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Games for Learning: Serious Entertainment

Christopher Harz looks into the ever-expanding field of educational videogames, moving games from the home into the classroom and office.

One of the hot topics at the recent Game Developers Conference was Serious Games, videogames used for learning — by students learning physics in schools, by surgeons in hospitals, by corporations to train salesmen, by the Army to train soldiers in combat, by the Forestry Service to practice firefighting, and even by the Secret Service, to learn how to respond to crisis events.

In a time when it's getting much more expensive and risky to produce games for entertainment (costs for PlayStation 3 games are expected to routinely top \$10 million), Serious Games offer an interesting possibility for game houses to create moderately priced games, do some good for society, and get paid up front to prop up cash flow.

To better understand what learning games are all about, it helps to get a broad view of some of the different types being developed in the market right now.

Types of Learning Games The types of learning games run the gamut, and may be used for just about any application involving training. The sober approach is to see where the funding comes from (“Show me the money!”) — this points to a smaller number of categories, including games sponsored by the military and other government agencies, health care organizations, first responders and emergency management groups, professional groups such as attorneys, and specialized niche categories such as religious, political, yoga and exercise, and social change.

America's Army (www.americasarmy.com) is the most successful Serious Game to date, and you will hear it referenced at just about every conference. Initially funded by the Army as a pr tool, and produced by the Naval Postgraduate School in Monterey, California, for an initial cost of around \$8 million, *America's Army* is now used for actual training of soldiers, using existing and even experimental weapons. It also has a large civilian following — more than six million players belong to the online community, which can download the game for free. Gameplay options continue to grow, with around \$10 million per year being spent for upgrades and new categories. *America's Army* is now also available for Sony PlayStation 2 and Microsoft Xbox game consoles.

Harpoon 3, by Advanced Gaming Systems (www.advancedgaming.biz) is a game for the U.S. Navy that can also be played by civilians for entertainment. This is an example of an industry trend to develop both entertainment and Serious Game versions of the same basic game, thereby re-using digital assets and saving production costs. The “Harpoon” referred to is not for killing whales, but is an anti-ship missile used by the Navy in combat.

Tactical Iraqi (www.isi.edu/stories/101.html) is a game created by the University of Southern California

Information Sciences Institute (USC ISI). It introduces the player into social settings in Iraq, where he learns and tries out both the Arabic language and his understanding of the various social symbols, gestures and cultural habits of that country. The game was funded by the Department of Defense, which has had an ongoing \$10 million per year contract with the University, sometimes called “Hollywood meets the Pentagon.”

Angel Five is a Serious Game that was developed for the FBI by Visual Purple (www.visualpurple.com), one of the prime game companies in this area, which uses both video clips and 3D animation for games that teach decision making skills for a range of government agencies.

Hazmat: Hotzone, by the Entertainment Technology Center at Carnegie Mellon University (www.etc.cmu.edu/projects/hazmat) is a game to teach firefighters how to deal with crisis situations involving hazardous materials such as poisonous gases or radioactive materials. Developed in conjunction with the New York Fire Department, this is an example of how successful games should be made — tightly coupled with the community they are trying to serve.

Fire Brigade Commander Training, by VStep (www.vstep.nl) of the Netherlands is a Serious Game developed for firefighter training for the European community. In Europe, as in the United States, there is increased awareness of the need for training forces for Emergency Response Systems, which include hundreds of thousands of policemen, firefighters, nurses, physicians and ambulance personnel. The company also produces “fly-through” exploratory 3D animation games to help energy exploration companies find their way through virtual representations of oil fields.

National Fire Academy Training Simulation, by Dynamic Animation Systems (DAS) (www.d-a-s.com), of Fair Oaks, Virginia, is a firefighter training game developed for the U.S. National Fire Academy. The company has produced a game for the U.S. Forest Service, and also produces entertainment games. In order for developers of Serious Games to cut down on production time and budgets, DAS offers a suite of 3D terrain and game development tools to help gaming houses reduce risk and generate more efficient production pipelines.

Food Force, by Deepend and Playerthree (www.food-force.com) is a game about nutrition and world hunger that was developed for the United Nations. It is an example of games produced for social change, which can be sponsored by either international groups such as the U.N. or by business or charitable trusts.

PowerPolitics III, by Kellogg Creek Software (www.kellogg-creek.com) is a good example of a successful educational game intended to teach political science in high school or college classrooms. The game focuses on the presidential race, and engages players in the topics and strategies related to winning the presidency. In 2004, Kellogg Creek pioneered an interesting new type of distribution, by letting readers of the *Christian Science Monitor* download a free version of the game, which had input from the paper. Readers thereby also became gamers, and much more involved in the topics being covered in the *Monitor*. Political Science and history seem to be especially popular and effective topics for learning games, as politics and history can be especially dry and boring when only learned from books.

