International Journal of Food Studies | IJFS April 2016 | Volume 5 | pages 1–11

Developing and delivering food systems training programmes for 21st century audiences

Troy Hahn[a] and Patricia A. Curtis[b*]

[a] Office of Instructional Technology (OIT), SUNY Suffolk County Community College, 533 College Rd., Selden, NY 121784, USA
[b] Auburn University, Food Systems Institute, 559 Devall Dr., Auburn, AL 36849, USA
[*]Corresponding author
Pat_Curtis@auburn.edu
Tel: +1-334-844-6247
Fax: +1-334-0452

Received: 13 June 2014; Published online: 18 April 2016
Invited paper from the 3rd International ISEKI_Food Conference - ISEKI_Food 2014 - Bridging Training and Research for Industry and the Wider Community - Food Science and Technology Excellence for a Sustainable Bioeconomy

Abstract

Expectations for training programmes today are very different from expectations for training programmes in the past, because today's audiences are not only multigenerational, but the younger generations learn in distinctly different ways from older, more traditional audiences. To meet the needs of these multigenerational audiences, the Auburn University Food Systems Institute (AUFSI) has developed on-demand, online courses that offer a variety of ways for learners to interact with training materials. For example, a typical course may offer not only traditional text, but audio, video, simulations, and more. In addition, AUFSI has developed supporting educational tools such as interactive virtual tours and video games. This approach to creating courses is a response to the different levels of experiences of the generations as well as different expectations of how materials should be delivered. In order to be effective, training materials need to be designed to appeal to this multigenerational audience. Traditionalists (born before 1946) prefer face-to-face training programmes. Baby Boomers (born 1946-1964) are more accepting of technology. Generations X (born 1965-1980), Y (born 1981-2000) and C (born after 2000), however, expect to receive training at their convenience, to have it delivered electronically, and to be entertained as well as educated.

Keywords: Training; Distance education; E-learning; Food safety education

1 Introduction

Expectations for training programmes today are very different from expectations for training programmes in the past because today's audiences are multigenerational. The different generations have different levels of experiences as well as different expectations of how materials should be delivered. In order to be effective, training materials need to be designed to appeal to this multigenerational audience. To meet their needs, the Auburn University Food Systems Institute (AUFSI) has developed on-demand courses that offer a variety of ways for learners to interact with training materials. For example, a typical course may offer not only traditional text, but audio, video, simulations, and more. In addition, AUFSI has developed supporting educational tools such as interactive virtual tours and

 10.7455/ijfs/5.1.2016.a1

video games. The primary focus of this collaborative project is to design, develop, and disseminate food/feed safety training programmes that are consistent with the U.S. Manufactured and Retail Food Standards, as well as third-party criteria for accreditation.

Auburn University, located in Auburn, Alabama, has a long history of research and outreach in disciplines having to do with food systems. The university created AUFSI in 2011, with one of the goals being to maintain an infrastructure to support interdisciplinary research on food systems issues, as well as to encourage teaching and training collaborations and external partnerships with academia, industry, government, and consumers. Objectives included developing quality credit- and non-credit educational courses in food-systems-related disciplines as well as developing quality education for K-16 learners in food safety and related environmental issues. A concomitant objective was to create and improve public awareness about food systems-related health, economic, and implementation issues.

In the first year, AUFSI created the Virtual Food Systems Training Consortium (VFSTC), which brought together subject matter experts from several different universities. The consortium's first task was to create online, on-demand training for inspectors of U.S. Food & Drug Administration. The challenge was to create training that would engage inspectors of various ages, with various levels of education and training. AUFSI and VFSTC have since branched out to make this training available to other organizations and to create additional courses, building upon what has been learned about creating training to appeal to heterogeneous, multigenerational audiences. AUFSI has particularly attempted to reach younger learners in a way that is meaningful to them, utilizing electronic on-demand delivery, simulations, games, and built-in assessments in training. AUFSI achieved certification from the American National Standards Institute (ANSI)/International Association for Continuing Education and Training (IACET).

2 Rationale and Approach

In order to be effective, training materials need to be designed to appeal to today's multigenerational audience, including Traditionalists, Baby Boomers, Generation X, Generation Y, and Generation C. Traditionalists were born before 1946 (Table 1). They prefer formal types of interaction and more structured types of communication. They like face-to-face business transactions and participation in educational programmes. They prefer to talk with people rather than to interact with computers. Traditionalists prefer face-to-face training programmes, so reaching them with online training can be a challenge. However, most Traditionalists are willing to use technology as long as the technology is easy to navigate, although it is not their preferred source of information.

