



“Game-Based Learning”

An  Learn Perspective Paper

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 MASIE Center
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Game-Based Learning: Present and Future State of the Field

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TO: e-Learning CONSORTIUM Members
FROM: Elliott Masie and Elizabeth Pearce, The MASIE Center
DATE: February 18, 2005
RE: Gaming for Learning: x-Learn LAB Perspectives

Dear Colleague,

The e-Learning CONSORTIUM is pleased to release the first of our “x-Learn LAB Perspectives”:
Gaming for Learning
By Kurt Squire, University of Wisconsin-Madison

The CONSORTIUM funded the development of this Perspectives research paper to push our thinking about the future of Learning. Kurt has written a provocative and passionate paper about the current and future roles for Gaming in Learning.

Some of you will be excited about Kurt’s viewpoints. Some of you will argue with Kurt’s viewpoints. Some of you will want to dialogue about Kurt’s viewpoints. And some of you will want to start Gaming for Learning projects in your organizations. Personally, we felt challenged and even uncomfortable with the characterization of e-Learning’s current “flat” state. And that is exactly what we wanted to accomplish with the x-Learn LAB Perspectives.

Send your immediate comments to us at consortium@masie.com. We will kick off a dialogue about Gaming for Learning. This Perspectives report will kick-off a range of CONSORTIUM calls, projects and on-line dialogues over the next few years.

Thanks to Kurt Squire and his colleagues at The University of Wisconsin for their leadership in this field. And thanks to the CONSORTIUM for supporting this work.

Elliott Masie and Elizabeth Pearce
e-Learning CONSORTIUM

Game-Based Learning: Present and Future State of the Field

Executive Summary

Interactive digital media, or video games, have emerged as a powerful new economic, cultural, and now educational force. Games are now a multi-billion dollar industry, and new conferences, journals, and research initiatives are all competing to become the home of “serious gaming.” But when most people think of educational games, they think of Reader Rabbit, Math Blaster, or quiz games. Others see today’s games and assume that they’re primarily about “fancy graphics.” In truth, games are much more powerful; they provide *situated* experiences in which players are immersed in complex, problem solving tasks. Good games teach players more than just facts; they provide ways of seeing and understanding problems and, critically, supply opportunities to “become” different kinds of people. This study takes these theoretical notions of situated learning through game play and shows how a new generation of “serious games” coming out of (perhaps oddly) business strategy, “advergaming,” and entertainment gaming all share common features that point to a future paradigm for e-Learning. Most critically for instructional designers, the movement toward “serious games” challenges us to rethink fundamental assumptions about instructional design.

Acknowledgements

I would like to thank Zhan Li for his work in the early portions of this research, particularly in helping conceptualize the study and encouraging me to focus on gamer cultures. I would like to thank Constance Steinkuehler for her careful editing of the paper. Constance, you are the best editor I have ever known. Extra special thanks to Jill Burger for her patience and willingness to work with me in crafting this report, especially for helping frame it in a way that (I hope) will be useful. Thanks to James Paul Gee for his intellectual contributions to and support of the ideas here, and to Judy Brown for connecting me to the MASIE Center community. Finally, thanks to the folks at Root, Breakaway, and YaYa Media, as well Jon Goodwin from Eli Lilly and joystick101.org.

I. Why Gaming and Why Now? From e-Learning to Experience

Beyond e-Learning

e-Learning, a paradigm for the electronic development, management, and distribution of learning materials, seems to be in flux. Critics argue that e-Learning proponents have lost sight of the grand vision of “learning anytime, anywhere” and instead have replicated the social organization of traditional schooling. As instructional designers digitize content, post lectures and class notes on the web, and create digital registration systems, it is clear that e-Learning, as it is currently constituted, is an evolution in education, not a revolution. The basic organizing metaphors of traditional education – *knowledge* as discreet and abstract facts, *learning* as the “acquisition” of content, and therefore *instruction* as the organization, dissemination, and management of that content – have gone unchanged.¹ The promise of e-Learning – that it would provide customized, accessible learning experiences – has given way to more mundane pursuits, such as free online content. In the words of Cross and Hamilton:²

Corporate eLearning is a powerful paradigm, but it has strayed from its inspired beginnings. Poised to become a driver of business performance, eLearning lost its way as vendors reached for quick economic gains at the expense of long-term strategic position... eLearning devolved into quick-to-sell IT-only content libraries, bland Web course designs, and unfocused, minimally tailored portal solutions. This was a boon to the training department, but not the business as a whole, and the value of hassle-free turnkey campuses and trainer-empowering LMSs became the low hanging fruit in the marketplace.

In short, many e-Learning leaders recognize that publishing content online is not synonymous with making learning accessible, or actually ensuring learning. E-Learning educators have focused too much on the “e” – making content electronic (or more accurately, digital) – and not enough on the learning – creating technology enhanced experiences designed to change future understanding and performance. E-learning has become all about replicating traditional education in an electronic format. In short, we have become experts at technology-mediated chalk and talk. In fact, so-called content (i.e. declarative knowledge in the form of information bits or facts) is, and always has been, “cheap;” even before the Internet, one needed only go to the public library for access to the world’s information. What has been more difficult to achieve is the effective design of instruction in order to provide the kind of social and material experiences necessary to make sense of that content, and to make it meaningful and useful for future action. In short, a number of critics like Dreyfus have even asked if meaningful learning is really possible online.³

Why Gaming? Why Now?

Yet, meaningful learning occurs online and in computer mediated environments every day, and, in fact, people pay billions of dollars for it. If you are over the age of 35, you may find the following data points surprising:

- Games are a multi-billion dollar industry, rivaling Hollywood in revenues and cultural influence.⁴
- The biggest media day in history was November 9, 2004, the day of the launch of Halo2 (for the XBox), with revenue exceeding the box office take of Spiderman II.
- Digital games are one of the only (other than pornography) unambiguously profitable uses of the Internet.⁵
- Digital games are routinely listed as the most "important" and influential medium by those under 35.
- Games are a powerful socializing force; those who play computer and video games have different attitudes about work, play, and their coworkers than do their peers.⁶

In short, e-Learning designers struggle to compel users who have paid thousands of dollars to complete an online course. Yet, game players routinely spend dozens, if not hundreds and thousands of hours mastering complex skills in digital worlds that are time-consuming, challenging, and difficult to master. As an industry, games have spent billions of dollars in user interfaces, controls, mechanics, and modes of interaction in a highly competitive, rapidly iterating, Darwinian environment resulting in game mechanics that are highly refined, embodying a wealth of design knowledge.

Consolidation and Change

As the games industry transitions into big business, a number of smaller "garage shop" developers are being squeezed out. A number of these designers have found that the design and technical expertise carefully honed after decades of work in the games industry is worth big money in advertising, training, and marketing. Not surprisingly, companies like Breakaway Games are turning to their attention opportunities in training, business, and consulting. The military, in particular, is gobbling up game designers for their knowledge of how to create *compelling user experiences* which can be the basis for changing understandings, behavior, beliefs, and even identities. As these game players, designers, and even entire companies migrate into the training space, traditional e-Learning developers will have to rethink some of the basic ways that they conceptualize their practice. This report details:

- How this transition is occurring
- What new models of training are emerging
- What kinds of institutional changes are occurring (and need to occur for this to move forward)
- The implications of game-based learning for instructional designers

Games as Experiential Worlds

As e-Learning gasps for air, a wholly different form of digitally mediated experience that began as entertainment is emerging as a powerful form of learning based on a very different model of what it means to know and understand. A new model of e-Learning, commonly called digital game-based learning, is emerging as an alternative vision for e-Learning.⁷ Over the past few years, several research projects, organizations, centers,

grants, books, and studies have emerged exploring new visions for game-based technologies in learning.⁸ Indeed, between 2002, the first year of the Woodrow Wilson sponsored Serious Games initiative, and the 2004 Serious Games Summit, there has been a veritable explosion in games for learning, as game-based training has gone from a niche market of one or two products to a market that is anywhere from \$30 to \$75 million annually, depending on the scope of defense investments and how one assesses the commercial off the shelf edutainment market.

