Effective Digital Game Design for Multi-Generational Learning

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Abstract

This paper provides an overview of digital games highlighting how learners can benefit from the implementation of pedagogically appropriate game designs. It discusses the results from several studies which examine the impact digital games have to enhance learning. Motivation, scaffolding, coaching, problem solving and deep learning are some of the key findings from the empirical research discussed. Applications of digital games in government, healthcare, military and educational settings were reviewed. Lastly the paper addresses the relevance digital games have with a multi-generational workforce and explains how high performing organizations can utilize these digital learning games to positively impact employee performance.
**Introduction**

Teachers throughout the ages have searched for methods to inspire students in their quest for knowledge. Creative techniques of games and activities date back as far as 3000 B.C. to ancient China with the game GO, a predecessor to modern day chess (Shotwell, 2008). Legend has it that Emperor Yau had a son, Danzhu, would not study but only wanted to play no matter what incentives or threats his tutors provided. The emperor, frustrated with his son’s lack of focus, sought to gain his son’s attention through a game that would teach military strategy yet hold his son’s attention. Thus, the game GO was created.

The legend goes on to say that the boy became so captivated by the game that he spent all of his waking hours playing the game while learning military strategy, mathematics and problem solving at the same time. By creating an educational environment that offered stimulating activities and enjoyment, Emperor Yau had found a way to focus his son and teach him skills to lead China. This “edutainment” (Malala, 2009) philosophy has spilled into the digital gaming space in which today’s student expects high fidelity interactive environments to learn.

Games continue to entice players to learn through creative activities with embedded learning objectives. In 2008 the digital games industry generated revenues of $11.7 billion up 22% from the previous year (Entertainment Software Association, 2010). Top games such as *Halo 3* generated more revenue in its first few weeks of sales than most top box office movies (Entertainment Software Association, 2010).

In a study conducted by the Corporation for Public Broadcasting (Federation of American Scientists, 2006) the average, children between the ages of 8–18 spends about 50 minutes per day playing video games. This same study reported that the average adult male spends 7.6 hours and the average adult female spends 7.4 hours per week playing digital games per week. The
average gamer is 35 years old and 25 percent of gamers are over 50 years of age. These statistics demonstrate strong demand for digital games across all age groups. In addition, with the explosion of wireless devices, game playing on mobile devices has taken off with more than thirty-seven percent of adults surveyed indicating a preference for playing games on a smartphones, blackberries and other wireless devices. (Entertainment Software Association, 2010). Digital games are here to stay and “digital natives” (Prensky, 2001) expect this type of technology to be embedded in their learning environments

With the advancements of technology and connectivity, digital games no longer are restricted by physical location or available players. Instead virtual playgrounds have emerged offering players an expansive selection of game choices and global competitors. The most popular online games fall into the category of casual games such as puzzles, board games, game shows and knowledge competitions claiming 44% of the online gaming market (Entertainment Software Association, 2010). Digital games have become the toy of choice among both boys and girls. The digital gaming industry has seen a significant increase in demand for female focused games and is creating games that meet this population (Dickey, 2006). Currently female players make up 40 percent of digital gamers (Entertainment Software Association, 2010). Digital games have come to represent a new form of media socialization in which technology, human interaction, and entertainment have been rolled into a single entity (Calvert & Jordan, 2001). Robust interactive digital learning environments have become forums of “distributed authentic professionalism” (Oblinger, 2006) in which players learn to be professionals such as soldiers, fashion designers and astronauts by playing online games where other players of similar interests also engage in the game. Participants share knowledge, collaborate, problem solve and often work in teams to meet a game objective. Such games fall into the category of serious
games with role-playing, strategy, action and adventured embedded in the game scenario. However, not all games must be complex serious games to be effective learning environments. Casual digital games, such as Jeopardy, Scrabble and card games for example promote memorization, concept matching, pattern recognitions of facts, labels and concepts. (Oblinger, 2006).