The next group, Baby Boomers, were born between 1946 and 1964. For educational meetings, they prefer a conversational style of presentation. They like a group approach to problem solving and are more accepting of technology. They readily utilize fax, email, and voicemail. They represent the largest group of new Facebook users. Baby Boomers have indicated they prefer tactile learning. This finding indicates that they have a need for hands-on learning activities using three-dimensional and manipulative materials (Cambiano, De Vore, & Harvey, 2001).

The most challenging group to reach, Generation X, was born between 1965 and 1980. They dislike voicemail and landlines, and they do not like group work. They tend to avoid meetings and phone calls. They do not like to waste time. They favour making decisions without unnecessary discussions. When it comes to presentations, they want to hear the "bottom line" first and then decide if they feel the rest of the presentation is worth their time. They like electronically delivered material that entertains as well as educates. They own the latest technology, and texting is their preferred means of communication. In order to maintain a favourable learning environment for Generation X, instruc-

Table 1: Generational Differences

Generation	**Born**	**Prefer**
Traditionalists	Before 1946	· Formal presentations · Structured communication · Face-to-face transactions
Baby Boomer	1946-1964	· Conversational style presentations · Hands-on learning · Group approach to problem solving · Fax, email and voicemail
Generation X	1965-1980	· Making decisions without unnecessary discussions · Hear bottom line first · Electronically delivered material that entertains as well as educates · Texting as a means of communication · Carefully laid out plans for learning
Generation Y also known as Millennials or Net Generation	1981-2000	· Highly social · Collaboration and group work · Email for work and school · Texting and calls for personal communication · Multitasking while using diverse range of digital media · Interactive and participatory learning
Generation C	After 2000	· Hyper-connected · Community oriented · Convenient and entertaining educational experiences

tors should maintain a very structured environment. Generation X needs carefully laid out expectations in the learning situation, including knowing what assignments are due in the future, the parameters of each lesson, and the sequential steps involved in all assignments, with the instructor leaving nothing to interpretation. The prime learning time of Generation X is in the evenings, so flexibility of scheduling should be considered (Cambiano et al., 2001).

Members of Generation Y, also known as the Millennials or Net Generation, were born between 1981 and 2000. One of the key descriptors of this group is that they are highly social. In fact, they constantly share their lives via social networks. They are very community oriented and prefer collaboration and group work. Millennials use technology as much as possible and have specific uses for different types of technology. For example, they use email only for work and school. They reserve texting and calls for personal communication. Regarding education, they expect to receive training at their convenience, to have it delivered electronically, and for training to "entertain" as well as educate. They also want the information to be short and to the point. Schooley et al. (2005) reported that Millennials have an innate ability to use technology, are comfortable multitasking while using a diverse range of digital media, and demand interactivity as they construct knowledge. Schooley also wrote that although Millennials lack the workaholic drive of their burned-out predecessors, they compensate by using many technologies, often simultaneously, to get the job done quickly and have a personal life as well.

Millennials are not interested in passive classroom learning but instead prefer many learning opportunities on a variety of subjects, taught in an interactive and participatory fashion (Kriegel, 2013). McGuire and Gubbins (2010) pointed out that informal learning, such as the kind of learning favoured by Millennials, could be frustrating if there is a lack of direction and, therefore,

learners must be considered active partners in the design and facilitation of the learning process. Emerging technologies support and encourage the type of learning that appeals to Millennials; social media and mobile learning tools revolve around this type of learning. Millennials also like hands-on learning, collaboration-leveraging technology, and for assignments to be clearly outlined with the expectations clearly structured. Although they do like to work in groups and informally, they are not motivated to explore on their own and need more structured direction. New strategies have to be developed to properly engage this generation's personality: special, socially conscious, team-oriented, sheltered, confident, conventional, pressured, and achieving (Wilson & Gerber, 2008).

Generation C was born after 2000. They have grown up in a digital world and are hyperconnected. In fact, the way adolescents of today learn, play, and interact has changed more in the past 15 years than in the previous 570 years—since Gutenberg's popularization of the printing press (Giedd, 2012). Members of Generation C are community oriented and, like Generation X, expect education and training to be convenient and entertaining. Oblinger, Oblinger, and Lippincott (2005), however, reported that although members of Generation C have grown up with widespread access to technology and are able to use a variety of IT devices intuitively and navigate the Internet, their understanding of the technology or source quality may be shallow.