It is no surprise that these kinds of “experiential” worlds are hot, given the speed of today’s capitalist marketplace. Companies no longer sell products; they sell experiences. Successful companies no longer only train employees in skills; they motivate employees to adopt the perspectives and goals of the company, and empower employees to work creatively for the company. In the words of Pierre Levy⁹, they convince workers to take up the *subjectivities* of the company.¹⁰ As social theorists such as Jim Gee have argued, the “dot com” era was not only about technological innovation; it was also about social change. Organizations – from Microsoft to the United States Army – need workers not just to perform competently but also to adopt the values and perspectives of the parent organization and think creatively with them in solving problems. And getting people to adopt new roles – to think creatively within new perspectives – is one thing that game designers know how to do.

Educational Games?

Many critics will look at the current state of “educational gaming,” and justifiably ask “where is the learning?” This is no wonder, as thus far, most large scale game-based learning efforts have been conducted in the absence of good theories of learning. Games like Virtual U and Virtual Leader are the “zero drafts” of the serious games movement, challenging us to rethink what can be done.

Even though some educators have an ambivalence regarding the power of games for learning (they see games as primarily popular culture), it is ironic that learning within game environments matches up very well with emerging cognitive science research on how people think and learn.¹¹ Cognitive scientists coming from many different traditions have come to adopt what is called “a situated view of learning,” one that proposes that thinking is not a matter of abstract, symbolic representations, but rather rooted in direct experience and concrete contexts. A number of compelling examples of learning based on situated learning are emerging, but perhaps none are quite as compelling as the learning that is naturally occurring in games like Rise of Nations, Civilization III, Lineage II, Viewtiful Joe, or Full Spectrum Warrior.¹²

“Serious Games”

To give a quick sense of how games are changing the landscape of modern business, consider America’s Army¹³ (Li, 2004). America’s Army is an immensely popular, commercial-quality 3D multiplayer game funded by the Army (for around \$5 million) and given away free over the internet and at recruiting offices to promote the United States Army. Although America’s Army is not a training tool per se, it covers the same terrain as many learning products. It seeks to communicate core

Army brand values, change citizens' attitudes about the Army, and persuade some participants to enlist. In short, it seeks to create changes in behavior, attitudes, and beliefs.

And America's Army isn't alone. The United States home building association funded a game (for about \$1 million) to help home owners, students, and teachers better understand the home construction process. The goal was to help people better understand the complexity of what contractors do – and therefore be less likely to sue them when something goes wrong. By the fall of 2004, literally dozens of e-Learning games starting popping up at the various Serious Games workshops and events.

Beyond Serious Games

While the projects emanating from the games industry typically cost millions of dollars, another group of developers coming from more traditional business consulting are developing game-based learning experiences that point the way to the future of games and e-Learning. YaYa Media, an advergaming company, has been exploring uses of its platform for training. Root Learning, a company originating in the field of business strategy, is drawing on gaming principles in developing training simulations. Both of these companies show how the principles of gaming can be cleverly and creatively employed to make learning more engaging and more effective. The future of "Serious Games" may not be in games companies per se (although it's still possible), but may very well be in those learning organizations that understand the mechanics of how games work and the implications of games culture for the next-generation of employees.

Games as Experiential Spaces

Specifically, these companies have applied principles from marketing and strategy that align closely with games to create learning environments that are not about "memorizing facts or training discreet skills" but rather about using technologies to generate new experiences for employees – new experiences that lead to new worldviews, new ways of viewing problems, marshaling resources, and solving those problems in complex environments.

II. Research Scope

Purpose

The purpose of this research paper is to document and describe the contemporary games and learning movement. It seeks to provide a strategic framework and underlying argument for understanding the impact of games on business and training. Specifically, it:

- Provides a model of learning with digital gaming technologies;
- Shows how learning organizations are creating sustainable training programs that leverage gaming technologies;
- Explores what organizations are doing right now with gaming and simulation technologies to support learning;
- Develop guidelines and principles for using gaming technologies in e-Learning;
- Suggests implications for the future of instructional design.

Research Questions

This research was motivated by the following driving questions:

- What models of game based learning are emerging?
- What are the driving factors behind game-based learning programs?
- What expertise is needed to create effective game-based learning materials?
- Who are the key stakeholders in these kinds of projects?
- How does this change the design process?

Phase I

Work on this report began with a review of existing work on gaming cultures, technologies and e-learning. Specifically, I examined the Serious Games archive and the emerging literature in games studies on e-Learning, advergaming, and ubiquitous gaming. I identified and contacted several successful programs for further study, and conducted informal interviews with representatives from learning organizations, ranging from small independent contractors to Fortune 500 companies (gamelab, Root Learning, Digital Mill, E.I. Lilly, Breakaway Games, Ya Ya Media, Simulearn, Simquest, Desq, and the U.S. Army). During this phase, I uncovered a disconnect between those coming from traditional instructional design / e-Learning backgrounds, and those from outside sectors, including gaming, marketing, and business strategy.

Based on these initial interviews, I selected three game-based learning companies (YaYa Media, Breakaway Games, and Root Learning) doing innovative work in game-based learning that coalesced around similar themes: Games as spaces for experiential learning, games as contexts for discussion, games as tools to think with, and games as spaces for exploring new identities (both individually and as a group).

Phase II

Three leading developers are detailed here. These interviews were conducted over a 12-month period, and included site visits, phone interviews, and personal visits. These data were collected with the assistance of MIT graduate student Zhan Li, whose Master's thesis discussed America's Army¹⁴ and who has co-authored work with Ya Ya Media CEO Keith Ferrazzi.

Between July and October 2004 we examined YaYa Media, Breakaway Games, and Root Learning in greater depth. We interviewed company CEOs, developers, and trainers, reviewed games and other materials, and talked with clients and vendors to triangulate data. Based on these data, we generated profiles of each company. More specific methods (and rationale) are detailed in the Methodology Section.

III. Frame Factors

Introduction

Frame factors describe the constraints and drivers in a research project, which determine how the research is conducted. They are included here to give the reader a sense for the overall research context.

Changing Focus

The purpose of this study is to develop models for learning organizations as to how games can be used in training. Early in our initial interviews, we learned that games were barely on the radar of most organizations. Consistent with Beck and Wade's findings,¹⁵ we found that IT and training professionals under the age of 35 were very familiar with games, but saw little opportunity for using them in their organization. Older workers were even less aware of games and had little understanding of the broader social, technical, and cultural shifts associated with them or the burgeoning field of games and learning more generally (or the Serious Games movement in particular).

Rapidly Evolving Industry

This study was conducted between May 2004 and December 2005, a time of both rapid innovation and cultural change within the games industry as well as one that saw important shifts in technology and training more broadly. In 2004, there was an "explosion" of interest in Serious Games, with several international conferences dedicated to the topic and nearly \$100 million of product in development. These conferences include:

- The first annual Serious Games at the Game Developer's Conference (intended for game developers entering training);
- The third annual Serious Summit in Washington, DC;
- The first annual Serious Games Health Care; and
- The First annual Education Arcade session at the Electronic Entertainment Exposition.

There are currently plans for Serious Games summits in Europe and Asia, as well. In addition, there were major events on educational gaming held at Stanford and the National Science Foundation as well as the more traditional meetings of the Gaming and Simulation Societies.

At the time of proposing this study, the importance of games culture was still being explored for training. "Serious Games" were still something of a hypothetical possibility. Since that time, several research initiatives, business plans, and conferences have been launched, making the question of whether games will enter business and training somewhat moot. Given the disconnect between most consortium members' experiences with games and the current state of the field, it seemed better to focus energy on documenting and understanding the forces behind this movement.

Costs

This paper was funded with the generous support of The MASIE Center. The research costs helped cover expenses for interviewing participants, and traveling to conferences and supplies.

IV. Methodology

Overview

This study uses a combination of historical research methods, document analysis, interviews with trainers and game developers, and critical study of game artifacts, to theorize contemporary serious games as an emerging model of e-Learning. The background document data collection for this study occurred between May 2003 and May 2004, as the author reviewed conference proceedings, e-mail posts, and recorded presentation sessions. The primary interviewing occurred between May 2004 and December 2004, when the author and paid researcher interviewed 18 developers representing eight different e-Learning organizations with game-based learning projects.

