Oblinger, D. (2004). *The Next Generation of Educational Engagement.* Journal of Interactive Media in Education, 2004 (8). Special Issue on the Educational Semantic Web [www-jime.open.ac.uk/2004/8]

Published 21 May 2004

ISSN: 1365-893X

The Next Generation of Educational Engagement

Diana G. Oblinger, Ph.D.

Abstract:

Games are no longer just for fun; they offer potentially powerful learning environments. Today's students have grown up with computer games. In addition, their constant exposure to the Internet and other digital media has shaped how they receive information and how they learn. There are many attributes of games that make them pedagogically sound learning environments. An increasing number of faculty are using games as enhancements to the traditional learning environment with encouraging results. While the interactivity and engagement of games are highly positive a number of questions remain about how games will be developed, deployed and accepted in higher education.

Keywords: games, informal learning, learning environments, augmented reality, pedagogy

Commentaries:

All JIME articles are published with links to a commentaries area, which includes part of the article's original review debate. Readers are invited to make use of this resource, and to add their own commentaries. The authors, reviewers, and anyone else who has 'subscribed' to this article via the website will receive e-mail copies of your postings.

1. Introduction

While it is commonly accepted that information technology has changed how we work, live, learn and entertain, we may overlook the impact that IT has had on our learners. Students' attitudes and aptitudes have been shaped by an IT and media-rich environment. Raised in the presence of video, console and computer games, students in their twenties may have more years experience with games than with reading. Has this environment changed student expectations for engagement and fun? Perhaps most importantly, what value can this media form bring to collegiate learning environments?

Today's students are digitally literate. Whether 18 or 48, virtually all learners are accustomed to operating in a digital environment for communication, information gathering and analysis. Students also tend to be "always on." They are in communication with friends and peers constantly through a mixture of cell phones, instant messaging (IM) and email. Mobility is another characteristic—students are constantly on the move, between classes, at work or socializing. The current generation of college students (ages 18-22) tend to be experiential learners—they prefer to learn by doing, as opposed to learning by listening. And, they are community-oriented. Friends, relationships and contributing to the community are important.

This article describes the current generation of learners who have been heavily influenced by information technology. It also explores the potential of learning environments that incorporate games and simulations to create greater engagement.

2. Changes in Students

A new generation of students are entering higher education_a group called the "Millennials" or the Net Generation. NetGen'ers were born in or after 1982 and exhibit different characteristics than siblings who are just a few years older. NetGen'ers tend to:

- Gravitate toward group activity
- Believe "it's cool to be smart"
- Are fascinated by new technologies
- They are racially and ethnically diverse (Howe and Strauss, 2000)

NetGen'ers learning preferences tend toward teamwork, experiential activities, structure and the use of technology. Their strengths include multitasking, goal orientation, positive attitude and a collaborative style (Raines, 2002).

Today's 18-year old college students, born when the PC was introduced, began using computers at an early age. Among this group, 20% began using computers between the ages of 5 and 8. Virtually all students were using computers by the time they were 16 to 18 years of age (Jones, 2002). Another measure of the ubiquity of technology to today's students is the percentage who own computers. In a recent survey, 84% of college students reported owning their own computer, with 25% owning more than one (Student Monitor, 2002).

Not surprisingly, technology is assumed to be a natural part of the NetGen'ers environment. Virtually all teenagers use the Web for school research (94%) and most believe the Internet helps them with schoolwork (78%). Perhaps most striking is their adoption of the Internet as a communication tool_as comfortable for them as the telephone. Having grown up with both, it may not be surprising. Among teens, the use of instant messaging seems to be a natural communication and socialization mechanism. Seventy percent use instant messaging to keep in touch. Forty-one percent indicated they use email and IM to contact teachers or schoolmates about class work. An even higher percentage use email to stay in touch with friends and relatives (81%). In fact, a slight majority (56%) prefer the Internet to the telephone (Lenhart, Simon and Graziano, 2001).

By the time students reach age 13-17, they are spending more time with digital media (computer, Internet, games) than they are television. Their top Internet activities are searching/surfing and communicating, educational activities, followed by games. When students (ages 9-17) are asked what they want from the Net, getting new and exciting information ranks #1 (nearly 80%). It is followed within a few percentage points by learning more/learning better. Communication is third (Grunwald, 2003).

