in insisting that students understand "the production" of media? How many English teachers would be considered *literate* in writing, if understanding the economics, politics, and social ramifications of book or newspaper publishing were considered a prerequisite to teaching English? Further, such projects, by attempting to tie to the commercial games industry, may risk focusing on issues (profitability, market share) while overlooking others (underrepresented voices). Regardless, these studies also emphasize that the biggest challenge in developing a critical vocabulary around games may not be with students, but with teachers, parents, and administrators who treat games as trivial, rather than influential cultural artifacts and practices.

Games as Designed Contexts for Studying Learning

Although there is a long tradition of games in education (particularly instructional design), historically there has been very little useful research into the effectiveness of games and simulations in instruction, with common critiques being that games research has lacked a coherent theoretical focus (Gredler, 1996, 2004; Rieber, 1996). One of the few fruitful paths of research has been psychological studies by Mark Lepper and colleagues, who used games as sites for studying highly motivated learning. Malone (1981) and Malone and Lepper (1987) examined games to build a theory of intrinsic motivation, finding that "good" games create highly motivated learning through challenge,

curiosity, control, fantasy, competition, and collaboration. Cordova and Lepper (1996) built prototypes of educational games in mathematics that leverage these properties in order to increase motivation, finding that more highly motivated students performed better than their peers on similar mathematics tasks. These well-designed studies suggest how design-based approaches can lead to fundamental insights into cognition that improve the quality of instructional materials.

Building game-based learning environments. The most overt attempt at designing learning environments based on the technologies, learning principles, and social values of games to date has been MIT's Microsoft-funded Games to Teach Project. The Games-to-Teach Team (2003) was grounded in the premise that for too long, educational technologists have treated computers as technology rather than as media, thereby missing opportunities for designing powerful learning environments in the process. Holland, Jenkins, and Squire (2003) described their 15 conceptual prototypes as ideal sites for generating and testing game theory, using prototypes as sites for identifying and exploring new avenues for game theory. These prototypes range from historical role playing to physics-simulation games to massively multiplayer engineering games, each of which seeks to both explain how games work and to argue for new models of games.

One such game, *Supercharged!,* situates the student in the role of piloting a spaceship that has the power to adopt the properties of a charged particle; this design is in keeping with research that found expert physicists reason by imagining themselves literally "inside" physics problems. Students work through a series of maze-based levels based on popular platform game conventions that are designed to build their conceptual understandings of electrostatics, starting with Coulumb's law and moving through most of an advanced high-school physics electrostatics curriculum (Squire, Barnett, Higgenbotham, & Grant, 2004). Squire and colleagues found that students not only developed better conceptual understandings of physics, but a better understanding of *why* representations in their textbooks look the way that they do. Further, Squire et al. found that lower achieving students emerged as leaders in their classes and showed the highest gains on pre-post tests. Teachers interviewed believed lower achieving students outperformed high-achieving students because the activities and assessments in the unit did not primarily involve reading, interpreting and producing text, unlike most school activities.

Similarly, Dede and colleagues (2005) developed *Riverworld,* an interactive 3-D environment where students investigate a host of environmental problems in an early 20th -century village. The purpose of *Riverworld* is to help low-achieving students perform better in science through complex inquiry-based tasks where they must identify problems, collect data, synthesize information, and generate conclusions based on their understandings. Dede and colleagues

found that not only did students learning in *Riverworld* perform better than students in a control group, but attendance rates were higher, there were less disruptions in class, and teachers and students alike reported higher levels of motivation. Importantly, students showed improved understanding of scientific inquiry as a result of participating in the program.

In another effort to apply gaming principles to formal learning environments, Barab and colleagues (2004, 2005) designed *Quest Atlantis,* a 3-D environment aimed at helping elementary- and middle-school students learn science more effectively. Just as games are designed according to the values of a particular media property, *Quest Atlantis* is designed according to social commitments including an affirmation of diversity, personal agency, social responsibility, environmental awareness, healthy communities, and compassionate wisdom. The tasks and challenges of *Quest Atlantis* are designed to foster these virtues, creating a liminal space where students can inhabit a world that acknowledges and fosters these values. Barab (in press) argued that students participate in *Quest Atlantis* out of a desire to help others, which suggests that contemporary models of motivation have omitted altruism as a powerful source of learning and virtue for designing learning environments.

These studies point to the rich pedagogical potential of games, but also to some of the limitations of creating pedagogical programs based on game-based principles in formal learning environments. All of these projects, while well funded, are very primitive compared to even the most basic commercial video games. Whereas role-playing games are designed to be played over 40 or more hours, most of the "units" developed with classrooms in mind were forced to work within a traditional school environment where students have a dozen hours at most for learning about a particular topic or concept. When compared to a contemporary massively multiplayer game, where participants *average* 20 hours per week online, students have significantly less time to become involved and to develop identities and investments within these virtual environments. Last, while engaging, such environments frequently pale in design sophistication compared to commercial games. As a result, a number of games researchers have begun experimenting with using commercial games in classrooms, hoping to use such games as "attractors" for academic intellectual work.