Holyoke and Larson (2009) measured three learning aspects: readiness to learn (i.e., a student's inherent need to know new things); orientation to learning (i.e., a student's interest in applying new knowledge to his or her own life experiences); and motivation to learn (i.e., a student's desire to improve one's life through learning). The results indicated that Millennials had the lowest readiness to learn of any generation, citing distractions or lack of curiosity as the main reason. Generation X had the highest readiness to learn, whereas Baby Boomers only had a high readiness to learn when the material pertained to personal growth. This was a common theme in the survey results, as every generation had a high orientation to learning when the material pertained to their own lives. According to the results, Millennials lost interest quickly when they could not relate to the material. Generation X enjoyed personal discovery and had low orientation to learning when the material did not relate directly to them. Baby Boomers were most engaged in the "joy of discovery and self gratification."

Another theme in the research showed that Generation X was most motivated when involved in collaborative efforts, while Baby Boomers were most motivated when they were able to show their competence and speak to their own experiences. Interestingly, Millennials were found to have the lowest motivation to learn, placing much of the onus for creating motivation on the instructor. Twenge and Campbell (2008) supported this claim, indicating such a low internal motivation to learn may have serious implications for engaging Millennials in corporate training.

Many authors have written about the different generations, and the exact years for each generation vary by author. It is important to acknowledge that there is a great deal of variance among the distinguishing characteristics within any given generation, and so it is not justified to assume that if a person was born in 1985, he/she would have most of the characteristics of Generation Y, or that someone born in 1960, and thus a late Boomer, would not be as sophisticated about technology as a person born into Genertion X or Generation Y (Reeves, 2006).

2.1 Implications

What does this mean for our current system of education? Do we need to change the way we currently create and deliver educational materials? What expectations do Generations X, Y, and C have when it comes to learning? Research indicates that these younger cohorts want education and training at their convenience. Since they are heavy users of technology, electronic delivery seems to be most appropriate for these groups. Unlike their parents, whose expectations regarding education and entertainment were very different, these generations were exposed to an abundance of educational programmes that were designed to entertain as well as educate. This expectation

for entertainment-style education along with the growth in technology has led to the need for a major overhaul in the way educators think about developing and implementing education and training programmes in the 21st century. Prensky (2001a) stated:

> "Our students have changed radically. Today's students are no longer the people our educational system was designed to teach. Today's students have not just changed incrementally from those of the past, not simply changed their slang, clothes, body adornments, or styles, as has happened between generations previously. A really big discontinuity has taken place. One might even call it a 'singularity'—an event which changes things so fundamentally that there is absolutely no going back. This so-called 'singularity' is the arrival and rapid dissemination of digital technology in the last decades of the 20th century."

In fact, "digital natives" may actually think differently from earlier generations. Reeves (2006) quoted Prensky (2001b) summary findings of various basic research studies in neuroscience from which he concluded that is the case:
Based on the latest research in neurobiology, there is no longer any question that stimulation of various kinks actually changes brain structures and affects the way people think, and that these transformations go on throughout life. The brain is, to an extent not at all understood or believed to be when Baby Boomers were growing up, massively plastic. It can be, and is, constantly reorganized. (Although the popular term rewired is somewhat misleading, the overall idea is right—the brain changes and organizes itself differently based on the inputs it receives.) The old idea that we have a fixed number of brain cells that die off one by one has been replaced by research showing that our supply of brain cells is replenished constantly. The brain constantly reorganizes itself, a phenomenon technically known as neuroplasticity. One of the earliest pioneers in this field of neurological research found that rats in 'enriched' environments showed brain changes compared with those in 'impoverished' environments after as little as two weeks. Sensory areas of their brains were thicker, other layers heavier. Changes showed consistent overall growth, leading to the conclusion that the brain maintains plasticity for life.