The life experiences that shaped today's students are quite different from those of previous eras. Each generation is defined by its life experiences, giving rise to different attitudes, beliefs and sensitivities. Marc Prensky estimates that by the time an individual reaches 21 years of age they will have spent:

- 5,000 hours reading
- 10,000 hours playing video games
- 10,000 hours on the cell phone
- 20,000 hours watching TV

In addition, he estimates the individual will have sent 200,000 emails (Prensky, 2003).

These differences (Table 1) are exhibited in how different generations view the Web, community, careers and authority (Savage, 2003).

	TV Generation	PC Generation	Net Generation
Web	What is it?	Web is a tool	Web is oxygen
Community	Personal	Extended personal	Virtual
Perspective	Local	Multi-national	Global
Career	One career	Multiple careers	Multiple reinvention
Loyalty	Corporation	Self	Soul
Authority	Hierarchy	Unimpressed	Self as expert

Table 1: How different generations view the Web, community, careers and authority (Savage, 2003).

Perhaps as a reflection of the increasing availability of diverse types of content, we are seeing a growing interest in informal learning. Whether it takes the form of a learner searching the Web for information or a museum exhibit or a naturalist cruise, 21st century learners construct their own courses of learning. Learning is conducted in many styles, for many reasons. Largely self-directed and internally motivated, learning is unconstrained by time, place or formal learning structures. And, learning is facilitated by technology (Sheppard, 2000).

Games represent an informal learning environment. It is not unusual for young people to spend 50, 60, 70 hours or more in a particular virtual world playing a game. It might also take 60 hours or so to read 'War and Peace.' One difference is that games provide a 'multi-sensorial' environment. The students are there in body as well as in spirit, and hence memory is enhanced. An increasing number of researchers and educators are considering gaming as a means of teaching this next generation of students (Marinelli, 2003).

3. Use of Games in College

Games are part of growing up in the U.S. Game sales were approximately $7 billion in 2002; the average 8th grader plays video games for approximately 5 hours a week. A recently completed survey found that "by high school 77% of respondents had played computer games and over two-thirds (69%) had been playing video games

since elementary school. By the time the current cohort of college students graduates, virtually all of them will have had some kind of experience with gaming" (Jones, 2003). Games have cultural and social influence.

A study on games and college students found that games—computer, video and online—are intertwined into everyday college life. According to author Steve Jones:

- Sixty-five percent of those surveyed are regular or occasional game players
- Games are part of their multi-tasking environment; students will play games while visiting with friends, listening to music or doing assignments. In observations, male students were frequently seen to have online games open alongside their assignments.
- Students integrate games into their lives, playing between classes or while socializing. Students were observed to stop by computer labs for after-class or pre-dinner gaming sessions. Games are seen as a way to spend time with friends (Jones, 2003).

College-age men may be the most avid game players. They report playing games over 15 hours a week. What students play varies by gender. More women play computer and online games (60% women vs. 40% men); the gender ratios are about equal for video games. When asked which type of game they play at least once a week, computer games dominate (37%). The reason may be ubiquity; computer games can be played anywhere there is a computer. Video games, on the other hand, tend to be played at parents' or friends' houses. Although many believe that games may have a role in education, the majority of students surveyed (69%) had no exposure to games in the classroom (Jones, 2003).

While the mental image that college and university personnel may have of game playing is a solitary student with a game console, the reality is that games are highly social. Students play games in groups; they play with and against others; they discuss games in online communities; they add on to existing games, sharing their work with others. "Games encourage collaboration among players and thus provide a context for peer-to-peer teaching and for the emergence of learning communities. …Look up any popular game on the Internet and you find robust communities of game players debating games, sharing game tips or offering critiques to designers. Game theorists use the term meta-gaming to refer to the conversations about strategy which occur around the actual game play itself as players share what they know, ask questions of more expert players and put their heads together to resolve vexing challenges. This

kind of critical engagement with the game can resemble what educational psychologists call meta-cognition, the process of reflecting on learning itself" (Squire, 2003).

Just as learners have different styles (e.g., visual, auditory), so do game players. Four types of players have been described.