Given the affinity for technology, digital games for learning could be the key to teaching complex high level skills which will prepare learners to succeed in the global economy. Gaming proponents suggest that complex digital games can teach higher order thinking skills such as strategic thinking, interpretative analysis, problem solving, plan formulation, execution, and adaptation to rapid change. Immersive gaming environments serve as powerful “hands-on” opportunities for teaching practical and technical skills, from automotive repair to heart surgery (Gee, 2005). Gaming environments integrate cognitive thinking skills with advanced learning objectives by providing interactive problem solving activities that motivate learners to play thus developing the innovative thinkers of tomorrow (Akilli, 2007).

This paper will discuss the affordances of digital games for successful learning outcomes and provide a framework for how these technologies can be pedagogically integrated into learning environments from the classroom to the boardroom. It will also discuss why these technologies are imperative for inclusion into training environments as the workforce expands to include both digital immigrants and digital natives (Prensky, 2001). Given the issues discussed above, three questions will be addressed in this paper:

1. What is the history, definition and taxonomy of digital games?
2. What does the research say about digital games and how they enhance learning?
3. How are digital games being used and why are they important for high performing organizations with multi-generational employees?

**Digital Games Evolution, Definition and Taxonomy**

Digital games got their beginning in 1958 by a physicist, Dr. William Higginbotham at the Brookhaven National Laboratory where he created a game called Tennis for Two on an oscilloscope to attract visitors to the lab. Interest in his innovation became so popular that each day hundreds of people would line up for a chance to play the electronic tennis game (Brookhaven Bulletin, 1981). Tennis for Two became the predecessor to the successful game Pong released in 1972 and was later expanded upon with the Wii Tennis game in 2006. Since that time numerous digital games have been developed to educate and entertain reaching children as young as 6 months old with recognition-matching games to memory enhancing games for senior learners. The significance of digital games application in both education and entertainment has taken center stage in the socio-cultural context of modern day life (Foster, 2009).

As technology has advanced so has the sophistication of digital game development. Incorporating the affordances of these innovations to learning is a dynamic process because of the brain’s ability to change the way learning occurs based upon socio-cultural factors. Early cognitive researchers theorized that learners created knowledge and reason through a series of deductions and inferences. (Foster, 2009). Contemporary cognitive researchers have expounded on this theory and propose that the mind operates similar to a high powered parallel processing computer in which experiences and data are stored via a complex network of associations and meanings and interpreted through deductions and inferences. (Gee, 2007).
Digital games integrate rich interactive rich environments allowing the player to self-create mental models for creating and extrapolating information out of game play (Van Eck, 2007). In addition, with the emergence of these complex computer-like instructional environments, the learning paradigms shift from an objectivist to a constructivist perspective supporting the concept that the learner can determine one’s own learning within the structures of the digital game. Central to a constructivist theoretical perspective is the belief that knowledge is constructed, not transmitted, and that learners play an active role in the learning process. To foster the construction of knowledge, learners should have opportunities for exploration, interaction and manipulation within the learning environment (Duffy & Cunningham, 1996) digital games, by nature of being virtual spaces, can be created to represent complex environments that allow the learner to explore, interact and manipulate characters and events for the purpose of game play. These complex gaming environments provide the learner opportunities with sophisticated problem solving scenarios, which require higher level thinking and stimulate deep learning (Gee, 2007).

**Definition and Taxonomy of Digital Games**

Games whether regardless of format contain similar characteristics. According to Gredler (1996) to be effective for learning, games must: 1) be important, 2) be easy to understand and interesting but not distort the learning process, 3) should not penalize for wrong answers, 4) should allow for multiple winners recognizing the gain of all participants. Taking Gredler’s game definition and applying it to digital games, Prensky (2001) identified the following components for effective digital game design: 1) Player Roles, 2) Game Rules, 3) Goals and Objectives, 4) Puzzles or Challenges, 5) Narrative or Story, 6) Players’ Interactions, 7) Payoffs and Strategies and 8) Feedback. Instructional games incorporate practical, cognitive,
motivational and social skills into their design in order to keep the learner engaged while stimulating high level thinking and problem solving. Each skill is embedded in the game to provide the player an authentic experience, which is transferable to real life experiences (Mishra & Foster, 2007).