Teaching and learning with commercially available entertainment games. Despite the broad popularity of management simulation, historical strategy, and games such as *Sim City,* there have been very few studies to date of such games being used in classrooms. In perhaps the first study of such a game being used in a classroom environment, Squire (2004) created custom historical scenarios for the game *Civilization III.* Squire's scenario was designed to build on the game's underlying geographical/materialist simulation model in order to help low-achieving high-school students understand key processes in world history (cf.,

Manning, 2003; McNeil, 1968). Squire found that the game created a liminal space for students to explore world history, leading to basic background conceptual understandings in history, as well as deeper historical understandings of broad causes in history, which Dunn (2001) has called the "patterns of change" model of world history. Students previously marginalized from the study of history found spaces for their identities and lived histories to enter historical narratives. In particular, they found exceptionally rewarding that the "Rise of the West" might be seen as a particular product of its geographic location and access to trade networks (and ensuing colonization).

Attempting to use complex games in school-based learning environments also poses substantial challenges, however. Squire (2004) reported many of these challenges: A single game of *Civilization* can take up to 20 hours to complete. The interface is opaque to new users, as it employs conventions built up over generations of strategy-game iterations. Many girls do not immediately read the game as a girl-friendly play space, as games have been historically gendered male, as has game playing culture. Further, research on games suggest the existence of the game-privileges literacies (e.g., generating original interpretations of history) that schools devalue. As Squire described, the game "changes the rules of the game" on students, and it can be difficult to establish entirely new learning cultures within a traditional classroom environment.

In 2005, Egenfeldt-Nielsen conducted a similar study in Denmark, using *Europa Universalis* as a tool for studying European history. Egenfeldt-Nielsen reported implementation obstacles similar to Squire and noted some conceptual problems in experiential game-based learning approaches. These conceptual problems include a mismatch between learning outcomes through games and state curricular goals, time constraints in setting up games, differential learning outcomes across students, and the complexity of game interfaces for novices. Egenfeldt-Neilsen described learning through game-based environments as a hermeneutic process whereby students observe phenomena, interact with game rules, and draw interpretations based on previous understandings of history, just-in-time information provided by teachers and outside resources, and experiences in the game environment. As such, game-based learning in intentional learning environments is a hermeneutic process that resembles learning in a research lab. Learning is driven by a combination of students' questions, emerging experiences and findings, and historical interpretations.

Based on these findings, Squire and colleagues have been examining the potential of *Civilization III* and *Civilization IV* in after-school environments (Squire, Giovanetto, DeVane, & Durga, 2005). Whereas previous game development and curricular enactment programs have struggled to accommodate the demands of schools, formal after-school environments offer intriguing possibilities for rethinking educational practice for a digital age. Squire and his colleagues' program engages students iteratively in building and playing historical "mods" or scenarios for *Civilization III* and *Civilization IV*. They

Q82

Q83

Q84

Q85

reported the processes by which students learn to build these historical mods as a process of (a) developing interest in the game, (b) developing advanced knowledge of the game systems, (c) seeing iterative models of the game tailored in response to students' play, (d) adapting scenarios to enhance their play, in particular, to create games for other students to enjoy, and (e) building models to highlight particular game dynamics, such as the domination of the Vikings in medieval Europe. Squire and colleagues are finding that in controlled environments, students can and do develop literacies as game producers, which is marked by a systemic level understanding of game systems and design. Squire and colleagues posited that such literacies could be developed in classrooms, but would require systemic changes that give teachers and students more freedom in choosing what they study and more flexibility within the curriculum.

Conclusions

A recent *New York Times* piece describing the rise of academic programs in higher education quotes former Senator and current president of the New School Bob Kerry. Kerry argued that, "The skills and methods of videogames are becoming a part of our life and culture in so many ways that it is impossible to ignore," (as cited in Schiesel, 2005) suggesting an alternative narrative to the predominant broadcast media story that "games are bad for you." Each year that the Nintendo generation ages, the average age of gamers rises, and some reports suggest that aging Generation Xers and baby boomers are turning to games as a way to stay social when there are children in the house (you may not be able to go out every night, but you can log into *World of Warcraft*), or ward off the effects of aging (Sheff, 1994; Oblinger & Oblinger, 2005; Steinkuehler, 2005). As games become increasingly mainstream, literacy scholars are looking to video games as sites for studying emerging digital literacies.

Perhaps the alarm bells sounding the decline of "reading" do not signal a "loss" of literacy, but the emergence of a new constellation of literacy practices that could someday transform our social institutions. If the history of media holds true, video games, like film or television, are not going to replace books but live along side them (cf., Thorburn & Jenkins, 2004). Games are becoming ingrained within a range of political, military, commercial, and—at least for now on the margins of—educational systems, bringing with them attendant changes in cultural practices. Cases such as *America's Army* show how a game made for military recruitment purposes operates differently from a 30-second recruiting advertisement run during a televised football game, which, in turn, changes what it means to brand and recruit new military personnel. Similar examples can be found in politics: (e.g., *The Mass Balance* game where citizen-

players are challenged to try and balance the budget), advertising (e.g., YaYa Media's *Jeep* driving game, where salespeople and consumers can test drive new vehicles), or military training/entertainment (e.g., *Full Spectrum Warrior,* a game that challenges you to lead squadrons through urban militarized zones; Gee, 2005; Squire, in press). These examples suggest how emerging literacies are about more than physical (or digital) materials; they are about emerging cultural practices that reciprocally transform people and social institutions.

Perhaps not surprisingly, schools have been slower than the military and industry in taking advantage of the opportunities in games. The literacies that schools are based around include "mastery" over predetermined, increasingly federally mandated content, reading and writing traditional school-based genres of text (i.e., The five- paragraph essay, the term paper), ritualized performance on decomposed tasks, participation in activity cleaved from other social processes and institutions. Game-based literacies include a constellation of literacy practices that are quite different: texts are spaces to inhabit, learning as a productive, performative act, knowledge is legitimized through its ability to function in the world, participation requires producing as well as consuming media, expertise means leveraging digital spaces to further one's goals, and social systems have permeable boundaries with overlapping trajectories of participation.

