

Pre-conference Paper
Unlocking the Potential of Gaming Technology

The Nintendo generation has reached college age. 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? Is it possible that students' attitudes and aptitudes have been shaped by this environment? Perhaps most importantly, what value can this media form bring to collegiate learning environments? Answering that question requires an understanding of the current generation of college students, how they use games and how they learn.

The “Bilingual” Learner

The impact of information and communications technologies (ICT) is clearly manifested in our youth. From their earliest years, they learned to sort through and manage vast amounts of information. Rather than viewing computers as machines for analysis and data processing, they view technology as a natural extension of their lives: for work, entertainment, and learning.¹

Today's college students are part of a generation in transition. They bridge two cultures, being comfortable in traditional learning environments yet attached to their cell phones, instant messaging and e-mail. They are also a game-playing generation; they have spent hours playing games during their formative years. “If nothing else, games expose players to deeply engaging, visually dynamic, rapid paced and highly gratifying pictorial experiences that make almost any sort of conventional schoolwork (especially when mediated by a lecture or a text) seem boring by comparison.”²

These students favor different learning styles. For example, their learning preferences tend toward teamwork, experiential activities, structure, the use of technology and engagement. Their strengths include multitasking, goal orientation, positive attitude and a collaborative style.³ Do those attributes indicate that games may be a more effective learning environment than our traditional ones?

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.⁴ 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.”⁵ Games have become a cultural and social force.

The study found that games—computer, video and online—are intertwined into everyday college life. According to 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.⁶
- About two-thirds (66%) of students feel that gaming has no influence on their academic performance. However, about half (48%) admit that gaming keeps them from studying “some” or “a lot.” Even more telling is the fact that nearly one in ten (9%) play games to avoid studying.⁷

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.⁸ 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.⁹

While the mental image that college and university administrators 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 build and add 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."¹⁰

Just as learners have different styles (e.g., visual, auditory), so do game players. Four types of players have been described.¹¹

- **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.¹²

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 motivations 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.”¹³

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.¹⁴ Learning is seen as an act of participation; knowing depends on practice and participation. In fact, knowledge is integrated in the life of communities so 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.¹⁵

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.

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. While deductive or linear reasoning is common among Baby Boomers, younger learners use lateral reasoning and synthesis. Although the prevailing attitude for those born in the 50's may be to not try what they don't know, the Net Generation are experimenters who link, lurk and try things for themselves.¹⁶

Games have many attributes that are associated with how people learn.

- Games are often social environments, sometimes involving large distributed communities.
- When a new player enters a game, he/she must immediately call up prior learning, deciding what to apply to the new situation. If the prior learning is incorrect or inadequate, the player must address the deficiency.
- Games require facts. In some cases they are trivial; in other cases games are based on deep stores of knowledge about mythology, geology, meteorology, science or history. Players must use that information? and oftentimes must learn new facts? to move to higher levels of gameplay.
- Context is important in games. Knowing what information or techniques to apply in which situations enables greater success.
- 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.

- 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.

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 interplay and see the outcome. 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.¹⁷

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.

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.¹⁸

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.¹⁹ Games can also provide realism while reducing risk (e.g., simulating combat situations).

The military has also explored multiplayer environments. For example, a soldier 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.²⁰

Another example is provided by America's Army. America's Army is a two part game that introduces users to Army careers and provides teams of online users with realistic combat simulations. While ultimately a shooter game, the players must learn a great deal before shooting. They go through basic training, choose a career, move through a tour of duty, all while learning about Army life. "Even when the combat missions begin, success (especially in multiplayer mode) depends on the player's ability to communicate and to participate in teamwork."²¹

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."²²

Potential Uses of Games in Higher Education

Kurt Squire and Henry Jenkins 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.”²³ Their conclusion is that games are a versatile pedagogical medium.

Using *Civilization III* as an illustration, they describe how the game becomes the impetus for students seeking out more traditional sources of learning material. To win the game 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.”²⁴ 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.”²⁵

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.”²⁶ 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.²⁷

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 help the students understand 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.”²⁸

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 provide 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.”²⁹

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 are inherently learner-centered and provide immediate feedback.³⁰

The table below 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 play 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 |
| 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 evaluate their own learning and/or compare it to that of others | Games allow users to evaluate their skill and compare themselves to others |

Beyond the principles noted, 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.”³¹ 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.”³² It also incorporates assessment at each level. Players cannot move to a more advanced level without becoming competent at the current level.

Conclusion

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 and 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.