With the high-tech innovations such as 3D graphics, high-fidelity interactions and complex storylines, numerous genres of digital games have come to dominate the market. There is however, no distinct categorization of digital games, rather, the stakeholders such as developers, educators, government, industry and game reviewers each rely on a specialized categorization appropriate for their audience (Kirriemuir & McFarlane, 2004) At the highest level of categorization, there exist mini, casual and serious digital games. A separate industry exists for each of these game types however, there can overlap. Mini games, also termed Easter eggs or secret game are usually small stand alone games designed to promote a serious game often they are also embedded in the serious game. These online games frequently use adobe flash or java to provide a rich gaming experience within the browser and although they are small in terms of file size. They noted for being highly causing the player to have "just one more try" to complete a seemingly simple activity (Minigame, 2010).

Casual digital games are easy to play, require few instructions and can be played in short time intervals ranging from 1 to 30 minutes. They have mass market appeal and are re-playable making them very effective for teaching basic knowledge (Kapp, 2007). They are vary in complexity and can be played on computers, mobile devices or in cyberspace by audiences of all skill levels. They include puzzles, mystery games, action games and scaffold in complexity as the player advances in skill (Kadle, 2009). These games are usually built with a few developers
in two to three months at a development cost of about $100,000 (Kapp, 2007). Some examples of casual games would include crossword puzzle, Scrabble, Jeopardy and Wheel of Fortune.

The definition for serious games however is a bit more challenging to pin down because of the differing uses for serious games. One definition that has received acceptance among researchers, developers and gamers is that serious games use computer game technology for uses other than pure entertainment (Potts, 2008). Serious games typically include complex user interface and interaction options resulting in a sophisticated game-play which progressively improves skills. Game difficulty is increased at each subsequent level thereby influencing long term behaviors and enhancing deep learning (Prensky, 2001). Serious games work on the logic of cause and effect in which the decisions the learners make during the game decides the path. They are typically complex applications designed to improve analytical and softer skills which change long term behavior (Kadle, 2009). Serious games are heavily used in the healthcare, government and military sectors. An example of a serious game designed to educate about financial concepts and to influence spending and saving behaviors is Moneytopia. The goal of the game is to teach players to learn how to manager personal finances.

Both casual and serious games can be further refined to categorize game tasks with specific outcomes. A structured taxonomy for serious digital games, although not formally acknowledged by all stakeholders in the gaming industry, is composed of the following categories of digital games: 1) Action, 2) Adventure, 3) Role Playing, 4) Strategy, 5) Sports, 6) Fighting. Simulations 7) Puzzles (Kapp2007, Van Eck, 2007). Casual games may contain elements of each of the taxonomies listed above, however due to their simplistic design, the learning objectives with casual games remains at the lower level of knowledge attainment (Kapp, 2007).
What the Studies Show

Digital Game Research

Research of digital games goes beyond the learning of content but includes an array of socio-cultural attitudinal changes which result from interaction of digital games (Becker, 2007). Social norms are developed within gaming communities that impact game play. Roles of player and designer become interchangeable and scaffolding occurs within the community (Gee, 2005). The following studies cut across several different disciplines to evaluate the benefits of digital games.