As games become more culturally entrenched, the idea of using games in education may be passing from an *opportunity* to an *imperative,* if we are to create an educational system that adequately prepares students for life in an information/knowledge rich economy. Writing in late 2005 on the day of the release of the Xbox 360, games are only rising in cultural prominence and acceptance as SONY, Microsoft, and Nintendo, and Electronic Arts all vie to expand their markets beyond traditional gamers and seemed poised to become even more mainstream. At the same time, schools are being regarded by students as less relevant than ever; for the first time in the United States' history, for example, a majority of students—even successful ones—see school as little more than credentialing spaces (Baines & Stanley, 2003). In schools, we label those students who exhibit the qualities of gamers—increased independence, preference for multitasking, decreased respect for authority—as ADHD; outside schools, these same students are championed as leaders of the new economy (Gee, Hull, & Lankshear, 1996). The history of education also suggests that if these emerging literacies do prove to be foundational to success in the new economy, upper-middle-class parents will make sure that their children develop these skills, and in particular, have access to not just games but the affinity spaces and self-organizing learning systems that are crucial to becoming producers of and with digital media. The real question will become how will underfunded and overlooked urban schools respond.

Q86

References

Aldrich, C. (2004). *Learning by doing: A comprehensive guide to simulations, computer games, and pedagogy in e-Learning and other educational experiences.* New York: Wiley.

Anderson, C. A., & Bushman, B. J. (2001). Effects of violent games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychological Science, 12*, 353–358.

Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and life. *Journal of Personality and Social Psychology, 78,* 772–790.

Baines, L. A., & Stanley, G. K. (2003). Disengagement and loathing in high schools. *Educational Horizons*, *81*, 165–168.

Q87   Barab, S. A., & Squire, K. D. (in press). Design-based research: Putting a stake in the ground. *The Journal of the Learning Sciences, 13*(1)*,* 1–14.

Q88   Barnett, M., Squire, K., Higgenbotham, T., & Grant, J. (2004). Electromagnetism supercharged! In *Proceedings of the International Conference of the Learning Sciences.* Los Angeles: UCLA Press.

Beck, J., & Wade, M. (2004). *Got game: How the gamer generation is reshaping business forever.* Cambridge, MA: Harvard Business School Press.

Betrus, A. A. (1995). *Structuralist analysis of educational video games.* Paper presented to the annual Hypermedia conference, Bloomington, IN.

Betrus, A. A. (2005). *Motivational game elements.* Paper presented at the annual meeting of the Association for Educational Communications and Technology, Orlando, FL.

Q89   Bijker, W., & Law, J. (Eds.). (1992). *Shaping technology/building society: Studies in sociotechnical change.* Cambridge, MA: MIT Press.

Q90   Bowman, R. F. (1982). A Pac-Man theory of motivation. Tactical implications for classroom instruction. *Educational Technology, 22*(9)*,* 14–17.

Buckingham, D. (2002).The electronic generation? Children and new media. In L. A. Lievrouw

Q91   & S. Livingstone (Eds.), *Handbook of new media* (pp. XX–XX). London: Sage.

Buckingham, D. (2003). *Media education: Literacy, learning, and contemporary culture.* Cambridge, U.K.: Polity Press.

Bushman, B. J., & Anderson, C. A. (2001). Media violence and the American public: Scientific facts versus media misinformation. *American Psychologist, 56*, 477–489.

Carlson, S. (2003). Can Grand Theft Auto inspire a generation of scholars. *Chronicle of Higher Education*. Retrieved August 15, 2003, from http://chronicle.com/free/v49/i49/49a03101.htm

Cassell, J., & Jenkins, H. (Eds.). (1998). *From Barbie to Mortal Kombat: Gender and computer games.* Cambridge, MA: MIT Press.

Castronova, E. (2001). *Virtual worlds: A first-hand account of market and society on the cyberian frontier* (CESifo Working Paper Series No. 618). Retrieved November 22, 2005, from http://ssrn.com/abstract=294828

Q92   Church, D. (2000, March). *Abdicating authorship.* Paper presented at the annual meeting of the Game Developer's Conference, San Jose, CA.

Clinton, K. A. (2004, April). *Embodiment in digital worlds: What being a videogame player has to teach us about learning.* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.

Q93   Confrey, J., Cobb, P., diSessa, A., Lehrer, R., & Schauble, L. (2003). Design experiments in educational research. *Educational Researcher, 32*(1), 9–13.

Cordova, D. I., & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology, 88,* 715–730.

Q94   Crowley, K., & Jacobs, M. (2002). Islands of expertise and the development of family scientific literacy. In G. Leinhardt, K. Crowley, & K. Knutson (Eds.), *Learning conversations in museums* (pp. XX–XX). Mahwah, NJ: Lawrence Erlbaum Associates.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optical experience*. New York: Harper Perennial.

Davidson, D. (2005*). Plotting the story and interactivity in Prince of Persia: The sands of time*. Paper presented at Media in Transition 4: The Work of Stories, Cambridge, MA. Retreived July 25, 2006, from http://waxebb.com/writings/plotting.html

de Castell, S., & Jenson, J. (Eds.). (in press). *Worlds in play*. New York: Peter Lang.