Second Life, by Linden Labs of San Francisco (www.secondlife.com), is a virtual environment that lets educators explore learning with groups of students, and develop their own training games. The company’s *Campus: Second Life* program offers special support and discounts for such academic groups, who now have an extensive community “in world,” where they hold regular meetings and exchange best practices. Harvard, Pepperdine University (in Malibu), Texas University and other major schools have “islands” where they explore how communities and teams can learn most effectively.

Objection! and **Expert Witness!**, by TransMedia Games (www.objection.com) are examples of successful games that were produced for large groups of professionals, the professionals in this case being trial lawyers that are learning or refreshing their skills in the courtroom. *The Objection!* series of

games is in wide usage in the U.S., and can even provide academic and professional credits.

Pulse!!, by BreakAway Games of Hunt Valley, Maryland, (www.breakawaygames.com) is an example of a Serious Game developed for the healthcare market, a growing category. *Pulse!!* was started by Claudia Johnston, who has a doctorate in nursing, when she noticed that the frantic pace of FPS (First Person Shooter) games had a lot in common with the interior of an emergency room, including resource and time management as well as quick thinking under pressure. The game was developed under a \$7.5 million grant from the Office of Naval Research, and replicates the Intensive Care Unit of Bethesda Naval Hospital's Intensive Care Unit. Special technical challenges included modeling skin with subtly different colors and bodies with different breathing profiles that indicate the condition of the patient. BreakAway Games is an example of a real success story in the Serious Games genre; it also produces a series of entertainment games, encouraging its creative groups to switch between the two types of gaming.

Emergency Room, by Legacy Interactive (www.legacyinteractive.com) is another example of a learning game for the medical community. It's a role playing game that you play as a medical student in an overwhelmed emergency room.

Stone City, by Persuasive Games (www.persuasivegames.com) is an example of what many expect to become a booming category — learning games used by major companies to train their executives and workers. *Stone City* was generated for the Cold Stone Creamery ice cream company, and uses a 3D replica of one of its stores to teach new employees how to prepare and serve ice cream to customers.

Take Back Illinois, by Persuasive Games (www.takebackillinoisgame.com) is an example of a specialized market niche — political games. *Take Back Illinois* was sponsored by a major political party to teach local groups how to lead grass roots campaigns. It can be expected that usage of this type of game will increase with the upcoming hotly debated political campaigns of 2006 and 2008.

Interactive Parables, by GraceWorks Interactive (www.graceworksinteractive.com) is another example of a learning game created for a niche market, the religious market, of which Christian games is the largest segment so far. *Interactive Parables* is sold at Christian retailers and over the Internet.

Dance Dance Revolution, by Konami (www.konami.com or www.ddrfreak.com), is an example of a health-oriented game that encourages physical activity, and has been praised by its users for a great way to lose weight. It is also illustrative of the fact that games don't have to depend on joysticks or keyboards for their interaction. Other entries in this market include games for meditation, yoga and a variety of martial arts exercises, using either gamepads or Sony's popular EyeToy video camera attachment for the PlayStation 2.

Serious Games are of course not a panacea — they can't be applied to make every learning task easier. But for many subjects — such as exploring complex subjects visually, or for learning how to collaborate as a group - they appear to hold huge potential.

Early and Late Adapters One of the first communities to formally use games for learning has been the military, tracing back to the sand boxes that Alexander the Great and Julius Caesar used for practicing tactics, continuing through the *Kriegspiel* ("War Game") exercises with concealed enemy movements that were used by the Prussians, to today's large-scale networks of tank and aircraft simulators, which developed the graphics and software technology foundations for modern civilian videogames.

It's easy to understand why the military is such an enthusiastic audience for game based learning. The U.S. Department of Defense (DoD) has to train hundreds of thousands of students each year in thousands of specialized tasks, many of which require a team approach. Many warfighters are not really big fans of reading textbooks. Finally, many combat-related tasks are just plain dangerous to learn in real life. For

instance, the Air Force found during the Vietnam War that pilot survival was a function of time — if a pilot could survive his first few missions, he tended to persevere pretty well after that.

It was decided that the first few missions would be done both in “Top Gun” live gameplay and in simulators — it was much easier to have a pilot “die” in an electronic mission than in a real one. Armor and Infantry units followed suit - by the time the Army deployed to the Gulf War, its mobile units had fought hundreds of battles in an electronic replica of Iraq that was in places accurate enough so that the troops could follow the street signs.

But simulators are expensive (around \$1 million a piece) and weigh a ton (more or less), so they are limited to schoolhouses. As a result, the Pentagon is on the lookout for videogames for its soldiers — low cost virtual training environments that can be used anywhere. A new line of logic is starting to develop, one much different from the old practice of sending warfighters to school houses to learn: instead of having the soldier go the training, perhaps the training should come to the soldier.