Format

The background section describes trends uncovered in the literature review, interviews with participants, and analyses of various Serious Games discussions. The core of the study is reported through three illustrative case examples, selected to show how portions of the games industry and traditional training sector are converging on instructional design models consistent with a situated approach to learning and instruction.

Data Sources

Data was gathered primarily through soliciting key informants, largely through the Serious Games, Education Arcade networks, and relations with the Academic ADL Co-Lab. Data points were chosen purposively to illuminate research questions and theoretical issues (as opposed to randomly). Rather than capture the general attitude towards gaming (which is constantly shifting), I drew on my expertise as a leader in the Serious Games movement (where I delivered an invited address at the first summit and each subsequent summit) and Co-Director of MIT's Education Arcade. I reviewed discussion documents from these organizations and examined existing game-based learning materials, interviewed informants, and visited locations where game-based learning is taking place.

Document Analysis

As a part of this historical research, the authors attended and reviewed presentations from the 2003, and 2004 Serious Games Annuals, the 2004 Education Arcade Conference, and 2004 Serious Health and Serious Games Summits*. They reviewed all six issues of the Serious Games Newsletter.† In addition, the researchers reviewed e-mail threads from the Serious Games Listserv between March 2003 and the December 31 (a total of approximately 1250 documents)‡. Finally, the authors examined books written by authors posted on the Serious Games list and documents generated through meetings of the National Science Foundation, the annual meeting of the Learning Federation, MIT's Games-to-Teach Program, and Stanford's Media X meetings.

* Available at <http://www.seriousgames.org/multimedia.html>

† Available at: <http://www.seriousgames.org/snagged/>

‡ Available at: http://listserver.dmill.com/lyris.pl?enter=seriousgames&text_mode=0&lang=english

Interviews

The authors conducted 18 interviews with developers from eight different companies doing some form of game-based learning. These included: a) large companies pursuing game-based training as a part of an e-Learning strategy; b) small training companies entering game-based learning as a core e-Learning strategy; and c) large companies based in the games industry moving into training. After preliminary interviews with these eight organizations, we conducted follow-up interviews with three organizations, Ya Ya Media, Root Learning and Breakaway Games.

Case Studies

Case studies were conducted with three companies representing different approaches to game-based learning but converging on some similar ideas. Each of these companies represents different approaches to e-Learning. It is worth noting that none of the featured companies started in instructional design, technology or e-Learning; they come from business strategy, marketing, and the games industry.

Breakaway Games

<i>Organization</i>	<i>Background</i>	<i>Size</i>	<i>Offices</i>
<i>Breakaway Games</i>	Entertainment games, military consulting	100	Baltimore, MD
<i>Root Learning</i>	Business strategy / consulting	75	Toledo, OH, Chicago, London, and Zurich
<i>Ya Ya Media</i>	Business Strategy, Marketing / Advertising	50	Los Angeles and New York

Located in Baltimore, MD, Breakaway Games is one of the many games companies that was spun off of the legendary Microprose after its breakup, which began following its purchase by Spectrum Holobyte. Deb Tillet and Doug Whatley were approached in 1995 by ABC Holobyte to explore new interactive media. They formed OT sports and began creating interactive entertainment software around sports franchises. After a three year successful run, Disney bought ABC and it was no longer clear how OT sports fit with the Disney stable of companies.

Positioning in the Baltimore area allowed Doug Whatley to start pursuing government contracts, particularly military contracts through existing connections. The company built models and simulations, particularly war games and war games support tools (tools that helped support face to face war game simulations). Breakaway's rapid development process (typical for the games industry) made them valuable for quickly coding war game scenarios and simulations.

Most of Breakaway's early experience was with 2D war games. Breakaway's early contracts included Peloponnesian War, a game still used in the Army college to teach about ancient warfare; however, Breakaway also continued making traditional games, including Waterloo, Austerlitz, and expansion packs for the Tropic, Cleopatra,

and Civilization series. Breakaway also continued to pick up military industry contracts, mostly for contractors who wanted to “jazz up” their Powerpoint presentations with 3D graphics. Examples of this include small demo simulations to show next generation military technologies, such as netcentric warfare concepts¹⁶. Like many games companies, Breakaway found that their expertise in creating media to generate and shape users’ experiences was directly applicable to other endeavors, including marketing and training.

Currently, Breakaway is developing a number of proprietary systems and technologies such as Entropy-Based Warfare (a system for campaign analysis and war game assessments) and Integrated Gaming System (a system for supporting war gaming) (Figure 1). In addition, they have a number of trademarked technologies for 3D terrain generation, multi-user support tools, and simulation tools. In short, the stuff one needs in order to build full 3D worlds.



Figure 1. Breakaway’s Gaming Systems

Ironically, they are also preparing to launch a game for “A Force More Powerful,” a group dedicated to using nonviolent conflict to achieve democracy and human rights (Figure 2). One normally does not think of non-violent peace activists as funding million dollar games, but the particular challenges behind training such activists – including, for example, the need for it to enable a globally distributed workforce to espouse a particular ideology for solving problems – means that game-based solutions are especially attractive.¹⁷



Figure 1. Breakaway’s Force More Powerful

Finally, Breakaway, like many companies, is exploring the Homeland Security arena. After September 11, 2001, it became clear that the United States was insufficiently prepared for a biological, chemical, or nuclear attack on its soil. As advanced learning technologies emerge as the quickest, most cost-efficient way to implement such training, it looks as if video games will be a key component of national security.¹⁸ Breakaway is building *Incident Commander*; SimQuest has another similar simulation. Regardless of how the specifics shake out, it is clear that in the next five years, several million dollars will be spent building, deploying, and testing game-based systems to train emergency first responders for terrorist attacks.

Root Learning

Root Learning is a “strategic learning company” doing leading work in gaming and training, though it does not have a background in instructional technology per se. Instructively, their mission is not to “fill people’s heads with content” or “help people develop new knowledge, skills, attitudes, and beliefs” but rather to engage and connect people so they can achieve results in a context that respects their humanity, intelligence, and capacity to grow. Indeed, on their website, they identify themselves as “educators, trainers, artists, writers, technology specialists, designers, scientists and businesspeople. The left brain and right brain, as it were.” Crucial to their identity is that they are both scientists and artists, educators and business people.

Root opened in 1978 as a publisher, but within 6 years had begun publishing “learning maps.” Within ten, they became a dedicated learning / strategic consulting firm. A classic Root learning map, depicted below, is generated as the result of strategic discussions with company leaders and participants. A graphic artist listens to the conversation and generates a core metaphor to describe the training / strategy problem. Participants interact with learning maps by reading content, discussing problems, and doing mini-games that ask them to consolidate or think using information they have encountered. Critically, learning maps are not about pushing content but rather intended to convey a particular message or world view which facts are used to support. Key to this model is the “offline” interaction between participants; in fact, the gameboard is, in essence, a tool for facilitating discussion.



Root soon took on full-time artists and more and more projects, growing out of their small offices and adding a second location by the 1990s. By 2000 they opened offices in Chicago and London and moved to e-Learning entirely, with products such as the Business MadeSimple™ line of learning products. By 2002, they were raking in industry awards, including the e-Learning Success Stories Award from e-Learning Magazine and positive stories from Fortune, The Wall Street Journal, Harvard Business Review, The Economist, Fast Company, HR Executive, and Computerworld. By 2003-2004, Root had won numerous other awards for interactivity and online education.

In some ways, Root Learning has been relatively slow in branding themselves as a games company, although, as Tom Crawford, director of e-Learning, acknowledges, their learning maps most closely resemble board games. Their e-Learning products are simulations that try to retain these key features. They are now moving more toward producing game experiences that use the features of role playing games. In one such example, created for Blockbuster, the participant interacts with customers, completes tasks, and gets feedback on her performance.