Scaffolding. Understanding how digital games create online learning communities (Squire, Giovenetto, Devane, & Shree (2005). examined the inter-relationships between gamers, designers and the online gaming community, Apolyton University,(AU) a self-organized group of high performing gamers whose purpose is to sharpen skills and share experiences in order to improve their Civilization III game playing experience. The AU community had approximately 74 documented members and more than 100 unofficial members. Members within the university posted questions, tips and created mini-lessons in order to promote distributed knowledge and encourage sharing of game strategies and tips with other players. The community, AU, started in response from other experienced Civilization III gamers desiring to share their knowledge so that the game could attract new challenging members (Squire, Giovenetto, Devane, & Shree, 2005).

Results from this study showed that learning occurred not only through the play of Civilization III, but also through the interaction of players at AU. Comparative studies of students who participated in the AU and those who did not revealed that students engaged with AU had greater knowledge of ancient Rome facts and concepts and performed higher at the
game. In an effort to improve the game, players took on the role of developer and stepped outside the gaming domain to suggest game design enhancements and test beta versions of software hence taking ownership of their future learning. Civilization III and the online community demonstrate multiple layers of learning. Although difficult to measure, learners reported using multiple instructional strategies such problem solving, coaching, role playing and multiple perspectives to meet learning objectives (Squire, 2008, Gee, 2007).

**Problem Solving.** In another study looking at how student learning is enhanced by becoming game designers, Clark, Brandt, Hopkins & Wildhelm, (in press), studied multicultural at-risk youth. Students were asked to design a digital game utilizing math concepts. Students had opportunities to be creative in developing game characters, strengthen math skills and learn basic game design. Results from this study demonstrated that motivation increased when learners became instructors and designers. Students from this study provided favorable feedback about their experiences in which they indicated high level of satisfaction from the game design process. In addition, students strengthened math skills as identified by post testing of math knowledge (Clark, Brandt, Hopkins & Wildhelm, in press). This study further supports the notion that gamer as designer empowers learners to take responsibility for their individual learning develop deep problem solving skills (Gee, 2007).

**Coaching.** A question as to whether a game by itself can be an effective tool was the focus of a study conducted by Reiber and Noah (2008), researchers from the University of Georgia. Results from this study indicated that digital games attributed to a greater level of satisfaction however students who received visual instructions along with the digital game demonstrated greater understanding of concepts as noted by an end of the game evaluation. This result was further confirmed in the qualitative study in which five students were interviewed to
gain attitudinal data and procedural data. In both cases students reported greater learner satisfaction and greater tactic learning when visual metaphors were provided along with the digital game for learning (Reiber and Noah, 2008). This study highlights the importance of coaching and visual instructions along with the digital games for learning. Digital games cannot be the sole learning tool, but instead be incorporated into a multi-faceted learning environment (Prensky, 2007).

**Deep Learning.** Studies on the educational significance of digital interactive games play in relationship to adult learning and learner satisfaction is a highly relevant topic as organizations struggle with training of a multi-generational workforce. A study conducted at the University of Central Florida by Malala (2009) explored user receptivity of digital games by adults of various ages and technical expertise. One quantitative study surveyed a diverse online population of elementary, secondary and higher education educators to gain insight as to what factors limit their use of digital games to enhance learning. The results of this study revealed that fear of technology and concern with keeping up with student expert gamers hindered the adoption of digital games as an educational learning tool. A second online survey of people looked at the attitudes adult learner have towards educational benefits of digital game. Findings from this study showed an overwhelming approval of digital games when compared to textbooks and television in the categories of: “socialization”, “physical activity”, “creativity” and “lasting knowledge”. It was only in the category “benefit to brain” that video game was rated below textbooks. The relevance of this study demonstrated a high level of user acceptance to digital games in the learning process by adults in terms of edutainment value demonstrating both user satisfaction and learning relevance (Malala, 2009). It did reveal that research confirming benefits of digital games to intellectual brain development needed to be further promoted.
Motivational. Looking to see if digital games actually motivate learners, Koepp et al (1998) conducted a brain imaging study to track the impact video games have in producing dopamine, a chemical released in the brain. Dopamine is commonly associated with the reward system of the brain, providing feelings of enjoyment and reinforcement to motivate a person proactively to perform certain activities. In this study participants maneuvered a tank through a battlefield on a computer screen using a mouse with the right hand. To win, subjects collect flags with the tank while destroying enemy tanks. The research showed that a significant amount of dopamine was released in the reward center of the brain while playing the game and the higher the score. The study showed that the level of this increase was directly related to the players’ performance. The higher the players scored the more dopamine that was released. This study confirmed the motivational impact digital games have with learners (Koepp et al, 1998).