- **Committed gamers:** Committed gamers represent approximately 15% of the game playing population. They are driven by deep challenges and have a high tolerance for frustration in pursuit of their objective. They are highly self motivated_even driven.
- Wanna be's: Wanna be's identify with committed gamers and aspire to be like them. Although they are driven by a desire to belong to the gaming community, wanna be's are less tolerant of frustration. Wanna be's represent another approximately 15% of the gaming population.
- **Fun seekers:** Fun seekers play for immediate gratification. They view games as one of several entertainment choices and will weigh playing a game against another form of entertainment. Often in their 20's with more disposable income, fun seekers purchase more games than more serious gamers and make up 25% of the gaming population.
- **Time killers:** Some play games to kill time (about 45%). Like the fun seekers, time killers tend to be shallow game players wanting to experience the rewards of the game quickly (Phillips, 2003).

This game player taxonomy has implications for those who seek to use games as learning environments. While committed gamers will work diligently to learn whatever is needed to be successful in a game—physics, mathematics, history, geography—the majority will not invest as much time and effort—nor be as self-motivated. In short, it would not be correct to assume that all would share the same motivation when playing nor behave the same if a game were used as a learning environment. However, "if given the choice between lecture and a challenging, deep and frustrating game for an hour, they might choose the game as an alternative because it's the lesser of two evils" (Phllips, 2003).

4. How People Learn

Our notions of how people learn have evolved over time. Rather than a response to reward or punishment, we have begun to view learning as something that is constructed, an active process in which the learner develops his or her own understanding by assembling facts, experience and practice.

This constructivist approach to learning has been accompanied by a growing realization that learning is a social process (Henschel, 1999). Learning is seen as an act of participation; knowing depends on practice and participation. In fact, becoming part of a community enhances learning and knowing through shared practice.

If learning is constructed, the attitudes, beliefs and knowledge a learner brings into a new situation matter. This existing learning becomes the foundation for whatever learning follows. If this "foundation" is weak, building on it may be difficult or unreliable. As a result, it would be ideal if a learner's knowledge, attitudes and beliefs were evaluated when entering a learning situation. Deficiencies could be remedied and a solid base established for future learning (Donovan, *et al.*, 1999).

The goal of learning is often competence—not just awareness. Competence requires factual knowledge. Facts, information, definitions and so on are a basis for competence. But facts aren't enough. Having a conceptual framework allows us to sort information and place it in context. Those facts are more likely to be remembered if they fit into a conceptual framework.

When we learn, the hope is that the learning will transfer from one situation to another. Learning information in a context of use enables people to move beyond rote learning and acquire the competence to use and re-use knowledge in new situations. The ability to transfer learning from one situation to another and solve problems is critical for competence.

It has been observed for years that students who are tutored tend to do significantly better than those in a class (by 2_). One of the major differences is the amount of student-instructor interaction. We also know that there is little interaction in the average college class. Estimates are that students ask 0.1 questions per hour; faculty ask 0.3. It is often difficult to engage students in interactive dialog, particularly in large classes. By contrast, if a student was in a tutored session, he/she would ask between 20-30 questions compared to over one hundred by the tutor. In computer-based instruction, the number of questions posed to students per hour ranges from 160-800 (Fletcher, 2003).

Beyond the fundamentals of how people learn, we are discovering that the Web has led to the development of a new type of multimedia or information literacy. No longer is our understanding based primarily on text; many students combine an intuitive understanding of text and image resulting in information literacy. This

information literacy parallels other shifts in how we approach learning such as of moving from an environment of being told or authority-based learning to one based on discovery or experiential learning (Brown, 2000).

In order to consider games as potential learning environments, the structure and practice of games must have useful parallels to sound pedagogy and the current generation of learners. Games have many attributes that are associated with how people learn.

- **Activates prior learning:** Games require facts. In some cases games are based on understanding topics such as mythology, geology, meteorology, science or history. Players must use previously learned information_and learn new facts_to move to higher levels of gameplay.
- **Context:** Context is important in games. Knowing what information or techniques to apply in which situations enables greater success.
- **Feedback and assessment:** Games provide ample feedback on the player's progress. Scoring, reaching different levels and ultimately winning provide rich feedback and assessment. (Online help can provide just-in-time remediation, as well.)
- **Transfer:** Games require transfer of learning from other venues_life, school and other games. Being able to see the connection and transfer existing learning to a unique situation is part of gameplay.
- **Experiential:** Games are inherently experiential. Those who play games engage multiple senses. For each action, there is a reaction. Feedback is swift. Learning is often by trial and error: hypotheses are tested and users learn from the results.
- **Social:** Games are often social environments, sometimes involving large distributed communities.