YaYa Media

YaYa media is a company with roots in the games industry and in business strategy that has carved out a niche in advergaming and is doing forays into training as well. At the time of this writing, YaYa seems to be in flux after CEO Keith Ferrazzi sold the company to American Vantage*. According to Keith Ferrazzi, the title and subject of a Stanford Business School case study, most of the company's \$8 million annual revenue was from Ferrazzi's business network. While Ferrazzi has

* Keith Ferrazzi. Stanford Business case OB-44 written by Jeffrey Pfeffer and Victoria Chang 11/15/03.

moved on to ferrazzigreenlight (his business consulting firm), the ideas he initiated at YaYa live on and are worth examining in greater depth.

YaYa was founded in 2000, with funding from Michael Milken, as a “leading interactive technology company.” As an innovative marketing firm, YaYa’s initial business charge seemed to be figuring out how to market and advertise in today’s new economy. Although YaYa has sputtered a bit of late, the core charge of rethinking marketing in an interactive age where consumers can Tivo television shows and skip advertising altogether continues to be relevant.

YaYa may be most famous for branding “advergaming” a new genre of advertising that uses a proprietary gaming engine to simultaneously advertise and gather marketing data. An early game, Chrysler Get Up and Go, typifies the YaYa approach. Users login to the game, try to match their personalities to one another (and the Chrysler vehicle) and win a free vacation to a location best suited to their personality based on a cosmo-style quiz. Other games include an accounting game, “Bizzfun,” and a Jeep driving game for the Chrysler / Jeep sales force. YaYa’s next generation game, a Nike snowboarding game, allows players to race against one another and post high scores online. Players vie for a chance to win Nike snowboarding gear.



In both of these cases the key is not just that players interact with the brand for 20-30 minutes in a carefully scripted manner; it is that the engine is also collecting data on users’ choices, preferences and habits. In such a constrained environment, it is relatively simple to track players’ progress and identify patterns (such as which color is most popular with the 18-24 year old age group). At the beginning of this study, YaYa was actively looking for new ways to apply this technology to problems associated with training.

V. Emerging Framework: Computer and Video Games as Situated Learning

Visions for e-Learning:

A core assumption behind e-Learning is that technology ought to be used to make learning more ubiquitous – available any time, anywhere. This approach might be best summarized by the vision of the Advanced Distributed Learning Co-Laboratory, the Department of Defense research group responsible for administering SCORM standards, among other things, “*ADL’s Vision is to provide access to the highest quality education and training, tailored to individual needs, delivered cost-effectively anywhere – anytime.*” But as companies experiment with e-Learning and struggle to convince employees to complete courses (and, in so doing, come to recognize the limitations of traditional instructional paradigms), it is increasingly clear that simply replicating existing paradigms of instruction is unwise in the information age.

Information Age Education

Practitioners of new paradigms of instruction such as problem-based or case-based learning have tried to develop instructional systems consistent with what Reigeluth¹⁹ and others have called *the information age* (see Table 1). Whether this shift is characterized as the result of an information communication, or network age is debatable, and distinctions across such time scales are always broad, necessarily imperfect and fuzzy. But regardless, there is a growing recognition that traditional models of instruction, organized by modernist, scientific, rationalist social theory and assembly line metaphors for social organization are failing to work for us in the new economy²⁰. Like Reigeluth, Gee, and others, I argue that new organizing metaphors for learning and new models of learning environments are needed to respond to the social and economic realities of the 21st century.

INDUSTRIAL AGE		INFORMATION AGE
Standardization	.....	Customization
Centralized control	.....	Autonomy with accountability
Adversarial relationships	.....	Cooperative relationships
Autocratic decision making	.....	Shared decision making
Compliance	.....	Initiative
Conformity	.....	Diversity
One-way communications	.....	Networking
Compartmentalization	.....	Holism
Parts-oriented	.....	Process-oriented
Teacher as "King"	.....	Learner (customer) as "King"

Table 1: Changes in Global Economies²¹ (Reigeluth, 1999).

Entertainment Experiences

Over the past decade, immersive interactive entertainment or video games have become an increasingly established and pervasive medium entering our art galleries, academies, schools, and workplaces, and, increasingly, our schools and workplaces for training. Of course, the

military invests millions of dollars in simulation and gaming technology every year; but with the release of games such as Virtual Leader, it seems clear that they will enter civilian training as well²². Critics will note that there is a long tradition of games and simulations in instructional and human performance technology²³. Today's games and simulations, however, which allow for real-time graphical 3D rendering, real time physics simulation, and increasingly sophisticated character design, represent a qualitative shift in training capacity. They allow for the design of new kinds of *experience*, the cognitive impact of which we are only beginning to understand.

Situated Cognition

A potential marriage exists between situated views of cognition and computer video games²⁴. Many instructional and performance technologists are turning away from representational theories of mind toward "situated" views of cognition.²⁵ From this perspective, cognition is stretched across physical tools and social relationships, instantiated through interaction with a social and material world.²⁶ Learning (and especially human performance), from this perspective, is not something that can be meaningfully isolated into bits or chunks (representations) solely the "heads" of learners, but rather must be rooted in context. Thus, the minimal meaningful unit of analysis must include individual(s) and the tools we use, the social organizations in which we use them, and the purposes our knowledge serve, in short, the "who, what, when, why, and hows" of a situation²⁷.

If learning is not a process of accumulating bunches of facts, but rather, developing abilities to see, think, do and be in the world, then meaningful education cannot be reduced to "exposure to content." Rather, education (and this is consistent with Dewey²⁸) is about having experiences that give rise to particular viewpoints, or ways of making sense of the world. It is critical to note – especially in business and training – that what is desired is getting participants to adopt a very particular viewpoint. In terms of corporations, this means adopting the point of view desired by the organization.

Social Identities

Of course, these points of view or frameworks are inherently social, political, and wrapped up in particular ideologies that are developed and accepted (although continuously negotiated) within communities. One trick for corporations, then, becomes convincing employees to adopt a corporate identity as a part of their own sense of self. Building this trajectory of learning involves not just teaching skills, facts, or procedures, but also providing players pathways for developing new identities. Crucially, these pathways must start where learners are psychologically, confront existing assumptions and beliefs, and allow learners to grow into new roles and identities.

In short, supporting learning is about providing experiences that lead to trajectories of social participation. These experiences allow learners to think with information, use tools and resources, and leverage knowledge in complex situations.

Compelling Experiences

Creating compelling experiences is just what games do. From a situated perspective, the promise of games is not so much that they allow us to structure rewards or provide detailed practice and feedback (although they do both quite effectively); rather, it is that they create situated experiences in which learners are immersed in situations in which they think with tools and resources in the service of complex problem solving. As Gee argues,²⁹ as games become more complex, they have begun using intelligent tutors, scaffolding, and affinity groups for learning in order to help players understand their increasingly sophisticated interfaces and systems. Rapid iterations in a highly competitive market have resulted in highly evolved interfaces and learning systems designed to teach players how to play them³⁰. In short, many game designers have developed an expertise in (some) fundamental principles of instructional design, in particular, the idea of experience design, which Wilson³¹ and others have argued is fundamental to situated views of cognition.

Immersive Learning

In this study, I synthesize the work of several research programs, prototypes, and interviews conducted with leading e-Learning providers to articulate an emerging approach to e-Learning *immersive digital learning environments* (also called digital game-based learning environments)³². As an emerging approach to the design of learning environments, this model is still evolving. However, drawing heavily from the case study of two very different e-Learning providers (one with roots in the games industry, one with roots in e-Learning and business strategy), I articulate an emerging approach to e-Learning with roots in the gaming industry. This “game-based” approach provides both a response to the needs of information age organizations and an extension of more general theories of situated cognition³³ (See Table 2). The experiences described by these organizations suggest a somewhat radical reshaping of instructional designers’ practice from one of controlling and managing content to one of designing experiences. Most importantly for instructional designers, many leaders in this area find themselves distributing the work of instructional designers across several different roles, effectively retaining the traditional competencies of instructional designers while effectively eliminating them from their teams.

VI. Findings

Overview

The results of this literature review, background research, and interviews are presented in the following sections:

1. Driving factors: From content to context
2. Designing experience: Models of game based learning
3. Designing for interactivity

1. Driving Factors: From Content to Context

Overview

Participants reported that a primary driver behind their work was to build more engaging immersive experiences. The challenges they reported are helping employees manage increasingly complex webs of information, helping engender strategic thinking, and helping employees think with knowledge on the fly.