Dede, C., Ketelhut, D., & Ruess, K. (2002). Motivation, usability, and learning outcomes in a prototype museum-based multi-user virtual environment. *Proceedings of the Fifth International Conference of Learning Sciences,* 406–408. Mahwah, NJ: Lawrence Erlbaum Associates.

Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32*(1), 5–8.

Frasca, G. (1999). *Ludology meets narratology: Similitudes and differences between (video) games and narrative*. (Original work published 1999). Retrieved (date), http://www.ludology.org

Friedman, T. (1999). Civilization and its discontents: Simulation, subjectivity, and space. In G. Smith (Ed.), *Discovering discs: Transforming space and place on CD-ROM* (pp. XX–XX). New York: New York University Press.

Games-to-Teach Team. (2003). Design principles of next-generation digital gaming for education. *Educational Technology, 43*(5), 17–33.

Gee, J. P. (1990). *Sociolinguistics and literacies: Ideology in discourses*. New York: Palmer.

Gee, J. P. (2000). The new literacy studies: From "socially situated" to the work of the social. In D. Barton, M. Hamilton, & R. Ivanic (Eds.), *Situated literacies: Reading and writing in context* (pp. 180–196). London: Routledge.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.

Gee, J. P. (2005). Learning by design: Games as learning machines. *Telemedium: The Journal of Media Literacy, 52*(1–2), 24–28.

Gee, J., Hull, G., & Lankshear, C. (1996). *The new work order: Behind the language of the new capitalism*. Melbourne, Australia: Allen and Unwin.

Gentile, D. A., Lynch, P. J., Linder, J. R., & Walsh, D. A. (2004). The effects of violent video game habits on adolescent aggressive attitudes and behaviors. *Journal of Adolescence, 27,* 5–22.

Gredler, M. E. (1996). Educational games and simulations: A technology in search of a (research) paradigm. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. XX–XX). New York: Macmillan.

Gredler, M. E. (2004). Games and simulations and their relationships to learning. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (2nd ed., pp. 571–581). Mahwah, NJ: Lawrence Erlbaum.

Greenfield, P. M. (1984). *Mind and media: The effects of television, computers and video-games*. London: Fontana.

Hayes, E. (2005). Women, video gaming, and learning: Beyond stereotypes. *Technology Trends, 49*(5), 23–28.

Herman, L. (1997). *Phoenix: The fall and rise of videogames*. Union, NJ: Rolenta Press.

Hertz, J. C. (1997). *Joystick nation*. Boston: Little, Brown & Co.

Holland, W., Jenkins, H., & Squire, K. (2003). Theory by design. In B. Perron & M. Wolf (Eds.), *Video game theory* (pp. XX–XX). New York: Routledge.

Huizinga, J. (1950). *Homo ludens: A study of the play element in culture*. Boston: Beacon.

Jakobsson, M., & Taylor, T. L. (2003). *The Sopranos meets EverQuest: Social networking in massively multiplayer online games*. Paper presented at the annual meeting of Internet Researchers, Toronto, Canada.

Jenkins, H. (1993). X Logic: Placing Nintendo in children's lives. *Quarterly Review of Film and Video*, 14(4), 53–70.

Jenkins, H. (1999, July). *Professor Jenkins goes to Washington*. Retrieved January 26, 2006, from Harper's Web site: http://web.mit.edu/cms/People/henry3/profjenkins.html

Q95

Q96

Q97

Q98

Q99

Q100

Q101

Q102

Jenkins, H. (2000, Winter). Lessons from Littleton: What Congress doesn't want to hear about youth and media. *Independent School*. Retrieved January 26, 2006, from http://www.nais.org/publications/ismagazinearticle.cfm?ItemNumber=144264

Jenkins, H. (2002). Game design as narrative architecture. In P. Harrington & N. Frup-Waldrop (Eds.), *First person* (pp. XX–XX). Cambridge, MA: MIT Press.

Jenkins, H. (in press). *Convergence cultures*. New York: New York University Press.

Jenkins, H., & Fuller, M. (1995). Nintendo and new world travel writing: A dialogue. In S. Jones (Ed.), *Cybersociety: Computer-mediated communication and community* (pp. 57–72). Thousand Oaks, CA: Sage Publications.

Jenkins, H., & Squire, K. (2002). The art of contested spaces. In L. King & C. Bain (Eds.), *Game on* (pp. 64–76). London: Barbican.

Jenkins, H., Squire, K., & Tan, P. (2004). You can't bring that game to school: Designing supercharged! In B. Laurel (Ed.), *Design research* (pp. XX–XX). Cambridge, MA: MIT Press.

Juul, J. (2001). Games telling stories: A brief note on games & narratives. *Games Studies*, *1*(1), XX–XX.

Juul, J. (2004). Introduction to game time. In P. Harrington & N. Frup-Waldrop (Eds.), *First person* (pp. 131–142). Cambridge, MA: MIT Press.

Juul, J. (in press). *Half real*. Boston: MIT Press.

Kadakia, M. (2005). Increasing student engagement by using *Morrowind* to analyze choices and consequences. *Technology Trends, 49*(5), 29–33.

Leander, K. (2005, February 19). Imagining and practicing internet space-times with/in school. Keynote address to the National Council of Teachers of English Assembly for Research Annual Mid-Winter Conference, Columbus, OH.