5. Evolution of Games as Learning Environments

Although we may think of games as new, they have been part of the learning environment for some time. Who has not been involved in a role play as a part of a sociology or political science course? In role playing, individuals assume roles, act out their characters, experience the interaction and see the outcome. For example, mock trials are a routine part of law school because law is about more than understanding legal code; it is about human dynamics. Role playing is a highly effective mechanism for helping learners understand the interplay of personalities and situations. Games, simulations and role plays are not new to education. It is only recently that technology has been added to games, giving them a different character.

Perhaps the organization with the greatest depth of experience with games as learning environments is the U.S. military. The impetus came from the need to balance cost, efficiency and effectiveness.

The best training involves massive amounts of practice with immediate feedback. However, training for an artillery sergeant might mean firing artillery rounds that cost $1000 apiece. Firing rounds may be the best learning environment, but it is also the most costly and cannot be accessed frequently. The Army now uses simulations to help soldiers gain necessary skills (Macedonia, 2003).

Balancing the trade-offs between cost, efficiency and effectiveness led the military to the concept of selective fidelity—the learning environment is chosen based on the instructional objective. If the objective is to learn a skill and that requires practice, a game or simulation may be best. Games and simulations provide practice that is tailored to the users needs, interests and intentions (Fletcher, 2003).

There is another important trade off between realism and fun. Games tend to be less real but more fun; simulations have greater realism. If the objective is to increase time on task and time spent with feedback, it may be wise to sacrifice some of the efficiency of a drill and practice routine and replace it with a game that causes people to voluntarily spend more time learning. A key benefit of games is acquiring massive amounts of time on task. Games can also provide realism while reducing risk (Fletcher, 2003).

The military has also explored multiplayer environments. For example, a solider can be in a tank simulator in Germany and call in close air support from an Air Force unit in Nevada because he's being attacked by a helicopter which is operated from a flight simulator in Alabama. The environment allows individuals in different branches of the military, who are geographically dispersed, to participate in the same game. Participants get deeply involved, intellectually and emotionally. The learning goes beyond mechanics to include interpersonal skills such as how to work as a member of a team, how to assess stress or how to manage risk (Fletcher, 2003).

Even though games and simulations are used extensively in the military, they aren't used in isolation from other learning activities. "Recruits go through boot camp, where they are exposed to military values and become soldiers. Games are used in conjunction with real-world simulations (like rifle ranges). Learning is guided by more experienced members of the military community and the meaning of these activities is negotiated through social interactions" (Fletcher, 2003).

6. Potential Uses of Games in Higher Education

Kurt Squire and Henry Jenkins (2003) illustrate a number of ways that games can be used in education. For example, they suggest that "small-scale games can be used for quick demonstrations in the midst of a classroom lecture; more ambitious games might be deployed over one or more class periods as central learning activities. Games can function as homework assignments, allowing students to work through challenges on their own. They also can be imagined as possible problems on a final examination, testing what the student learned by applying it to a specific task or activity." Their conclusion is that games are a versatile pedagogical medium.

Using *Civilization III* as an illustration, Squire and Jenkins (2003) describe how the game becomes the impetus for students seeking out more traditional sources of learning material. To win students must deal with political, scientific, military, cultural and economic issues spanning 6,000 years. Not only do students have to learn to be successful with the game, but they must synthesize and integrate information from multiple disciplines.

"We have come to think of games not as replacing traditional resources such as maps, texts or educational films. Rather, students are motivated to return to those media to do better in the game. They don't memorize facts; they mobilize information to solve game-related problems" (Squire and Jenkins, 2003). In addition, they conclude that "games are not simply problems or puzzles; they are microworlds, and in such environments students develop a much firmer sense of how specific social processes and practices are interwoven and how different bodies of knowledge relate to each other" (Squire and Jenkins, 2003).

The use of games as "immersion environments" is often mentioned as a potential approach. *Revolution*, a multiplayer game, is designed to make the history of Colonial Williamsburg come alive. Students assume roles in Williamsburg, becoming immersed intellectually and emotionally. The game becomes a social community with opinions, interests, personal concerns (e.g., earning a living) and political issues being layered on top of each other. Characters may see resistance to British rule as a disruption of their daily lives or as an important commitment to freedom. "You do not simply visit Williamsburg for an afternoon; you become part of that community." The game is more than an exercise for students; it allows them to share a common experience and use this as a basis for more detailed discussions (Squire and Jenkins, 2003)

The University of Phoenix is entering its second year of using simulations in the classroom. Simulations were originally designed for the MBA program and have since expanded to other programs: Undergraduate Business and Management, Health Sciences and Nursing, as well as General and Professional Studies.