Games are beginning to garner the attention of educators. As there is more focus on games and simulations as potent learning environments, a host of issues are raised as well. For example:

- Can games and simulations add to the overall value of a college or university education?
- What experiments and proof points will be needed for games to be seen as viable learning environments in higher education?
- Where might games and simulations provide the greatest value in higher education?
- What mechanisms will ensure that games are developed for the educational environment, not just commercial ones?
- What principles about games are needed to ensure that users and developers of educational games can effectively meet their learning objectives?

- What are the implications of game use in higher education for faculty and faculty development?
- What measures of effectiveness should be used for assessing the value of in education?
- What education might boards, legislators and parents need so as to ensure support of such novel learning environments?
- Where will the leadership come from to cause higher education to explore games and simulations?

The purpose of this symposium is to explore the potential of games and simulations as effective learning environments. We look forward to the deliberations.

Diana G. Oblinger

August 2003

¹ The Next Generation Student. August 2003. Wendy Rickard & Diana Oblinger.

² Joel Foreman. July/August 2003. Next generation educational technology versus the lecture. EDUCAUSE Review page 15 <<http://www.educause.edu/ir/library/pdf/erm0340.pdf>>

³ Claire Raines, Generations at Work: Managing Millennia, <<http://www.generationsatwork.com/articles/millennials.htm>.

⁴ Games to Teach: AERA 2004, Barnett, Squire, Higginbotham, Grant

⁵ Steve Jones. 2003. Let the games begin: Gaming technology and entertainment among college students. <<http://www.pewinternet.org/reports/toc.asp?Report=93>>

⁶ Steve Jones. 2003. Let the games begin: Gaming technology and entertainment among college students. <<http://www.pewinternet.org/reports/toc.asp?Report=93>>

⁷ Steve Jones. 2003. Let the games begin: Gaming technology and entertainment among college students. <<http://www.pewinternet.org/reports/toc.asp?Report=93>>

⁸ Steve Jones. 2003. Let the games begin: Gaming technology and entertainment among college students. <<http://www.pewinternet.org/reports/toc.asp?Report=93>>

⁹ Steve Jones. 2003. Let the games begin: Gaming technology and entertainment among college students. <<http://www.pewinternet.org/reports/toc.asp?Report=93>>

¹⁰ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p20

¹¹ The research data is not limited to college students however the results should be generalizable to college and university students

¹² Howard Phillips. Personal communication, August 13, 2003

¹³ Howard Phillips. Personal communication, August 13, 2003

¹⁴ Peter Henschel. 1999. The Manager's Core Work in the New Economy. <<http://www.newmango.com/01iff/henschel.html>>

¹⁵ Donovan, Bransford and Pellegrino, Eds. *How People Learn: Bridging Research and Practice*. National Research Council. National Academy Press. 1999. (Also available at <<http://books.nap.edu/books/0309065364/html/18.html#pagetop>>)

¹⁶ John Seely Brown. March/April 2000. "Growing up digital." Change: 11-20 <<http://www.aahe.org/change/digital.pdf>>

¹⁷ Michael Macedonia. Personal communication. August 5, 2003

¹⁸ Dexter Fletcher. Personal communication. August 5, 2003

¹⁹ Dexter Fletcher. Personal communication. August 5, 2003

²⁰ Dexter Fletcher. Personal communication. August 5, 2003

²¹ Joel Foreman. July/August 2003. Next generation educational technology versus the lecture. EDUCAUSE Review page 16. <<http://www.educause.edu/ir/library/pdf/erm0340.pdf>>

²² Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p4

-
- ²³ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p5
- ²⁴ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p9
- ²⁵ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p9
- ²⁶ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p11
- ²⁷ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p11
- ²⁸ Kurt Squire and Henry Jenkins. 2003. Harnessing the power of games in education. p17-18
- ²⁹ James Paul Gee. 2003. Learning about Learning from a Video Game: Rise of Nations. p. 24.
- ³⁰ Elena Moschini. 2002. Future learning: The use of interactive games in adult learning. ALT-C 2002 Abstracts. Unpublished.
- ³¹ Joel Foreman. July/August 2003. Next generation educational technology versus the lecture. EDUCAUSE Review page 16.< <http://www.educause.edu/ir/library/pdf/erm0340.pdf>>
- ³² Joel Foreman. July/August 2003. Next generation educational technology versus the lecture. EDUCAUSE Review page 16.<<http://www.educause.edu/ir/library/pdf/erm0340.pdf>>