Other early adapters include many of the other branches of the government, especially those having to do with law enforcement or crisis response. In addition, the medical community has shown great enthusiasm for games. One chief of surgery, at Beth Israel Hospital, discovered that surgeons that were gamers tended to make fewer mistakes (by 30%) and take less time (about 25% less) in surgery than surgeons who did not play games. As a result, he had a videogame created for his doctors to “warm up” on before they enter the operating room. Medical games (both for patients and health practitioners) are proliferating, and there are now several Serious Game conferences that specialize just in games for the medical community.

One very large community that holds huge potential for learning games is corporate training, a \$50+ billion per year market in the U.S. A major company, such as IBM, may spend over \$300 million per year in training its personnel, from boardroom executives to software engineers to salesmen. Much of this training is still text-based, even if it is online, but the demand for interactive learning is growing, and corporate training gatherings such as The Training Conference and Expo (www.trainingconference.com) now feature presentations and exhibits of learning games.

One community that does not show much promise is (ironically) schools, both K-12 and universities. Although academic interest in learning games is intense, few games have actually made a successful transition to the classroom. There are a number of reasons cited for this. One is the duration of most games. As Jim Gee pointed out at the recent GDC, games may last several hours, whereas high school classrooms typically have 45 minutes or less of time available. Another reason appears to be that most teachers don't trust games (unlike their younger charges, most of whom have grown up with videogames). Leaders of teachers' unions from the 1960s onwards have voiced their distrust of games, fearing they would disrupt classroom discipline, and that they could even be used to replace teachers. These beliefs still appear to be rampant.

In addition, many teachers are used to having customized content for their classes — university professors choose their texts and teaching styles. Using the same learning as everyone else in the community seems to run counter to academicians' nature. Unfortunately, educators don't have the budgets to pay for such customized games — it appears to be a case of having Cristal champagne tastes on a domestic beer budget. It is likely that after games get developed elsewhere (such as by the military) and thus become easier to understand — to the point where they can be “personalized” or “modded” by users — that teachers will finally kick in and use them in the classroom. In the meantime, it appears that the best way for parents to get games for their kids is to buy them on their own and give them to their offspring to use after school.

How Learning Games Get Produced

Getting a learning game produced has many of the same steps as getting a mainstream game produced, including finding funding, doing pitch sessions, designing the game, and testing it with audiences. In

general, the amount of money and time needed for a Serious Game is much less than for the entertainment equivalent. Much less money also translates to much less risk. Sources of funding for Serious Games include government sponsors (including SBIR, Small Business Innovative Research funding), large corporations, universities (which fund games for research, or for later splitting off a for-profit gaming division) and professional organizations, including health care and homeland defense.

The creation of mainstream games is still an art — the world is littered with games that did not make the grade. The creation of a learning game can be doubly difficult, because the game has to remain fun and motivating (like a mainstream game) while teaching a subject that is defined by the client. The fact that many developers of learning games have not succeeded too well in this design process can be gleaned from one of the major Serious Games panels at the GDC, manned by Professor Jim Gee, Dr. Henry Kelly (the president of the Federation of American Scientists) and Ben Sawyer, the chairman of the Serious Games Summit, which was titled, “What’s Wrong With Learning Games?”

Sawyer mentioned that there have not been many really successful learning game companies, and a number of startups have gone into bankruptcy. Henry Kelly noted that the Serious Games community needs to come together more, and work together to generate research and systematic improvement throughout the industry. “Right now,” he said, “everything is a cottage industry.” Dr. Kelly also noted that easier means are needed to show progress. His organization is developing several games, and is pushing hard for more funding and support at a national level for learning games for first responders; the site (www.fas.org) notes that there are almost two million full and part-time firefighters, three million nurses, 620,000 law enforcement officials, 200,000 medical technicians and 32,000 emergency physicians to train to deal with emergency situations such as 9/11 or Katrina, a huge requirement that cannot be met with conventional training methods such as school rooms or books.

In the absence of definitive manuals for Serious Game creation, one tactic that has been used is to create “rapid prototyping” for the game. Will Wright, the creator of *The Sims*, the most popular videogame in history, spoke to this at the recent GDC. The rapid prototyping approach involves building something quickly (using an available gaming engine such as that of *Unreal Tournament*), testing it with a student audience, and then making adjustments and creating improved prototypes until the game is successful. He noted that the hard part for a learning game was knowing what to leave out. “Only about 10% of what was in the first prototype will typically make it into the final version,” he noted.