Leander, K., & Duncan, B. (in press). Community construction in the virtual: Reconceptualizing joint action. e-Learning, 1(3).

Leander, K., & Lovvorn, J. (in press). Literacy networks: Following the circulation of texts and identities in the school-related and computer gaming-related literacies of one youth. *Curriculum & Instruction*.

LeBlanc, M. (2006). *Formal design tools* [Electronic version]. Paper presented at the annual Game Developers' Conference, San Jose, CA. (Original work presented 1999).

Lemke, J. L. (1998). Metamedia literacy: Transforming meanings and media. In D. Reinking, L. Labbo, M. McKenna, & R. Kiefer (Eds.), *Handbook of literacy and technology: Transformations in a post-typographic world* (pp. 283–301). Hillsdale, NJ: Erlbaum.

Lemke, J. (2000). The long and the short of it: Comments on multiple timescale studies of human activity. *Journal of the Learning Sciences*, *10*(1–2), 193–202.

Lemke, J. (2004). *Why study digital gameworlds? Notes toward a basic research agenda for learning technologies*. Retrieved December 11, 2004, from http://www-personal.umich.edu/~jaylemke/games.htm

Levy, S. (2001). *Hackers: Heroes of the computer revolution*. New York: Penguin.

Li, Z. (2004). *The potential of America's army as civilian public sphere*. Unpublished master's thesis, MIT, Cambridge, MA.

Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. *Cognitive Science*, *4*, 333–369.

Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning, and instruction, III: Conative and affective process analysis* (pp. 223–253). Hillsdale, NJ: Lawrence Erlbaum Associates.

Mateas, M. (2004). A preliminary poetics for interactive drama and games. In P. Harrington & N. Frup-Waldrop (Eds.), *First person* (pp. 19–22). Cambridge, MA: MIT Press.

McKenzie, N. (2005). *Searching for the intangible: Commercial game designers wrestle with educational games*. Paper presented at the 2005 Games, Learning, and Society Conference, Madison, WI.

McNeil, W. H. (1968). *The rise of the west*. Chicago: University of Chicago Press.

Meier, S. (n.d.). Quoted in Wikipedia. Retrieved date, from http://en.wikiquote. org/wiki/Sid_Meier

Murray, J. (2004). From game-story to cyberdrama. In P. Harrington & N. Frup-Waldrop (Eds.), *First person* (pp. 2–10). Cambridge, MA: MIT Press.

Myers, D. (1991). Computer game semiotics. *Play and culture, 4,* 334–346.

Myers, D. (1992). Time, symbol, transformations, and computer games. *Play and Culture, 5,* 441–457.

National Endowment for the Arts (NEA). (2004). *Reading at risk: A survey of literary reading in America*. Retrieved November 22, 2005, from http://www.nea.gov/pub/Reading AtRisk.pdf

New London Group. (2000). A pedagogy of multiliteracies: Designing social futures. In B. Cope & M. Kalantzis (Eds.), *Multiliteracies: Literacy learning and the design of social futures* (pp. 9–37). New York: Routledge.

Oblinger, D., & Oblinger, J. (2005). *Boomers, gen-xers, and millenials: The new generation*. Retrieved November 27, 2005, from http://www.educause.edu/ir/library/pdf/erm0342 .pdf

Ong, W. (2002). *Orality and literacy: The technologizing of the word* (2nd ed.). New York: Routledge.

Perlin, K. (2004). Can there be a form between game and a story? In P. Harrington & N. Frup-Waldrop (Eds.), *First person* (pp. 12–18). Cambridge, MA: MIT Press.

Prensky, M. (2001). *Digital game-based learning*. New York: McGraw Hill.

Provenzo, E. F. (1992, December). What do video games teach? *Education Digest*, *58*(4), 56–58.

Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research & Development, 44*(2), 43–58.

Robison, J. (in press). What videogame designers can teach literacy instructors. In R. Matzen & J. Cheng-Levine (Eds.), *Reformation: The teaching and learning of English in electronic environments* (pp. XX–XX). Taipei, Taiwan: Tamkang University Press.

Rosas, R., Nussbaum, M., Cumsille, P., Marianov, V., Correa, M., Flores, P., et al. (2003). Beyond Nintendo: Design and assessment of educational videogames for first and second grade students. *Computers and Education*, *40*(1) 71–94.

Rosser, J. C., Jr., Lynch, P. J., Haskamp, L. A., Yalif, A., Gentile, D. A., & Giammaria, L. (2004, September). *Are video game players better at laparoscopic surgery?* Paper presented at the Serious Games for Health Conference, Madison, WI.

Salen, K., & Zimmerman, E. (2003). *Rules of play: Game design fundamentals*. Cambridge, MA: MIT Press.

Sanders, B. (1995). *A is for ox: The collapse of literacy and the rise of violence in an electronic age*. New York: Vintage.

Schiesel, S. (2005, November 22). Video games are their major, so don't call them slackers. *New York Times*, pp. XX–XX.

Sefton-Green, J. (2003). Informal learning: Substance or style? *Teaching Education*, *13*(1), XX–XX.

Sefton-Green, J. (2004). Initiation rites; A small boy in a poke-world. In J. Tobin (Ed.), *Pikachu's global adventure: The rise and fall of Pokemon* (pp. XX–XX). Durham, NC: Duke University Press.

Shaefer, E. (2004). Blizzard Entertainment's *Diablo II*. In A. Grossman (Ed.), *Postmortems from game developers: Insights from the developers of Unreal Tournament, Black & White, Age of Empires, and other top-selling games* (p. 79–90). San Francisco: CMP Books.