- A. *Embracing an ideology*
- B. *Thinking with information*

Precursor: Content Isn't King As Tom Crawford explains:

We're always looking for innovative, fun, engaging pieces. So games are kind of a 'no duh' to move to." We ask, "How can we get people engaged and get them to learn?" People look at our maps and everyone says, "It's a game board." So we're giving in to what they're telling us. But the most important pieces of our strategy and philosophy of life [are based on the belief] that e-Learning has missed the boat. The industry has focused on content, getting out the content, but they leave out the context.

For Root Learning and their clients, *why* something matters is much more important than the content. And that fits nicely with both contemporary theories of cognition and with gaming.

There is a saying in e-Learning that "content is king." And in the early days of the web, there was some truth to this; with so many websites being no more than collections of links, even the simplest of text-based websites could impress. Now, with web pages numbering in the billions and internet access available through an ordinary cellphone, it is clear that the only problem with content is that there is too much of it. Knowing what, how, and when to look for information, and knowing what to do with it, are more commonly the training problems of today. Organizations want employees not just to "know a bunch of stuff" but to also think the way that the corporations want them to.³⁴

An. Embracing Ideology

A primary challenge for companies is how to train workers to make "better" decisions, defined, of course, as decisions that are more in line

with company goals. This means moving away from hierarchical models, where every decision must be vetted by upper management, and toward distributed models, where particular cultural values and ethos permeates, driving employees to make the “right” kind of decisions from “within” rather than “without”. As a participant from Root Learning commented:

Most organizations (like most of education) are built on a military-style set up of command / control hierarchy. Information is made available on a need-to-know basis. The idea is that if people (lower level employees) have the information, they will be dangerous. But there’s no way that I (as a leader) can manage information and decision making on a task-to-task basis. It’s just impossible. There is too much information and not enough time in the day. So, if you want people to do the right thing, they have to have the information to make their own conclusions, and then it will happen.

While this view of information and those espoused by most new capitalist business leaders is somewhat benign, critics such as Gee, Hull, and Lankshear³⁵ have pointed out that it isn’t just “any old decisions, conclusions, or perspectives” that new capitalist companies want employees, to have, but very particular ones that are in line with their cultural values. Different perspectives – or value systems – privilege certain kinds of information over others.

In one of Root’s more popular examples, Pepsi wanted truck drivers to understand that it was imperative for them to re-brand Pepsi’s business³⁶. Soft drinks sales were growing less quickly than that of other beverages, and large retail stores (such as Sam’s) were generating most of the profits.³⁷ The case here illustrates how the “right thing” and conclusions are hardly benign; in this case graphics were constructed to communicate “shrinking rates of growth” (belying the fact that Pepsi’s profits were in no danger of shrinking, let alone that the company was losing money; they were merely not growing quite as quickly as before, suggesting an ultimately unattainable value of continuous growth). Second, profits with large retail centers were privileged over personal relations with small retailers (which one can imagine a “premium” brand emphasizing) for their lower overhead costs. Of course, participants could challenge this dominant ideology, although in the case of Pepsi at least, workers might predict that if they want to keep their jobs, they should honor Pepsi’s goal to continuously increase profits and reduce costs.

Part of what makes solutions like these powerful is that they are systematically organized to frame problems in particular ways (i.e. continued growth in profit and reduction in cost is necessary). The map of the business terrain shows a “logical” progression from the 1950s to the 1980s, following a trend along different business models.

Building Experience

The experience of using the learning map is quite fun. The images evoke nostalgia, and immediately tie the brand and lesson not just to an abstract pedagogy but to personally meaningful experiences. I, like many, enjoyed looking at the different eras and picking out how old I was when

I started drinking Pepsi, when the “Pepsi challenge” hit, when Michael Jackson’s hair caught on fire, and so on. As the eye moves down the street (and through time), it encounters shops along the street showing different trends, with shrinking rates of profitability presented in order to elicit concern over participants losing their jobs. Key factual information – the things that you might find in a PowerPoint – is then organized and presented to emphasize this worldview.

One can contrast this approach with a more traditional approach, in which one might “set up the need for instruction, present generalities, examples, and cases, allow practice and feedback.” One can imagine 100 PowerPoint slides of information, charts and data. Root Learning executives explain how their approach treats data as subservient to an overarching narrative.

Most executives feel that everything is important. We ask ‘What are the key pieces of data people need to do to do their jobs differently’. One thing that artists do is filter through and say, “This is the key piece. This is the lynch pin to the story.”

Of course, this is not “any old story” but the story that Pepsi executives would like their employees to believe.

Importantly, facts are not just “presented” to the learner. Rather, learners participate in mini games where they match up their beliefs about the product to different facts – effectively eliciting and making explicit participants’ conceptions about the topic (something that cognitive psychologists have repeatedly found to be of critical importance when producing conceptual change³⁸).

Second, confrontation of existing beliefs is done in a social setting where participants must a) actually commit to a view, setting them up to rethink their ideas and b) explain their choices (creating reflection in action and deeper thinking about the topic). Further, this design allows learners to share stories, theories, and experiences with their products, further tying the learning experience to their work outside of the learning context.

The core features of this experience are indeed very game-like:

1. Learning is driven by personally meaningful scenarios and problems.
2. Particular attention is paid to what the user is doing and experiencing from moment to moment.
3. Problems are constructed and framed to build on previous understandings
4. Facts and knowledge are subservient to doing.

B. Thinking with Information

A second factor driving games is a shift in corporate goals. Today’s companies care much less about what the person “knows” or can “store in the head” than they care about what the person can do given access to a full set of tools, resources, and social networks. Thinking with and

managing complex information streams is increasingly a critical part of job performance. Building on the work of Hutchins³⁹, cognitive psychologists over the past decade have been increasingly aware that much of what constitutes expert performance occurs *outside* of the head – in tools and social networks.

One of the primary benefits of games is that they can immerse players in “smart contexts” where they have access to and are given reason to use tools, resources, and social networks. Training programs, from this paradigm, seek not to just give people user manuals or explanations of tools, but also and more crucially experiences where they are using those tools in the pursuit of complex problem solving practice.

This instructional approach may sound like the stuff of science fiction, but it is a reality for the gamer generation. For an example of this, Gee considers Full Spectrum Warrior, a simulation designed to be both a video game and a training module that “teaches” the player to think with soldiers⁴⁰. The player is a commander who directs two army battalions, each of which is programmed to behave according to army doctrine. So, rather than memorizing army doctrine and learning the different capacities of different roles, players are given a virtual squad to direct. In addition, they have access to maps, compasses, and other squadrons to think and act with.

Managing Information

Managing information streams, particularly in digital spaces, is an area of particular expertise for game designers. A designer from Breakaway explains:

I think the value of games in the future will be understanding human psychology and how you interact with information as opposed to traditional instructional design skills necessarily. How do human beings react to multiple sources of info to come to an analysis. That's what we're good at without knowing. We handle massive amounts of data – letting people manage copious amounts of data very well. That's the future. It's about how this data comes across and how you analyze it and come to a conclusion.

Indeed, even the simplest of game interfaces includes dozens of pieces of information, most of which have been streamlined for efficient use through several generations of testing with thousands of users. This is to say nothing of the relatively complex strategy game interfaces. Consider this screenshot from Firaxis' *Civilization III*.



Figure 3: A relatively simple screenshot from Firaxis' Civilization III

Through evolution over thousands of games in a highly competitive environment, successful design interfaces have been taken up and used, whereas “bad” or confusing interfaces are abandoned. Players enjoy complexity – especially the power that comes with powerful tools. What they do not like is “uninteresting decisions,” or games that leave them confused or with too many “easy” decisions – decisions where there is no learning to be had.⁴¹



Figure 5: A more complex screenshot of advisors from Firaxis' Civ.III

2. Emerging Models: Designing for Experience

Overview

If a core unifying theme of the emerging game-based learning paradigm is that content is less important than context, then the challenge for designers is how to build educational contexts – that is, contexts that give rise to the right kind of user experiences. Games allow educators to design truly educative experiences, those that give rise to a particular kind of thinking. Building on the findings of the previous section, we can describe how learning game designers are doing this by:

1. Having learning driven by personally meaningful scenarios;
2. Constructing problems to extend previous understandings and shape future ones;
3. Paying close attention to users' pre-existing beliefs;
4. Carefully designing for what the user experiences from moment to moment; and
5. Situating facts and knowledge in the context of doing.