Cost Savings. The cost to develop serious games has often been an impediment for game development. In a study conducted by the Public Transit System in Montreal (STM) Canada, a return on investment evaluation was performed to determine what if any cost savings had resulted from a new hybrid training approach for STM operators. Traditionally the training had been all in person class time but with the new approach students learned concepts and theory through eLearning methods and then applied the knowledge in a 3D subway tunnel digital game in which scenarios of fires, accidents and electrocution scenarios were obstacles in getting the train to its destination.

The results from this study are quite stunning. Training costs dropped from $763 per employee to $300. The hybrid approach reduced onsite training by 50 percent. Test results on knowledge learned went from 62% to 92% and the number of instructors required to run the
program dropped from 3 to 1 person. These results demonstrate a significant return on investment as well as increased learning performance (Potts, 2009).

**How Games Enhance Learning**

Effective learning with digital games requires learning objectives to be identified and incorporated into the digital game design from the onset (Aldrich, 2009). An integrated approach reviewing technologies, audiences, knowledge types, budgets, development time and learning environments play a key role in determining the type of digital game best suited for the learning situation (Potts, 2008). Due to the flexibility, interactivity and the robust user interfaces associated with digital games, finding the right game for a given learning objectives is a process of matching game attributes with design requirements (Gee, 2005).

At a macro level games are fun and entertaining but they are also immersive environments requiring the player to solve problems, and make decisions with a clearly defined goal. Research detailing how people learn has identified several key attributes, which are core components of digital games.

**Social.** Games are often socio-cultural environments, sometimes involving large distributed communities. Squire elaborated on this concept through the learnings of the online community associated with Civilization III. (Squire, Giovenetto, Devane, & Shree, 2005). Playing the game becomes more than a simple exercise but an immersive experience incorporating the players’ attitudes and beliefs into a larger context of game play (Oblinger, 2006). The distributed intelligence embedded in gaming communities provide a rich social environment for players to scaffold from each other (Gee, 2007).
Knowledge Building. Games require players to recall prior knowledge and determine what new information is needed, and how it should be applied to the new situation presented by the game (Scardamalia & Bereiter, 2006). Those who play digital games are often required to read and seek out new information to master the game. Serious games such as America’s Army require players to advance from simple to complex levels of play as the player achieves mastery of skills one level at a time (Macedonia, 2004).

Problem solving. Knowing what information or techniques to apply in which situations enables greater success, specifically, problem solving. This often involves collective activities of other players, external information, and trial and error in a failure free environment (Gros, 2007).

Application and Synthesis. Players integrated knowledge from other venues—life, school, games and other individuals to meet game objectives. Players are encouraged to transfer existing learning to a unique situation is part of game play (Galarneau & Zibit, 2007).

The complexity of implementing didactic and pedagogical games within an active learning environment provides great opportunity for both the designer and the teacher. Knowing when to apply a digital game into a learning asset and how to assess its effectiveness is often as complex an exercise as the actual creation of the digital game itself (Aldrich, 2009).

Applications of Digital Games

The use of games goes beyond entertainment or academic settings. Given the affordances of games, governments and the private sector have turned their focus to digital games to inform and change behaviors of employees and consumers.