Shaffer, D. W., Squire, K. D., Halverson, R., & Gee, J. P. (2005). Video games and the future of learning. *Phi Delta Kappan*, *87*(2), 104–111.

Sheff, D. (1994). *Game over: How Nintendo conquered the world*. London: Vintage.

Simpson, E. (2005). Here come the gamers. *Technology Trends*, *49*(5), 17–22.

Q109

Q110

Q111 & Q112

Q113

Q114

Q115&Q116

Solomon, A. (2004, July 10). *The closing of the American book*. Retrieved November 22, 2005, from the New York Times Web site: http://www.nytimes.com/2004/07/10/opinion/10SOLO.html?ex=1090460203&ei=1&en=819cb83606a96f4f

Squire, K. D. (2002). Rethinking the role of games in education. *Game Studies, 2*(1). Retrieved July 25, 2006, from http://gamestudies.org/0201/Squire/

Q117   Squire, K. (2003). Video games in education. *International Journal of Intelligent Simulations and Gaming, 2*(1), XX–XX .

Q118   Squire, K. (2005a). *The future is Sweden*. Retrieved July 25, 2006, from http://www.joystick101.org/story/2005/2/6/22938/72327

Q118   Squire, K. D. (2005b). Educating the fighter. *On the Horizon, 13*(2), 75–88.

Q118   Squire, K. D. (2005c). Toward a theory of games literacy. *Telemedium, 52*(1-2), 9–15.

Q118   Squire, K. D. (2005d). Recessitating educational technology research: Design based research as a new research paradigm. *Educational Technology, 45*(1), 8–14.

Q118   Squire, K. D. (2005e). Changing the game: What happens when video games enter the classroom? *Innovate, 1*(6). Retrieved date, from http://www.innovateonline.info/index

Q119   .php?view=article&id=82

Squire, K. D. (in press). Game-based learning: Present and future state of the field. *Performance Improvement Quarterly*.

Squire K. D., & DeVane, B. (2006, April 8–12). *Pimping my ride and representing my hood: GTA as a sandbox for constructing identity and representing race*. Keynote presentation to the Media, Culture, and Communications Special Interest Group at the annual meeting of the American Educational Research Association.

Squire, K. D., & Steinkuhler, C. A. (2005). *Meet the gamers: Games as sites for new information literacies*. Retrieved July 25, 2006 from the Library Journal Web site: http://www.libraryjournal.com/article/CA516033.html

Squire, K. D., Giovanetto, L., DeVane, B., & Durga, S. (2005). From users to designers: Building a self-organizing game-based learning environment. *Technology Trends, 49*(5), 34–42.

Starr, P. (1994). Seductions of sim. *The American Prospect, 5*(17), n.p.

Q120   Steinkuehler, C. A. (2003). *Videogaming as participation in a discourse*. Paper presented at the American Association for Applied Linguistics annual conference, Arlington, VA.

Q120   Steinkuehler, C. A. (2004a, October 28–31). *Emergent play*. Paper presented at the State of Play Conference, New York University Law School, New York. Retrieved June 29, 2005, from mywebspace.wisc.edu/steinkuehler/web/papers/SteinkuehlerSoP2004.pdf

Q120   Steinkuehler, C. A. (2004b, April). *The literacy practices of massively multiplayer online gaming*. Paper delivered at the annual meeting of the American Educational Research

Q121   Association, San Diego, CA.

Steinkuehler, C.A. (2005, October). *Guild leadership*. Presentation made to the Austin Game Developers' Conference, Austin, TX.

Steinkuehler, C. A. (in press-a). The new third place: Massively multiplayer online gaming in American youth culture. *Tidskrift Journal of Research in Education*.

Steinkuehler, C. A. (in press-b). Learning in massively multiplayer online games. *Mind, Culture, and Activity*.

Q122   Steinkuehler, C. A., & Chmiel, M. (2005, July 24–29). *Gendered talk in massively multiplayer online games*. Paper presented at the 14th World Congress of Applied Linguistics (AILA), Madison, WI.

Q123   Steinkuehler, C. A., Black, R. W., & Clinton, K. A. (2005). Researching literacy as tool, place, and way of being. *Reading Research Quarterly, 40*(1), 7–12 .

Sudnow, D. (1983). *Pilgrim in the microworld: Eye, mind and the essence of video skill*. London: HeinemannWeise.

Thorburn, D., & Jenkins, H. (Eds.). (2004). *Rethinking media change: The aesthetics of transition*. Cambridge, MA: MIT Press.

Q124   Turkel, S. (2003). From powerful ideas to PowerPoint. *Convergence, 9*(2), 19–28.

Vargas, J. A. (2005, September 27). *Gamers' intersection. Grand Theft Auto: San Andreas' plays to a generation from the streets to suburbia*. Retrieved September 27, 2005, from the Washington Post Web site: http://www.washingtonpost .com/wp-dyn/content/article/2005/09/26/AR2005092601697_pf.html

Weise, M. (2004). *Understanding meaningfulness in videogames*. Unpublished master's thesis, MIT Comparative Media Studies, Cambridge, MA.

Wiley, D. A., & Edwards, E. K. (2002). Online self-organizing social systems: The decentralized future of online learning. *Quarterly Review of Distance Education*, *3*(1), 33–46.

Willett, R. (2003). New models for new media: Young people learning digital culture. *Medienpädagogik*, 4.