This section fleshes out more of what these models look like, distinguishing between targeted games and immersive simulations, a useful distinction for instructional designers looking to enter this field.

Perhaps the biggest difference between game-based models and more traditional approaches to learning is that game designers most often start with the user experience, and more specifically, with what the user *does*. Legendary game designer Shigeru Miyamoto (creator of Mario, Zelda, and Pikmin) likes to say that he starts with *verbs*, that is, what a player can do in a virtual world. Imagine listing the verbs available to a learner in a classic e-Learning scenario. Most likely, they are 'read' and 'look,.' If the person is lucky, maybe 'chat.' (This isn't to suggest that good design is entirely about graphics; there are a number of creative things that can be done with text-based discussions.)

Targeted vs. Immersive

It is useful to distinguish between two types of games used in training, game types which cluster according to a few different variables. For now, we will call them targeted vs. immersive game experiences. Targeted games are designed to teach some very specific concepts. Immersive games try to include more of the context for learning, more of the values behind knowing, and generally, more of the learning experience within a specific package. While both targeted and immersive games need to be used within a broader learning context that would include readings, reflection, discussion, and examples, targeted games assume much more of an encompassing training context, whereas immersive games are meant to carry the weight of the learning experience (See Table 3).

	Targeted	Immersive
Learner Motivation	Exists	Needs to be Created
Percent of time in game world	20%	80%
Context	Within social context	Standalone

Building on the work at MIT's Games-to-Teach project, we can look, roughly, at two ends of a continuum. On the one hand, there is a targeted game such as *Supercharged!*, originally designed to be used with MIT freshman in electrostatic physics to teach some very specific concepts. In *Supercharged!*, the player adopts the properties of a charged particle and flies through electrostatic and magnetic fields. The idea is that by the end of the game, the player should better understand how charged particles interact and specifically, develop an intuitive understanding of the qualitative physics behind Coulomb's Law. The game does not do much to convince the player of why she needs to know Coulomb's Law, why it is used, or where it might be useful. In the context of an institution such as MIT, most students are highly motivated, have specific career goals where science will be used, and have already developed identities as scientists. Further, the social context of MIT carries much of the weight in terms of initiating students into scientific discourses.*

In contrast, transformative simulations aim to take the learner and teach a set of values, beliefs, ideas – all of which are taken up in new practices. In short, in transformative games, the idea is to usher the player through a set of experiences that transform (part of) that person into someone new. We might look at some of Root's maps as transformative in that they aspire to teach the user a new way of seeing, thinking, and being. The degree of transformation is not really tied to graphics; one can imagine that, depending on how it's implemented, *Breakaway's Force More Powerful* could usher one through a series of experiences whereby the player comes to adopt the principles of nonviolent action and becomes initiated into its discourse. Or, it could be a training module designed to teach targeted skills to people who already have adopted the discourse.

Of course, distinctions between these two poles are fuzzy and highly dependent on the context of use. In the case of *Supercharged*, the game was later used to help poor urban middle school kids realize that they could do complex science, in a sense engaging them in identity transformation. One could also use the Root maps to teach some targeted concepts. Whether it occurs in game or out of game, Gee⁴² argues that a core lesson from games is of the importance of these discourses in learning, something generally overlooked in instructional technology. In

* This is why MIT was willing to do Open Courseware. Everyone at MIT knows that "content" is a minimal part of the MIT educational experience, at best.

particular, the way that different discourses fit together or contradict one another is often overlooked.

Creating Context

The first thing that games do is create an *emotionally compelling* context for the player. Many games use cut scenes, short movies designed to situate the player in the game world and context. But, there are other, simpler ways to make the game emotionally compelling. Root's materials build on nostalgia, curiosity, visual appeal, and presumably, employees' interest in the "bottom line" of their company. What is important here is that the game emotionally connects with the learner, and provides an entrée or invitation into the world that is to be learned. The context creation (much like the problem in problem-based learning) is the bridge from where the player is to where she wants to go.

A common misconception about games and simulations is that they are perfect representations of reality. They are not. Inherently, they are simplifications of reality (much like any representation, i.e. book, picture, or film is also an incomplete representation of reality). I argue that games are ideological spaces. They are spaces in that they are worlds that we enter and make of as we please, but they are also worlds built according to particular values. They call our attention to some aspects of reality while obscuring others. Part of what makes games so powerful as a medium for learning is that they allow us to build worlds that are instantiated according to a particular set of rules.

Framing the Experience

The Root materials work on several levels to frame the experience. First, the "maps" draw on board game tropes to immerse the learners in an experience in which they are gathered together around a common task in a setting where informal talk, collaboration, and discussion is encouraged. But further, they make very powerful use of the core metaphor (going down a road, jumping a chasm) in order to emotionally engage and situate the learner while putting forth an argument as to how the particular problem should be viewed. In short, they use sophisticated design techniques to provide a visual metaphor for engaging with the topic. These metaphors are far from innocuous; they communicate subtly (and not so subtly) what the problem is about. They also set the agenda for the activities to follow.*

It's worth noting that Root Learning uses artists – not instructional designers with task analysis training – for this function. For Root, it is less important that they create an exhaustive (or even reasonably thorough) statement of the problem. What's more important is that they build a common metaphor for talking about the experience that is understandable to all parties.

* Commercial video games do the same thing with cover stories, scenarios, and cut scenes. They situate the player into a particular role. This serves several ends; it explains why the game isn't simulating everything in the world (i.e. few see the opening of Doom and want to kiss the martians, making it unnecessary to program in all of those potential interactions).

New Learning Models

Once games have created a context for experience and set up challenges, they give players situations to confront. How different games and game genres work is beyond the scope of this paper; For good explanations of this I recommend Gee's (in press) work on Full Spectrum Warrior⁴³, mine (in press) on Viewtiful Joe⁴⁴, or Steinkuehler's (2004a; 2004b)⁴⁵ research on massively multiplayer gaming. For a discussion of design principles more generally, see the Games to Teach Team (2003)⁴⁶. But common features cutting across game genres include:

- Games organize challenges in increasingly complexity, “black boxing” skills from one level to the next, but always representing problems in an intact, authentic manner (similar to Reigeluth's elaboration theory⁴⁷)
- They build in scenarios that deliberately challenge people's assumptions and pre-existing conceptions about a phenomenon.
- They provide well structured and open-ended opportunities for practice with that information in new and novel situations.

Again, the specifics of how games work is the subject of a number of good books and articles, but there are at least a few themes common to this emerging approach to learning that are worth highlighting.

Problem-Driven Activity

One remarkable thing that games do is structure the entire experience around problem solving – that is, putting the player in a position where she must think with information. This approach is also a core part of Root's strategy, which is what gives it its game-like feel. Crawford explains:

Our model is really about challenging assumptions. And we can do it in a way that no Powerpoint presentation can – by letting [the game players] challenge their own assumptions. Our basic theory is that most people are intelligent and rational, and when presented with information will come to their own conclusions. They will come to the same conclusions that the organizations do, although most organizations are actually afraid of giving them information. Rather than being afraid, we try to put it in their hands and let them talk about it. Liberating information doesn't cause problems. It creates solutions.

The hackers out there will note the rhetoric here, the similarities between the open source movement rhetoric, including slogans like “information is free,” (although some would say that it already is), gamer rhetoric, and this discussion. Regardless, the idea is that game-based environments put scenarios, information, and ideas out there, which users can then choose to employ as they see fit. Doug Whatley of Breakaway Games describes some of the issues with this pedagogical approach, in which information is present in the environment but users have considerable freedom to work with it.

Most training is highly linear. You have your objectives up front. Then you add information so that the learners can spit it back. Creating a

world in which the user is completely free, where the experience is open-ended is a little different circumstance. We have to know lots more about them and bring it back into the environment.