Each simulation focuses on a different fictional organization. In the MBA strategy course, students experience a *Thinking Strategically* simulation, where they play the role of Vice President of Business Development for a manufacturing organization. Students operate within a variety of resource constraints imposed by the simulation and must determine long-term objectives for this company on the basis of internal and external information they purchase. The dynamic nature of the software enables students to perform real-time strategic analyses using such electronic tools as Matched Pair SWOT Analysis. After completing the simulation students are able to formulate strategies more effectively.
Response from students and faculty has been very positive. Students who are visual learners consider the simulations to be an extremely effective learning tool. Importantly, students are able to experiment in a "safe" environment. In all simulations there are multiple paths students can take; students often play the simulation several times taking different paths to see how the results differ, as there is not one right answer or one winner. The multiple decision paths allow them to enhance and expand their decision constructs (Aguilar, 2003).

In Sweden, VETA's on-line Learning Games are used in regular education at the high school and college level. The games are designed to support cooperative learning and social interaction as well as enable different learning strategies through the use of media and interactive design. Each game has highly interactive content with 60-80 hours of active learning. The modules are divided into assignments and tasks, all bound together by a story. The content is equivalent to a specific course in line with the syllabus in the national curriculum.

Subjects like English, mathematics, physics, Swedish as a second language, business administration and health care are set in a learning environment where the user can explore, experiment and practice in a contextual manner. In mathematics, for example, the learner gets to know a number of characters who need the learner's help where mathematical understanding and skill development are necessary_from building up a taxi business with the help of functions, to coaching the career of a young journalist by using statistics. Health care students can learn how to help patients in environments such as a home for elderly people.

Surveys show that students who use the games find that difficult tasks can be engaging, intriguing_and amusing_when incorporated into a story and a meaningful context. In a May 2003 survey, students said that motivation and a sense of meaningfulness are aspects they appreciate about the games, and these in turn make learning more efficient. Instructors report that the games are useful tools for collaborative learning and that they enhance the learning process. Students solve assignments together. They discuss and suggest different strategies and solutions as they interact with the games' learning environment (Rydberg, 2003).

Games can combine the physical and virtual. *Environmental Detectives* integrates handheld computers, global positioning devices and physical locations in a game designed around locating a chemical spill on campus. Players walk around campus using their PDAs to take contaminant readings. Students collaborate and compete. While they are able to move around campus taking readings and interpreting the physical surroundings, they can also do desktop research to clarify the contaminant, its effects on people, and so on. Teams must articulate observations and conclusions throughout the process, even presenting their findings to the "university president." Faculty are able to coach students on more than the chemical spill—they can help students understand potential weaknesses in their problem-solving style. "In the best cases, the constraints of the game make flaws in the students' thinking visible to both teachers and students, enabling students to learn from the consequences of their actions. Unlike most academic experiences, where everyone is expected to succeed, we intuitively understand that games can be won or lost. If a team loses, the members can reflect on the experience and figure out what went wrong" (Squire and Jenkins, 2003).

Describing his experiences with *Rise of Nations*, James Paul Gee illustrates how this game builds user confidence, allowing users to assess themselves and identify skills they need to develop. Its tutorials provide basic skill development within the context of the real game, improving retention, integration and transferability of skills. As he points out, information is given multimodally, so messages are reinforced with print, sound and image. Information is provided more than once; it is provided just-in-time; there is immediate feedback from actions—all important principles of sound instruction. Once beyond the tutorial, "quick starts" allow users to begin at an easily manageable level of the game so users build confidence. He points out another principle of good gaming: "Good games allow players to operate within, but at the outer edge of their competence" (Gee, 2003).

The Interactive Communications and Simulation group at the University of Michigan has developed a character-playing simulation game: Conflix. Students are immersed in "virtual democracy" as they assume the roles of real-life politicians, addressing controversial issues such as affirmative action, capital punishment, educational reform, human rights, homelessness or same-sex marriage. Conflix intentionally exaggerates some aspects of government to generate discussion of issues such as power and influence. Students use a range of communication tools (real-time chat, email, threaded discussion) to establish political alliances and take positions. The "out of character" interactions among students and instructors—those interactions that happen around that simulation—are often the most important. Students consider the game highly effective, influencing not just their perspective of politics but their view of being an American citizen (Kupperman, *et al.*, 2003).