Williams, D. (2003). The video game lightning rod: Constructions of a new media technology, 1970–2000. *Information, Communication, and Society*, *6*(4), 523–550.

Williams, D. (2005). A brief social history of video games. In P. Vorderer & J. Bryant (Eds.), *Playing computer games: Motives, responses, and consequences* (pp. XX–XX). Mahwah, NJ: Lawrence Erlbaum. Q125

Williamson, B., & Facer, K. (2004). More than 'just a game': The implications for schools of children's computer games communities. *Education, Communication, & Information*, *4*(2/3), 255–270. Q126

Wright, W. (2001). Design plunder. Keynote address at the 2001 Gaming Developer's Conference, San Jose, CA.

Wright, T., Bouria, E., & Breidenbach, P. (2002). Creative player actions in FPS online videogames: Playing Counter-Strike. *Game Studies, 2*(2). Retrieved January 26, 2006, from http://www.gamestudies.org/0202/wright/

COMMENTS

Q1   CA: In every source I checked, including the dictionary, video games is two words.
Q2   CA: Please supply full reference for "Johnson, 2005" or delete this citation from the text.
Q3   CA: Please supply full reference for "Kim, 2002" or delete this citation from the text.
Q4   CA: Please supply full reference for "Kent, 2000" or delete this citation from the text.
Q5   CA: On p. 50, you state that you wrote this chapter in late 2005. Please clarify.
Q6   CA: Please supply full reference for "Poole, 2001" or delete this citation from the text.
Q7   CA: Please supply full reference for "King, 2001" or delete this citation from the text.
Q8   CA: Please supply full reference for "Scholder & Zimmerman, 2003" or delete this citation from the text.
Q9   CA: Please specify to which reference in-text citation refer by using "2004a" or "2004b."
Q10   CA: Please supply full reference for "Robison, 2005" or delete this citation from the text.
Q11   CA: Please supply full reference for "Wadrip-Fruin & Harrigan, 2004" or delete this citation from the text.
Q12   CA: Please supply full reference for "Frasca, 2003" or delete this citation from the text.
Q13   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q14   CA: Please supply full reference for "Jenkins, 2004" or delete this citation from the text.
Q15   CA: Please supply full reference for "Jenkins, 2004" or delete this citation from the text.
Q16   CA: Please supply full reference for "Eskelinen, 2004" or delete this citation from the text.
Q17   CA: Please supply full reference for "Bowman, 1991" or delete this citation from the text.
Q18   CA: Please supply full reference for "Church, 2001" or delete this citation from the text.
Q19   CA: Please supply full reference for "Robison, 2005" or delete this citation from the text.
Q20   CA: Please supply full reference for "Salen & Zimmerman, 2002" or delete this citation from the text.
Q21   CA: Please specify which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q24   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q25   CA: Please supply full reference for "Sheffield, 2005" or delete this citation from the text.
Q26   CA: Please supply full reference for "Squire & Smith, 2005" or delete this citation from the text.
Q27   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q28   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q29   CA: Please supply full reference for "Lemke, 2005" or delete this citation from the text.
Q30   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q31   CA: Please supply full reference for "Lemke, 2002" or delete this citation from the text.
Q32   CA: Please supply full reference for "Bijker, 1995" or delete this citation.
Q33   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q34   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q35   CA: Please supply full reference for "Wright, 2002" or delete this citation from the text.
Q36   CA: Please supply full reference for "Wright, 2002" or delete this citation from the text.
Q37   CA: Please supply full reference for "Wright, 2002" or delete this citation from the text.
Q38   CA: Please supply full reference for "Li, 2003" or delete this citation from the text.
Q39   CA: Please supply full reference for "Li, 2003" or delete this citation from the text.
Q40   CA: Please supply full reference for "Li, 2003" or delete this citation from the text.
Q41   CA: Please supply full reference for "Wright et al., 2001" or delete this citation from the text.
Q42   CA: Please supply full reference for "Spector, 2001" or delete this citation from the text.
Q43   CA: Please supply full reference for "Jenkins, 2005a" or delete this citation from the text.