Modeling the End User

Some educators may be surprised to hear that in designing an open-ended simulation, designers worry that they need to “know more about the end user.” But, in truth, good game design is all about that. They speak about teaching players different moves at different points, introducing new skills throughout a game, and graduating complexity evenly.

In the case of learning games, this is even more critical. For example, in *Supercharged!*, we tied specific levels to specific electrostatic ideas, so that players needed to understand specific principles to get beyond different levels. The same is (hypothetically) true of Incident Commander: Different levels contain different lessons for the user. The “holy grail” is to model the end user based on data gathered in situ, ala an intelligent tutor. YaYa’s game engine has the capacity to do some of this data gathering, as it is currently used to data mine for marketing reasons (i.e. what snowboard do 25 year old men in Madison, Wisconsin typically prefer?). But, to date, no game does this, and creators have opted, instead, for the more easily achieved “intelligent design” that builds in knowledge of the user.*

Failure Tied to Conceptions

But good design ties these challenges and failure states to key game play moments. In the case of *Supercharged!*, our user tests identified several key misconceptions held by players. Interestingly, these were misconceptions that arose primarily through game tests, which we were then able to transmit to new level ideas. Other game designs created at MIT take up this design mechanic in different ways; but all of them (much like goal-based scenarios) share a common approach involving the creation of *seductive failure states* that entice the user into acting in a way that makes his assumptions and misconceptions explicit.

This is one area where the “learning games” on the market, most of which were made by people without educational expertise, seem to fall down. Many are more interested in “simulating reality” than helping the learner think through a set of problems-grounded conceptual understandings. This is not to say that games should be scripted, but rather that learning games should “enforce mastery,” to use Gee’s term, the way that a good, hard console title does for the entertainment world.

A designer at Root explains how their new game designs for Blockbuster try to use failure as a key selling point:

* Basically, a gamer will “fly through” levels until they reach one of difficulty, at which point they struggle. Games like Viewtiful Joe now contain feedback loops so that players can “power up” by buying bonuses each time they fail, effectively balancing the game for the user.

For us, learning to recover is more important than seven bullet points. How do you come about learning to recover? Making success of a failure.

For them, a key part of games is that you get to fail. Games should give you contexts to practice failure and recovery safely. They are environments where we can and do take risks, trying on different learning strategies. In fact, in their studies of gamers, Beck and Wade⁴⁸ found that this willingness to take risks and learn through failure is a characteristic trait of the gamer generation that differentiates them from their older peers.

Practice for Transfer

If games are fundamentally about doing, then one of their primary strengths is that they provide opportunity for practice. Although some marvel at the fact that games take 20, 30, 40, even 100 hours to complete, in fact what is happening in such instances, is that game designers are allowing players to learn new skills and apply them in a variety of situations. Most games structure levels so that these skills are combined and put together in new ways through time. The game *Viewtiful Joe*, for example, structures levels so that players must combine and use knowledge in a variety of settings, the kind of practice schedule that is useful in generating transferable knowledge and skills.⁴⁹

In the case of “A Force More Powerful,” Breakaway’s designers have created a variety of different levels and scenarios so that players can try strategies in different situations and, in so doing, develop a kind of deep expertise that comes through multiple cases. (There is always a danger with only one or two cases that a player will over-generalize to all situations). This solves the problem stemming from the reality that their constituency is distributed across the world and flying trainers to train staff is impractical. Further, the game will ship with a full set of modification (“mod”) tools, allowing the user community to build mods of upcoming events and even share them.

But games in the emerging “episodic content” space can dole out levels over time, serving as refresher courses tailored to a particular employee’s needs, much like a personalized tutorial or “just in time” experience. With their Blockbuster game, Root is creating a module that will be the equivalent of 20 hours of training, yet is doled out over months. The idea is that players can begin by mastering basic skills in the game and then try these basics out in limited conditions in an apprentice situation. Next, they can return to the simulation for further training (as opposed to doing a lengthy training up front). Each of the 137 modules they have designed includes context, content, practice, and then elements that take them out on to the floor to complete. In this way, the game starts to span across the real and virtual space, a particularly promising form of training that Eric Klopfer has called “augmented reality”⁵⁰.

3. Changing Design Models.

Overview

Few debates are as contentious in instructional technology as those over design models. While many of the lessons emerging from the nascent games-for-learning movement will be familiar to those in e-Learning; some may be new. Participants in serious games are reporting at least seven distinct, crucial themes that characterize how they design games:

1. Managing expectations
2. Providing a holistic model of the product for clients
3. Iterative design
4. Early user feedback
5. Increased importance of visual designers
6. New business models
7. Distributing instructional design tasks across roles

There is no one common method for game design; there are at least as many different approaches as there are game design studios. One heuristic that tends to hold, however, is that game programmers tend to jump in and start coding much quicker than programmers from other disciplines. For most studios, prototyping is the norm. Design teams do still create elaborate design documents, yet most will start to get some working version of the game made as early as possible. The last several months are spent on “polish”.

Managing Expectations

With any game-based project, people will create models in their head as to what the game will be and these will differ greatly. Deb Tillet, CEO of Breakaway explains:

The biggest, biggest concern I have with non-gaming customers is that they require more education and laying out of expectations. If we are dealing with MS games, they know what the milestones and deliverables are and where we should be each step of the way. We have education sessions with non-game clients about what to expect (and when). The standard military business way of making a big committee, stating the parameters of a project and then implementing it to spec is not how you do games. So the first thing the client comes in and wants to see is “What is the final product going to be”. We set a goal and work together. You can’t lay out the specifications two years in advance with entertainment technologies.

Breakaway finds that one of the most important relationships to manage is the Subject Matter Expert (SME) relationship. A designer explains,

Guiding clients to the right SME is important. Some are more interested in protecting turf than creating a good project, so some are more than happy to sabotage your training to protect their turf. But either way, you want them in right at the beginning. Often what makes them comfortable is that they will pick their own SME. Then they are happy. If you co-opt them into the team, it feels like they designed it on their knowledge, and it was made in the right way.

Holistic Model

When designing a new game, which in all likelihood has dozens of serious uncertainties (i.e., no one can be sure at the very beginning what will and will not work), it is often useful to create a fully functioning model to give clients a sense of the scope of the project. Root Learning creates “animatics” – storyboards that are shot on film to give a sense of a typical user experience and communicate timing, rhythm, and pacing. Root finds that clients will often say that they are happy with a solution, yet, when seeing the storyboard shots, change their minds. This strategy solves the problem of having a 25% finished prototype with dead ends and links and allows the team to quickly and easily illustrate key concepts to the client. Oftentimes with games, problems can arise over scope. Holistic models help communicate the scope of the project in a more complete and intuitive way. Rapid collaborative visual prototyping⁵¹ is one method for managing these expectations.

Iterative Design

Most of Root’s games are fairly linear and less game-oriented than, say, Breakaway’s games. For a company like Breakaway, coming out of the computer gaming tradition, iterative rapid design is key. Rapid iterative design is especially critical in areas with multiple unknowns and where new game play is being tested. Having even simple objects on screen to interact with can give the clients and design team a sense of what is engaging (and not engaging), what is working, and what the experience will be like. For example, in our coding of Supercharged!, we had a working 3D model of the game within a week, and a functioning prototype in six weeks, even though there were several months before any user was scheduled to use it.

Early User Feedback

As the costs of game development rise, the risks and stakes increase as well. This means that a design team must find out as early as possible whether it’s on the right track. *The Sims*’ designer Will Wright describes how *The Sims* used literally thousands of testers in its development in an effort to simplify the controls as much as possible. The idea here – which is especially true if catering to a broad audience – is that the design team needs to learn how their game is interpreted, how their controls are perceived, and what usability problems emerge along the way. In our own work, we found that early user feedback on game controls helped save weeks worth of work in terms of choosing level designs, color schemes and interface patterns.⁵²

Root even advocates getting users in on design meetings with subject matter experts as a way of clarifying when something is confusing or contradicts their own experience. A designer explains:

Have them (users) in the design meetings. Knowing what they don’t know or already know is a key way of getting there. With controversial topics, we bring them in immediately. We try to find focus groups that are the most contentious and ornery and then test with them. We try to get the most honest, direct feedback to win them over, and everyone else becomes easy. Rather than shy away, we try to bring them in early,

whenever allowed, to make part of sessions for open honest feedback make module really work for that group.