2.2 The role of games

Humankind has used games and simulations as a tool for amusement for thousands of years, and the first use of games as a training tool was for military exercises or war games (Langton, Addinall, Ellington, & Percival, 1980). It was not until very recently, in 1962, that gaming and simulation methods were used in an academic environment to help teachers prepare for situational issues that can arise within the school system (Langton et al., 1980). As Caillois and Barash (1961) notes, in a game the rules of ordinary life are temporarily suspended, and the rules of the game are used.
Clearly, games have a role to play in modern-day education—and today those games are likely to be computer games. Quinn (2005) reported that 70 percent of survey respondents would be interested in a learning process that has computer games. Utilizing games may be especially useful in reaching the younger generations; it is clear that Generation Y spends more time playing video games than Generation X, and that Generation X in turn plays more than Baby Boomers (Rideout, Roberts, & Foehr, 2005). Oblinger (2006) noted that the appeal of games is not lost on older generations:

> "... games aren't just for youth; the average age of a game player is 30. In the United States, 50 percent of adults play games; one in five adults over 50 is a video gamer. Males and females play games about equally (55 percent are male; 45 percent are female). Perhaps the prevalence of games is why 63 percent of parents believe games are a positive part of children's lives; nearly 60 percent of teachers in the United

> Kingdom are willing to use games in the classroom."

The interactive games played by each successive generation have become increasingly sophisticated (Reeves, 2006), and today's electronic games and simulations have the power to actively engage people in a variety of ways. They are fun and provide interaction with others. The interactivity provides scenarios that involve problem solving through engaging stories and other elements that enhance the learner's involvement, motivation, and creativity. A key factor for learning is that games provide outcomes and feedback in real time that can be used to guide the player's next actions. The player can learn through mistakes, role-playing, collaboration, goals, etc. (Burgos, Fernandez-Manjon, & Richards, 2008). For example, the authors created a video game to be incorporated into training, with the goal of enhancing critical thinking by food inspectors. The video game places the player in situations that require the player to think "outside the box" in order to successfully complete the game. In addition, the player is required to pull knowledge from previous courses and experiences to determine the best way to move forward in a virtual situation.

Games also may have a future as assessment tools. Many educators are investigating how data can be collected from video game play to provide insight into the way students think as they explore new concepts. The goal is to move beyond tests that give little meaningful information about how or what students have learned, and instead use data gathered from actions in a game to obtain information about knowledge growth (Schwartz, 2014). The video game for food inspectors mentioned above will incorporate the collection of assessment data.

2.3 Positive or negative?

The changes in education that must result from the changing learning styles of different generations can be looked at in different ways. The digital revolution and familiarity with the Internet make it very easy to access information—never before has so much information been available to so many. However, not all the information accessed is credible; therefore, it is important that those using this easily available information be taught how to evaluate critically and effectively use the information to solve real world problems. Brown and Duguid (2000) wrote a book, *The social life of information*, whose central theme is that access to information does not equate to knowledge. In fact, they argued that much learning comes from informal social interaction between learners and mentors, and these interactions were difficult to achieve in mediated instruction.

Some commentators also express concerns about the effect of television, computer use, and video games on children's development. Healy (1998) in her book, *Failure to connect: How computers affect our children's minds—For better or worse*, argued that the development of abstract reasoning ability requires the physical experience of action, which is decreased when children are placed in passive mode for hours in front of the television or computer screen. She also expressed concerns about the lack of language stimulation from overexposure to video games, and worried that today's interactive media actually stifles children's intellectual curiosity.

New modes of instruction, in particular video games, have their supporters, as well. Prensky (2006) argued that video games stimulate children's creativity, and Beck and Wade (2004) argued that video games have led Generation X and Generation Y to work hard, be competitive, and fit into teams. Gee (2003), an applied linguistics professor from the University of Wisconsin, concluded that playing contemporary video games has positive outcomes with respect to many cognitive skills, including enhancing the ability to detect patterns in seemingly chaotic events and learning to think like a scientist (Table 2).

Holland, Jenkins, and Squire (2003) went so far as to suggest that interactive video games can be used to accommodate learners with different learning styles. Mitchell and Savill-Smith (2004) reviewed the literature on gaming in education and concluded that well-designed interactive games have the potential to do the following:

- Engage unmotivated learners.
- Engage learners who lack confidence in their ability to learn.