Military: The U.S. Army Simulation, Training and Instrumentation Command (STRICOM) as well as other military organizations have been early adopters to integrate gaming technology
as a tool for strategizing, training and recruiting. The online digital game Americasarmy.com immerses players in an authentic online army environment in which they learn about rules and regulations of the army while having fun (Macedonia & Herz, 2004). It has helped the Army to recruit soldiers at 15% of the cost of other recruiting programs and helped pre-training them and prepare for missions. (Potts, 2009).

**Healthcare:** Numerous examples of digital games have been employed within the healthcare arena including: physician training, preventative healthcare, pain management, patient education, rehabilitation to list a few.

- The National Institutes of Health (NIH) funded the design of the Hungry Red Planet game (www.hungryredplanet.com), designed to teach children healthy eating. (Susi, et.al, 2007).
- Managing pain through distraction therapy is the objective of the reality-based 3D undersea adventure game, Free Dive, which offers players the chance to swim with sea turtles and tropical fish as they search for hidden treasure. In a study conducted with the medical researchers at University of Maryland Medical Center and the non-profit foundation Believe in Tomorrow children engaged with Free Dive tolerated painful medical procedures better than those who did not have access to the game (Jana, 2006).
- Recovery and rehabilitation; games can be used to quicken the recovery for certain operations and conditions. They have also been used for increasing motor skills for example a game controlled with a stylus might replace conventional physical therapy for a stroke patient (Susi, et.al, 2007).

**Government:** Governments use digital games to prepare agency personnel to prepare for a number of different kinds of tasks and situations. Crisis management issues such as those
dealing with terrorist attacks, disease outbreaks, biohazards, health care policy issues, city planning, traffic control, fire fighting, budget balancing, ethics training, and defensive driving are represented through gaming environments. For example firefighters survey a digital raging forest fire through a digital game in which they must make choices for the locations of trenches and water drops against before the fire destroys everything (Chen & Michael, 2005). In another example, first responders from the Federal Management Emergency Agency practice evacuating cities working against under extreme time pressures to minimize causalities and chaos (Squire & Jenkins, 2003).

**Corporate Sector:** Corporation training departments spend an average of $10 billion annually to educate a global workforce. eLearning has gained momentum as a method to reach large population of workers with minimal travel costs and downtime. The use of digital games is beginning to play a role in this training as the workforce transitions to digital natives who expect edutainment to be incorporated into their training. Budgeting, hiring, team work, brainstorm, equipment training, policies, procedures and collaboration games are just a sampling of how corporate sectors utilize digital games for learning. (Prensky, 2001; Malala, 2009). SAP, a large global software company, utilized a team building game to build cohesive teamwork among team members around the globe (Kapp, 2007). Chrysler used a video car racing game teach sales people the attributes of their new Jeep steering accuracy (Susi, et.al, 2007).

**Education:** Digital games are alive and well in the academic sectors. Elementary, high school and advanced educational institutions have integrated games across the spectrum of learning levels. From the lowest learning level digital games have been used to reinforce factual information such as math, vocabulary and science facts. At the highest levels of learning such as create and evaluate digital games have been applied to complex learning spanning multiple
disciplines such as architecture, physics, complex civilizations and other disciples Civilization III, Revolution, Math Facts and numerous others games are examples of digital games utilized in schools and learning institutions to promote learning (Gee & Levine, 2009; Prensky, 2001; Squire 2005).

**Why digital Games are important for high performing organizations**

High performing organizations focus on achieving results that are aligned with the strategic mission of the organization and strive to meet the needs of customers and clients. In a high performing organization each employee understands the organization’s mission and how their specific job feeds measures into the success of the organization as a whole (Government Accountability Office Comptroller General, 2004). To reach this high standard, training of human capital takes center stage in order for organizations to enhance employee performance by providing relevant timely training in a dynamic work environment. With corporate training departments collectively spending more than $60 billion in 2008, demand for highly effective learning tools such as digital games are beginning to get a share of these expenditures (Bersin Associates, 2008).