One of the special challenges for Serious Games is testing what was learned. Entertainment games have informal ways of recognizing achievement, with different “levels” of gameplay that are reached by the player, as well as the award of game artifacts such as special armor, honors or “powers.” Many educators like very cut-and-dried numerical testing of learning results, which does not square well with the “game” part of the equation. Shanna Tellerman, the producer of the successful *Hazmat: Hotzone* learning game for firefighters, noted, “We considered the game to be a success when the students were excited and totally immersed in it, when they completed their missions and were able to help the victims effectively — and were all able to come out alive at the end!” These kinds of results are dramatic, but do not lend themselves to the easy True/False or multiple-choice tests that many instructors are used to.

Where to Learn More The best place to learn about learning games is at conferences, since you will meet both producers and users (and get both stories), and generally have an opportunity to play with some actual games on display. Hardly a month goes by without at least one such conference taking place. Here are some to choose from.

The Serious Games Conference (www.seriousgames.com) is an obvious hotbed for this type of game. This event takes place in the fall of each year in the Washington, D.C. area, and is a great introduction to how learning games are produced, who the customers are. The [Game Developers Conference](http://www.gdconf.com) (GDC) now also has a two-day Serious Games component; it takes place in San Jose, California in the spring (www.gdconf.com). The Education Arcade (www.educationarcade.org) is held in Los Angeles in May, in conjunction with the E3 (Electronic Entertainment Expo) show, and is oriented to researching how games work. The Games, Learning and Society Conference (www.glsconference.org) in Madison, Wisconsin

focuses on games that can be used for social change. The Interservice/Industry Training, Simulation and Education Conference (I/ISEC, at www.iisec.org), the Mecca of military simulation and training, is held annually in Orlando, Florida, near the beginning of December. As its name implies, it serves all three of the services (Army, Navy, Air Force) and Industry, and is the government's equivalent of the E3. While you're there, visit the University of Central Florida (UCF), one of the foremost universities in the world for teaching and developing Serious Game technology.

The Games for Health Conference (www.gamesforhealth.org) focus on games for healthcare policy and practice. This is a growing category, and has many government, corporate and private sponsors. It is also clearly an outstanding area to show that games can "do good" for mankind. The Cybertherapy Conference (www.interactivemediainstitute.com) in Switzerland examines how games can be used for all types of mental health healing and rehabilitation; a growing area of interest is using such games to treat soldiers returning from Iraq with PTSD (Post Traumatic Stress Disorder). The Christian Game Developers Conference (www.cgdc.org) held in mid-May in Portland, Oregon, is an example of the many new learning game conferences springing up for specialized markets. The Training Conference and Expo (www.trainingconference.com), a huge conference with almost 200 panels and presentations for the corporate training market, now features presentations and exhibits for simulations and learning games — although this part of the industry is still nascent, the potential is huge, with just the Fortune 1000 companies spending tens of billions of dollars for educating their personnel.

There are a number of associations and websites that can be of great help, including The Serious Game Initiative (www.seriousgames.org), the Department of Defense Game Community (www.dodgamecommunity.com) and Games for Health (www.gamesforhealth.org).

Several schools teach Serious Games, so this is a great way to get an early start in this area. Two that are outstanding (in addition to Orlando's UCF) are Carnegie Mellon University, in Pittsburgh, with its Entertainment Technology Center, and the University of Southern California, which teaches games and has two institutes that develop games for the military, the Institute for Creative Technology (ICT) and the Information Sciences Institute (ISI), both located near the University, overlooking the sailboats in Southern California's Marina del Rey harbor. The Art Institute of California — Los Angeles specializes in teaching 3D animation and gaming, and is planning special projects for learning game applications.

There are a number of books in this area. The classic is *What Videogames Have to Teach Us About Learning and Literacy*, by James Paul Gee, a professor at the University of Madison-Wisconsin, a hotbed for Serious Games research. A number of new books are coming out, and can usually be found on display at gaming conferences.

Summary Games for learning appear to be evolving into a major area of interest for game creators (and a new source of jobs for animators). The Serious Games market will exceed \$100 million this year, which is enough for a lot of modestly priced game productions. Although this is small potatoes in comparison to the total videogame market (over \$10 billion in the U.S. this year), the Serious Games segment has been showing healthy double-digit growth over the past five years, and should accelerate rapidly when it gets a foothold in the corporate training market. The Serious Games market also continues to offer opportunities for novel approaches and brand new gaming concepts, whereas many of the mainstream game houses are falling back onto the safe approach of producing only sequels and tie-ins with blockbuster movies or TV shows. Pick a conference, and go nosh on Pepsi and pizza and powwow with the gamers. You may wind up in a production that challenges you with ways to save the world — and you'll get sweet revenge on your parents or relatives, who once said that gameplay was a waste of time and that games would never amount to anything!

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