Table 2: Pros and Cons of Utilizing Games and Simulations in Education

Pros	**Cons**
· Stimulate creativity · Encourage teamwork · Increase competiveness · Enhance ability to detect patterns · Accommodate different learning styles · Engage unmotivated learners · Build confidence in ability to learn · Develop literacy skills · Develop mathematical skills · Develop visualization skills · Develop capacity for strategic and tactical decision making · Develop critical thinking and problem solving skills	· Cost of development · Time required to develop creative educational games that meets specific learning objectives · Lack of appeal to some students · Less physically active · Can lead to eye strain, headaches, wrist, neck and back pain · Requires technology which might not be available or accessible · May be difficult to monitor and assess progress

- Develop literacy skills.
- Develop mathematical skills.
- Develop visualization skills.
- Develop capacity for strategic and tactical decision making.
- Develop critical thinking and problem-solving skills

Beck and Wade (2004) argued that skilled game-players possess the type of skills that business demands today, such as the capacity to multitask, take risks, and exhibit leadership. Johnson (2005) described gamers as individuals who "perceive the world more clearly, are more creative problem solvers, are more confident, and are more social." Corporations are increasingly moving toward online, digital learning and away from conventional face-to-face classes. Kapp (2006) quoted John Cone, former head of learning for multinational computer technology giant Dell Inc., as saying:

> "The ideal 'learning event' at Dell has a class size of one, lasts five to 10 minutes, and takes place within 10 minutes of when someone recognizes that he or she needs to know something. Our challenge is to reduce learning to its smallest, most useful increments and to put the learner in charge of the entire process."

This kind of online, digital learning is ideally suited to distance education, and Battalio (2009) found a significant association between learning styles and academic success in distance education. Blackburn (2009) found similar results in a corporate setting. Both Battalio and Blackburn suggested that instructional designers create multiple versions of each course so that learners can thrive in an environment that best fits their learning preference. Kriegel (2013) suggested that instructional designers would benefit from knowing about learning style preferences for all generations so these preferences, as a whole, can be considered when creating corporate training programs.

The authors of this article strongly agree with John Cone's "ideal learning event," and it is this philosophy that we have tried to put into action with our Virtual Food Systems Training Consortium. We also agree with Battalio, Blackburn, and Kriegel that such training should address various learning styles. Although we do not create multiple versions of each course, we do ensure that each course has video, audio, traditional text-based distance education, and in-

teractive iBook formats. Some courses include simulations, games, virtual tours, and virtual world interactions. We use Google Glass to provide learners the opportunity to learn from a first-person perspective how to carry out certain tasks. We also have developed nontraditional assessment components within some of the courses. Nontraditional assessment components can include interactive video, virtual world interaction testing, etc.

Our simulations make it possible to "learn by doing" digitally. As an example, subject matter expert Cova Arias desired to supplement the often dry and difficult-to-understand material in her course, "Rapid Methods for Detection of Foodborne Pathogens: PCR and Re¬lated Techniques," with videos and simulations. In her search for a way to make her course interesting, Arias reviewed existing simulations and other types of media and was unimpressed. She thought they lacked coverage and depth, and failed to promote student engagement. So Arias collaborated with AUFSI staff members to develop a one-of-a-kind interactive simulation designed especially for her online class. AUFSI has created a 3D training simulation that allows learners to visualize and interact with PCR techniques, as well as apply what they have learned while taking the course. Learners are able to access and interact with the simulation on their favorite devices, from desktop computers and laptops to iPads and other tablets. Using built-in metrics, the AUFSI team will be able to measure the simulation's impact on material retention and engagement.

3 Results and Discussion

This kind of education, appealing to a multigenerational audience and incorporating a variety of digital tools, clearly has a promising future and can be as effective as more traditional styles of education. In fact, Clark (1983) pointed out that if the same instructional design is delivered by two different modalities (face-to-face vs. distance, for example), it makes no sense to expect two different outcomes. However, one modality may be preferred over another for reasons such as differences in cost, accessibility, and efficiency.

The value of simulations and gaming in an educational and training environment, however, is only as sound as the tools used to develop them. One cannot simply take any game or simulation off the shelf and expect it to be valuable in an educational setting. Johnson (2005) stated that "when new tools arrive, you have to learn what they're good for, but you also have to learn the rules that govern their use." Different kinds of games also offer different learning benefits, and that is just as true for video games as for more traditional games. Oblinger (2006) provided four game-style examples:

- Card games: promote memorization, concept matching, pattern recognition;
- Jeopardy-style games: encourage quick mobilization of facts, labels, concrete examples;
- Arcade-style games: good for improving speed of response, automaticity, and visual processing;
- Adventure games: useful for promoting hypothesis testing and problem solving.