7. Attributes of Games as Learning Environments

Games have many attributes of effective learning environments. For example, games include elements of urgency, complexity, learning by trial-and-error and scoring points. They also support active learning, experiential learning and problem-based learning. Games make it possible to use information in context and are inherently learner-centered and provide immediate feedback.

Games also offer advantages in terms of motivation. Oftentimes students are motivated to learn material (e.g., mythology or math) when it is required for successful game play—that same material might otherwise be considered tedious. "Games inspire players to seek out data and information in order to be successful rather than starting with facts and figures and then figuring out how they may be relevant" (Rickard and Oblinger, 2004).

A sense of competition and one's status in the game-playing community encourages students to work hard. The recognition and respect that comes from successful gameplay "fuels participation and invests the player in the experience because it transforms knowledge into social capital. Not only do players 'own' their learning (because they participated in the construction), but ownership is worth something in a social context where one's status derives from peer acknowledgement (an incentive that is often more powerful than grade point average or teacher approval)" (Herz, 2001).

Table 2 highlights some of principles of good pedagogy and parallels in a game environment.

Principle	Description	Application in Games
Individualization	Learning is tailored to the needs of the individual	Games adapt to the level of the individual
Feedback	Immediate and contextual feedback improves learning and reduces uncertainty	Games provide immediate and contextualized feedback
Active learning	Learning should engage the learner in active discovery and construction of new knowledge	Games provide an active environment which leads to discovery
Motivation	Students are motivated when presented with meaningful and rewarding activities	Games engage users for hours of engagement in pursuit of a goal
Social	Learning is a social and participatory process	Games can be played with others (e.g., multiplayer games) or involve communities of users interested in the same game
Scaffolding	Learners are gradually challenged with greater levels of difficulty in a progression that allows them to be successful in incremental steps	Games are built with multiple levels; players cannot move to a higher level until competence is displayed at the current level
Transfer	Learners develop the ability to transfer learning from one situation to another	Games allow users to transfer information from an existing context to a novel one
Assessment	Individuals have the opportunity to assess their own learning and/or compare it to that of others	Games allow users to evaluate their skill and compare themselves to others

Table 2: Some principles of good pedagogy and parallels in a game environment

Perhaps most significantly, games represent a performance-based environment. One cannot be passive when playing a game. "Learning through performance requires active discovery, analysis, interpretation, problem-solving, memory and physical

activity which results in the sort of extensive cognitive processing that deeply roots learning in a well-developed neural network" (Foreman, 2003). One of the limitations of many learning situations is that they stimulate "rote learning" or learning that cannot be applied to new situations. The learning-by-doing approach of games encourages transfer to future learning activities_or life.

"The game world resembles a well-designed academic course, one that (1) builds and integrates knowledge in a structured continuum that leads from the beginning of the semester to its end; and (2) requires that a student actively and continuously engage with subject matter and learning goals" (Foreman, 2003). It also incorporates assessment at each level. Players cannot move to a more advanced level without becoming competent at the current level.

8. Conclusion

There is a growing body of evidence that students have developed a different set of attitudes and aptitudes as a result of growing up in an IT and media-rich environment. While this may provide great advantages in areas such as their ability to use information technology and to work collaboratively, it may create a disconnect between their expectations and the learning environment they find in colleges and universities.

Interactivity and engagement are hallmarks of games and online environments; they are also known to lead to deeper learning. Institutions are experimenting with new tools and processes to enhance interactivity and engagement. For example, some use classroom communication systems to increase interactivity and change the learning dynamic in courses (Beatty, 2004). Others have adopted problem-based learning models. A few are experimenting with games and simulations.

Perhaps because they grew up with games, traditional age college students prefer an experiential style of learning. In a financially constrained environment, it may be increasingly difficult for institutions to provide adequate laboratory or hands-on experiences that suit the experiential learner. The alternative, of course, is to increase access to simulations and games that allow students to explore material in their own way. The dramatic increase in digital libraries and collections provides colleges and universities with the option of "first-person learning" in which students explore topics and make their own discoveries. Faculty guidance and intervention are still important in first-person learning.

The growing number of conferences and presentations devoted to the use of games as educational tools indicates that the idea is gaining momentum. However, a host of questions remain. For example:

- Who will be responsible for developing the content of games? Will entertainment become a higher priority than educational value or accuracy?
- How will intellectual integrity be safeguarded? What are the risks that educational content will be sensationalized or over simplified?
- How will games be integrated into traditional educational methods? Will games encourage students to resist more "boring" activities?
- How will games be evaluated and their benefits documented? (Oblinger, Ringle and Baer, 2004).