Q44   CA: Please supply full reference for "Li, 2003" or delete this citation from the text.
Q45   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q46   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q47   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q48   CA: Please supply full reference for "Squire, 2004" or delete this citation from the text.
Q49   CA: Please supply full reference for "Squire & Giovanetto, in press" or delete this citation from the text.
Q50   CA: Please supply full reference for "Squire & Giovanetto, in press" or delete this citation from the text.
Q51   CA: Please supply full reference for "Squire & Giovanetto, in press" or delete this citation from the text.
Q52   CA: Please supply full reference for "Li, 2003" or delete this citation from the text.
Q53   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q54   CA: Please supply full reference for "Squire & Giovanetto, in press" or delete this citation from the text.
Q55   CA: Please supply full reference for "Robison, 2005" or delete this citation from the text.
Q56   CA: Please supply full reference for "Leander, in press" or delete this citation from the text.
Q57   CA: Please supply full reference for "Squire & Steinkuehler, in press" or delete this citation from the text.
Q58   CA: Please supply full reference for "Gee, 2004" or delete this citation from the text.
Q59   CA: Please supply full reference for "Barab & Squire, 2004" or delete this citation from the text.
Q60   CA: Please supply full reference for "Cobb, Confrey, diSessa, Lehrer, & Schauble, 2004" or delete this citation from the text.
Q61   CA: Please supply full reference for "Design-Based Research Collective, 2004" or delete this citation from the text.
Q62   CA: Please supply full reference for "Squire, 2004" or delete this citation from the text.
Q63   CA: Please supply full reference for "Crawford, 1984" or delete this citation from the text.
Q64   CA: Please supply full reference for "Sutton-Smith, 1997" or delete this citation from the text.
Q65   CA: Please confirm the change in this sentence. I couldn't figure out its meaning.
Q66   CA: Please supply full reference for "Sutton-Smith, 1997" or delete this citation from the text.
Q67   CA: Please supply full reference for "Sutton-Smith, 1997" or delete this citation from the text.
Q68   CA: Please supply full reference for "Buckingham, 2004" or delete this citation from the text.
Q69   CA: Please supply full reference for "Sefton-Green, 2005" or delete this citation from the text.
Q70   CA: Please supply full reference for "Buckingham, 2005" or delete this citation from the text.
Q71   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q72   CA: Please supply full reference for "Provenzo, 1991" or delete this citation from the text.
Q73   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e".
Q74   CA: Please supply full reference for "Jenkins et al., 2005b" or delete this citation from the text.
Q75   CA: Please supply full reference for "Squire, Barnett, Higgenbotham, & Grant, 2004Q75" or delete this citation from the text.
Q76   CA: Is this correct? Do you mean pre and posttests?
Q77   CA: Please supply full reference for "Dede et al., 2005" or delete this citation from the text.
Q78   CA: Please supply full reference for "Barab et al., 2004" or delete this citation from the text.
Q79   CA: Please supply full reference for "Barab et al., 2005" or delete this citation from the text.
Q80   CA: Please supply full reference for "Barab, in press" or delete this citation from the text.
Q81   CA: Please supply full reference for "Squire, 2004" or delete this citation from the text.
Q82   CA: Please supply full reference for "Manning, 2003" or delete this citation from the text.
Q83   CA: Please supply full reference for "Dunn, 2001" or delete this citation from the text.
Q84   CA: Please supply full reference for "Squire, 2004" or delete this citation from the text.
Q85   CA: Please double check this sentence. It was a sentence fragment before the change was made.

Q86   CA: On p. 7, you state that you wrote this chapter in 2006. Please clarify.
Q87   CA: Please cite "Barab & Squire, in press" in the text or delete this reference.
Q88   CA: Please cite "Barnett, Squire, Higgenbotham, & Grant, 2004" in the text or delete this reference.
Q89   CA: Please cite "Bijker & Law, 1992" in the text or delete this reference.
Q90   CA: Please cite "Bowman, 1982" in the text or delete this reference.
Q91   CA: Please supply page numbers for this reference.
Q92   CA: Please cite "Church, 2000" in the text or delete this reference.
Q93   CA: Please cite "Confrey, Cobb, diSessa, Lehrer, & Schauble, 2003" in the text or delete this reference.
Q94   CA: Please cite "Crowley & Jacobs, 2002" in the text or delete this reference. Please supply page numbers for this reference.
Q95   CA: Please cite "Dede, Ketelhut, & Ruess, 2002" in the text or delete this reference.
Q96   CA: Please cite "Design-Based Research Collective, 2003" in the text or delete this reference.
Q97   CA: Please supply retrieval date for this reference.
Q98   CA: Please supply page numbers for this reference.
Q99   CA: Please cite "Gee, 2000" in the text or delete this reference.
Q100   CA: Please supply page numbers for this reference.
Q101   CA: Please supply page numbers for this reference.
Q102   CA: Please cite "Huizinga, 1950" in the text or delete this reference.
Q103   CA: Please cite "Jenkins, 2002" in the text or delete this reference. Please supply page numbers for this reference.
Q104   CA: Please supply page numbers for this reference.
Q105   CA: Please cite "Juul, 2001" in the text or delete this reference. Please supply page numbers for this reference.
Q106   CA: Please cite "Leander & Duncan, in press" in the text or delete this reference.
Q107   CA: Please cite "Lemke, 2000" in the text or delete this reference.
Q108   CA: Please cite "Li, 2004" in the text or delete this reference.
Q109   CA: Please clarify this reference per APA guidelines.
Q110   CA: Please cite "Prensky, 2001" in the text or delete this reference.
Q111   CA: Please supply page numbers for this reference.
Q112   CA: Please cite "Robison, in press" in the text or delete this reference.
Q113   CA: Please supply page numbers for this reference.
Q114   CA: Please supply page numbers for this reference.
Q115   CA: Please supply page numbers for this reference.
Q116   CA: Please cite "Sefton-Green, 2004" in the text or delete this reference.
Q117   CA: Please supply page numbers for this reference.
Q118   CA: Please supply retrieval date for this reference.
Q119   CA: Please specify to which reference in-text citations refer by using "2005a", "2005b", "2005c", "2005d", or "2005e."
Q120   CA: Please cite "Steinkuehler, 2003" in the text or delete this reference.
Q121   CA: Please specify to which reference in-text citations refer by using "2004a" or "2004b."
Q122   CA: Please cite "Steinkuehler & Chmiel, 2005" in the text or delete this reference.
Q123   CA: Please cite "Steinkuehler, Black, & Clinton, 2005" in the text or delete this reference.
Q124   CA: Please cite "Turkel, 2003" in the text or delete this reference.
Q125   CA: Please supply page numbers for this reference.
Q126   CA: Please cite "Williamson & Facer, 2004" in the text or delete this reference.