As the workforce expands to include people spanning multiple generations, developing tools that best enable learning take on a new dimension. Technology and learning styles are melded to create learning assets that effectively prepare the multi-generational workforce to effectively perform in our competitive global economy. Survival of the fittest takes on new meaning as organizations juggle learning requirements with training costs and course production time in order for organizations to be lean, mean agile machines in an evolving world market (Federation of American Scientists, 2006). Educators and trainers often lump all adult learners
into a single bucket, however with the immersive technology presence integrated into all phases of life, learners no longer view learning through the same lens. Three separate generations of adults currently work side-by-side in the workforce today: baby boomers, Generation X and Millennia. Those born with after 1980, the Millennia generation are the digital natives who fearlessly embrace technology and digital media (Holyoke, et al 2009).

To best understand the impact digital games have on adult learners, it is important to understand the underlying tenants of what motivates each generation to learn.

- Baby boomers (born 1943-1960) are a generation where technology happened around them. They did not grow up immersed in technology but adopted differing levels of technology savvy depending upon personal goals and motivations. (Prensky, 2001). On a whole, this group are highly interested in learning for personal growth. They are accustomed to a classroom format for learning and are very conscientious. Boomers when answering essay type questions are most likely to have well thought-out lengthy answers (Holyoke, et al 2009).

- Generation-X (born 1960-1980) is internally motivated by personal connections with the material, instructor and other students. They want to be part of the larger group and look to compare themselves to their peers for learning.

- Millennia (born 1981-2002) seemed to be motivated primarily from external sources such as teachers, classmates family and friends. They are motivated by hands-on experiences and look to their classmates for enhanced meaning. They want to learn only when the information is necessary to accomplish an immediate goal (Holyoke, et al 2009).

Given these differing perceptions towards learning, digital media are extremely important for the emerging workforce and viewed as a necessity by the retiring workforce. Those born after
1970 are considered the digital native whose cognitive styles have been shaped by ubiquitous access to computers and digital games. (Prensky, 2001). Those born before 1970, the digital immigrant, has adopted technology as the need arose. This digital divide offers challenges to instructional designers in the integration of technology within the learning environment. Learning for the digital native is facilitated when there exists: 1) active engagement, 2) group activities, 3) feedback and frequent interactions, 4) personally relevant connection to the content in the learning environment (Beedle & Wright, 2007; Prensky, 2009).

Squire proposed that digital games provided learners with a designed experience in which real world cognitive requirements are directly mapped to game world affordances and these affordances have become the expectation learning among digital natives (Reese, 2007). Today’s “Net Generation,” or “digital natives,” require multiple streams of information, prefer inductive reasoning, want frequent and quick interactions with content, and have exceptional visual literacy skills\(^1\)—characteristics that are all matched well with DGBL. (Van Eck, 2006). Digital natives expect learning to be fun and digital games meet the cognitive learning requirements while providing great entertainment (Gee 2007; Prensky 2009; Malala, 2009; Squire, 2007 and others).

The significance of digital game based learning (DGBL) has taken off as new generations of learners expect technology to facilitate knowledge transfer in every aspect of learning. With the integration of the digital native into the stream of the digital immigrant, a new form of “digital wisdom” is occurring in which technology and gaming savvy transcend generational boundaries to share a baseline understanding of technology and digital games for learning. Although the digital immigrant can never become a digital native, these individuals can attain a working knowledge of technology termed digital wisdom (Prensky, 2009).
Conclusion

This paper has examined the affordances of digital games for successful learning outcomes by providing significant research and examples of learning successes utilizing digital games. A review of the history and characteristics of digital games was discussed identifying three primary types of games: mini, casual and serious. Real world digital game applications were examined along with studies of how these technologies can be pedagogically integrated into learning environments. The studies revealed that digital games are motivational, deep learning, problem solving experiences for learners and can provide cost savings to organization. Discussions about why digital games have relevance to a multi-generational workforce substantiate the importance that digital games play in creating high performing organizations.
References