Each of these four game styles can use simple, non-electronic technology, like pen and paper or the chalkboard. However, with the advent of the computer, complex gaming and simulation experiences can be developed not only to challenge the learner but to allow individualized learning experiences. Within the last five years, gaming and simulations have become truly on-demand with adoption of mobile technology like the Android and Apple devices. A report by Nielsen in 2011 stated that tablets are proving to be an interactive learning tool for kids from tablet-owning families, with 57 percent of children using educational applications. Therefore, the ability to integrate electronic gaming and/or simulation into the curriculum is readily available, especially if the game/simulation is considered an ancillary part of the educational environment.

There are several implementation issues with game development, however, from sky-high costs to having the proper support (technical and content) infrastructure in place for the learner. Oblinger (2006) stated that institutions must consider the following when implementing games in a formal or informal curriculum:

- Are computer laboratories available where students can play the games, and are the games appropriately configured?
- Is the right equipment available, such as headphones, speakers, and special consoles?
- Is support available for the game, both technical and in terms of the game play?
- Is gaming integrated into the curriculum or just added on?
- Are there instructional designers who can develop games?

There also can be issues associated with getting learners from different generations to "buy in," or be interested in learning what the instructor trying to teach. This is an issue a game developer has to consider when developing training for FDA inspectors. For example, developers need to set the stage during orientation so that learners know how this learning experience to going to benefit them and how the information fits into the "real world." It is important to continually re-evaluate and modify courses to meet the changing expectations of learners. Chester (2005) in his book, *Getting them to give a damn*, provided the following training guidelines:

- Begin with an orientation, not skills training.
- Assess what they know.
- Continually reinvent your training.
- Communicate where to turn for answers.
- Don't just train the what, train the why.
- Keep training fun, interactive, and engaging.

Although digital learning has its critics, research has largely supported its effectiveness. When Tallent-Runnels et al. (2006) conducted a literature review of 76 published research studies that investigated the effectiveness of online courses, overall findings boiled down to: "Learning in an online environment can be as effective as that in traditional classrooms, and a student's learning in the online environment is affected by the quality of online instruction."
One caveat is in order, however. Although games and simulations allow a quick, fun way for students to learn and become immersed in a digital learning environment, there is a diminishing return on how long the game will be useful to the learner. It is normal for a gamer to be enthralled with the environment for a period of time, but this time can vary depending on the complexity, fun, and perceived value of the game. The major challenge when designing an educational game is to ensure that learning is not a by-product. Instead, learning specific tasks should be the main feature of the game and, somehow, in the development cycle, the game-makers should keep the environment enjoyable as well as keeping the learners' interest high—which is what makes the game fun in the first place. If the learner perceives the game environment as dull or overly complicated, the value of the training is diminished and chances of the learner completing the process are drastically decreased.
Balsabramanian and Wilson (2005) provided five guidelines when developing and designing educational games:

- The design of games and simulations should be sophisticated and challenging enough for students to be cognitively engaged with the game.
- The content of games and simulations should be aligned with the standards and viable curriculum in schools.
- The logistics and usability of the games should reflect classroom realities and time constraints in schools.
- The feedback and assessments embedded in the games should embody measurable learning outcomes.
- The teacher guides accompanying the games should provide sufficient ideas, activities, and resources to enhance students' learning.

4 Conclusions

In summary, it is important to remember learning styles of different generations. Traditionalists (born before 1946) prefer face-to-face training programs. Baby Boomers (born 1946-1964) are more accepting of technology. Generations X (born 1965-1980), Y (born 1981-2000) and C (born after 2000), however, expect to receive training at their convenience, to have it delivered electronically, and to be entertained as well as educated. In designing training that will be effective with a multigenerational audience, games and simulations can be an effective way to teach. The Auburn University Food Systems Institute is exploring the use of games, simulations, videos and other approaches in designing online, on-demand courses for inspectors of Food & Drug Administration-regulated projects, and audience that spans several generations. Evidence suggests that playing video games has a positive impact on student learning, outweighing any negative effects video games may have. With the workforce made up of workers who have spent large amounts of time playing video games, educators should explore the real and potential effectiveness of training games and simulations.

Like Dell Corp., quoted above, we see the ideal "learning event" as having a class size of one, lasting a short time, and being on-demand—in other words, available electronically as soon as an inspector or other learner recognizes that he or she needs to know something. We, too, strive to reduce learning to its smallest, most useful increments and to put the learner in charge of the entire process.

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