Games are part of our social and cultural environment: children grow up playing computer, video and Internet games and continue the practice throughout college. Although the appeal of games is "fun," there are deeper elements that may provide a new tool for educators. For learners who are experiential, social, multi-taskers, games may provide a new freshness of approach and motivation to their studies. Although a promising tool, games are not replacements for faculty involvement, direct student experience or the hard work of learning.

9. References

Aguilar, Beth. Personal communication (email). November 3, 2003

Beatty, Ian. (February 2004). Transforming student learning with classroom communication systems. EDUCAUSE Center for Applied Research. Retrieved February 5, 2004, from http://www.educause.edu/asp/doclib/abstract.asp?ID=ERB0403.

Brown, John Seely. (March/April 2000.) Growing up digital. Change magazine article. Retrieved May 14, 2002, from http://www.aahe.org/change/digital.pdf.

Donovan, M. S., Bransford, J.D. and James W. Pellegrino, Eds. (1999). *How people learn: bridging research and practice.* National Academy Press.

Fletcher, Dexter. (2003). Personal communication (phone). August 5, 2003.

Foreman, Joel. (July/August 2003). Next generation educational technology versus the lecture. *EDUCAUSE Review*, retrieved September 18, 2003, from http://www.educause.edu/ir/library/pdf/erm0340.pdf.

Gee, James Paul. (2003). Learning about learning from a video game: Rise of Nations. Retrieved August 16, 2003, from email communication.

Grunwald, Peter. (September 23, 2003). Key technology trends: Excepts from new survey research findings. Exploring the Digital Generation. Educational Technology, US Department of Education.

Henschel, Peter. (1999). The manager's core work in the new economy. Retrieved November 20, 2001 from, http://www.newmango.com/01iftf/henschel.html.

Herz, JC. (2001). Gaming the system: what higher education can learn from multiplayer online worlds. Retrieved August 5, 2003 from, http://www.educause.edu/ir/library/pdf/ffpiu019.pdf.

Howe, Neil and Strauss, William. (2000). *Millennials Rising*. Vintage Books, New York.

Jones, Steve. (2003). Let the games begin: Gaming technology and entertainment among college students. Retrieved July 8, 2003 from, http://www.pewinternet.org/reports/toc.asp?Report=93

Kupperman, Jeff, Weisserman, Gary and Goodman, Fred. (2002). The secret lives of students and politicians: Students as co-designers of their own learning. Retrieved October 14, 2003, from email communication.

Lenhart, Amanda, Simon, Maya, and Graziano, Mike. (September 2001). The Internet and education: Findings of the Pew Internet and American Life Project. Retrieved October 9, 2001 from, http://www.pewinternet.org/reports/toc.asp?Report=39
Macedonia, Michael. (2003). Personal communication (phone). August 5, 2003

Marinelli, Don. (2003). Personal communication (email). September 24, 2003

Oblinger, Diana, Martin Ringle and Baer, Linda. (January 26, 2004). Unlocking the potential of gaming technology. National Learning Infrastructure Initiative Annual Meeting, San Diego, CA.

Phillips, Howard. (2003). Personal communication (phone), August 13, 2003

Prensky, Marc. (2003). Digital game based learning. Exploring the Digital Generation. Educational Technology, US Department of Education.

Raines, Claire. (2002). Managing Millennials. Retrieved January 28, 2003, from, http://www.generationsatwork.com/articles/millenials.htm.

Rickard, Wendy and Oblinger, Diana. (2004). Unlocking the potential of gaming technology. Retrieved December 18, 2003, from email communication.

Rydberg, Katarina. (2003). Personal communication (email). October 30, 2003

Savage, Tammy. (2003). Microsoft unpublished document. Retrieved July 17, 2003, from email communication.

Sheppard, Beverly. (November 9, 2000). The 21st century learner: premises and goals. Retrieved January 30, 2003, from http://www.imls.gov/whatsnew.current/sp110900.htm

Squire, Kurt. (2003). Games to teach. Retrieved August 16, 2003, from email communication.

Squire, Kurt and Jenkins, Henry. (2003). Harnessing the power of games in education. Retrieved August 18, 2003, from email communication.