The trick here, like with Wright's "Kleenex testing," is that users cannot be used too often or they can become part of the design team. If they become too familiar with the product, they will lose perspective as users. Working with teachers, we found that once a member "truly" becomes part of the design team, they lose end-user perspective⁵³.

Artists in Teams

Interdisciplinary design teams are nothing new to e-Learning. But what may be surprising is the prominent role of visual designers in most game-based projects. Root, for example, employs three staff members on every project, which fairly closely mirrors the breakdown in games companies (although the numbers of employees involved in the project is of course multiplied by about 20 times).

1. graphic artists
2. program managers
3. programmers

For Root, the most critical step is getting artists in early to listen to clients, understand their needs, and develop a core metaphor for the project. They do the specs, storyboard, layout and animatic with the designer. The project manager meets the client and gets the objectives, goals, and basic information and then creates an outline.

What's most interesting about Root's teams is that they claim that the most important step involves understanding the culture of the organization in order to understand what products will work, what the cultural values of the organization are, and what are the most important messages that they are trying to communicate. The CEO remarks:

The trick to their success is bringing together diverse people in order to talk about the client, making it something of an anthropological study. Diverse ideas from people who normally wouldn't get together. MBA and artists just don't get together; it's not logical. When you do you get a unique different product working with 2 different thought patterns and learning styles, you get something that will appeal to all learners.

But a critical component for Root is attracting artists with diverse interests (including toy design, different forms of artwork) and allowing them to work creatively to solve problems. A knack for storytelling is a particularly crucial part of the Root formula.

New Business Models

Putting together the capital to fund a commercial scale game is not easy. But, from even a cursory glance at the Serious Games line-up this fall, it's apparent that it's happening.

For many companies, the vehicle for innovation involves a combination of marketing and training. The Jeep game created by YaYa could be a game to teach sales representatives or the public about the vehicle. The

list of other “educational” games released that blur these lines, such as *Homes of Our Own*, *America’s Army*, *Force More Powerful*, *Full Spectrum Warrior*, continues to grow as many new titles are currently in development. It is not unlikely that, in the future, marketing and training teams will become even more inter-related as simulations are used as a means for both.

In many cases, game companies are taking contracts as investments, developing technologies, intellectual property, or retail rights to games. Breakaway, for example, works on games where they put in kind services up front and get dollars down the road from future sales. Sadly, traditional game / publisher relationships are not always good for the developers, forcing them to “sink or swim” and frequently “starve” between projects, giving them ample incentive to work on other projects.

Distributing IST Functions

The last, and perhaps most interesting finding for instructional designers, is that most game-based learning approaches do not employ that particular category of expert whatsoever. All of the groups I spoke with found instructional designers somewhat redundant. Some companies did employ producers with instructional design experience but, more frequently, game designers fulfilled these roles on their own. With backgrounds as diverse as psychology, interface design, art production, game testing, and game tools design, game designers were considered more desirable than traditional instructional designers. In other cases, artists were better “needs analysts” because they could distill findings down to key ideas that everyone could understand and design around. As one executive commented:

Traditional instructional designers are stuck in old paradigms, which are all about objectives, content, and pen and paper assessments. We need people who can think holistically, imagine user scenarios, and understand the culture of organizations. There is no one way to do things.

The strong sense I had after many interviews with game design companies was that an ideal instructional design curriculum, from their perspective, would include courses in narrative, usability studies, cognitive science, software production, and basic art. What was especially surprising was the way that traditional graphic designers were preferred for their ability to interact with clients, iterate ideas, and understand different cultures. Traditional instructional designers were criticized for being “too married to text” and unable to work with visual media effectively.

VII. Implications: Beware of the “Eye Candy” Fallacy

Overview

The last finding – which cuts across all three previous ones, is that the move toward games is about more than 3D technologies or flashy graphics. It is about embracing aesthetics and creating compelling experiences more generally. There is a well known saying among designers in the educational games business: “If you want to take all of the fun out of it, get a bunch of educators involved.” And there is more than a little truth to that. In conferences, I’m frequently asked if educators may not be better served creating games that aren’t as fun, graphically compelling, or immersive. Some ask if it is just the creative talent that makes them so interesting. Why someone would intentionally choose to create something uninteresting, ugly, or boring is really unclear to me, but the fact that this is even a topic for consideration speaks volumes about the current state of the field, and why instructional designers might be concerned.

Getting Beyond Textualism

One of the deep disconnects between contemporary learning theory and instructional design, as it is generally conceived, is what historian Paul Saettler refers to as “textualism.”⁵⁴ Textualism refers to the belief that knowledge is “true” when represented through textual definitions. Textbooks, workbooks, and lectures work relatively well for generating this kind of knowledge – written explanations, definitions, and so on. Unfortunately, such descriptions, when not buffered by embodied experiences, are just not much more than what they seem—only words.

Perhaps surprisingly, I found that the companies working in digital game based learning have little need for traditional ISD competencies – or, more accurately, such competencies were distributed across teams, which were made up of business strategists, marketers, artists, interface designers, and programmers. One cannot help but wonder if part of the problem is the cultures of instructional design programs themselves. Imagine suggesting that students turn in a needs analysis in the form of a painting or picture. Now, imagine asking the average instructional designer to represent understandings in the form of digital models. While this type of practice may be foreign to instructional designers, it is much less foreign to a generation of students raised with games.

Exploring Digital Literacies

Games are generally less good than other media at generating textual understanding per se. But what they are able to do effectively is provide situated, embodied understandings. Players gain more than understandings; they can *feel* concepts learned in game-like environments. What the boundaries and features of these understandings are we are only beginning to comprehend. But, as we live in increasingly digitally mediated environments, most companies and work environments prefer employees who understand the properties of digital media just as earlier generations preferred those adept at decontextualized text.

Implicit to this view is a focus not just on games per se, but also and equally on visual media, culture, and literacy. Educators’ concerns about

“eye candy” shows a deep misunderstanding, – if not distrust – of popular culture and the arts. Eye candy functions in games in important semiotic ways, cueing emotions, conveying meanings, and tipping off users to new semiotic possibilities. One can imagine, for example, in creating their Blockbuster game, how Root might run into difficulties generating a sense of emotional immediacy, concern, or excitement. (For example, why would an average Blockbuster’s clerk care about selling a video to a virtual patron? After all, another service sector job is just a block away.) Good artwork can ramp up emotional intensity, perhaps making the player feel pressured, nervous, angry, sad, or compassionate. Seem far-fetched? It happens as a result of good writing and animation all the time in major game titles such as *Animal Crossing*, which is little more than a simulated town (where kids go to work, pay rent, and so on).

Understanding Eye Candy

This is not to suggest that all games need to be fully functioning 3D environments. Rather, it is to suggest that good artwork, writing, and storytelling can function not just to make a piece of instruction more compelling or sticky but also as critical part of the learning itself. In her excellent analysis of *Prince of Persia*, Clinton⁵⁵ describes how seemingly minor graphic elements immerse players into the world of the Prince, creating dramatic tension, nervousness, or anticipation. Drawing on the work of ecological psychologist Michael Young⁵⁶, Clinton links perception and action, showing how perceptual symbols function to create a *sense of being there*, a sense that may very well be critical for digitally mediated learning in terms of creating experiences that participants construe as believable and educative.

Will e-Learning Go Digital?

One upshot of all of this for e-Learning educators is that, if they intend to truly embrace e-Learning as a model for instruction, then they ought to look at spaces where learning is already occurring online and investigate how it works. Many of the more entrepreneurial instructional designers I interviewed are beginning to do so. People like Jon Goodwin at Eli Lilly are interested in games not so much as a medium that they must use for learning right away, but rather as a place for ideas and design inspiration.

Gaming communities are the cutting edge of consumer grade simulation, artificial intelligence, and community design. One route for e-Learning designers is not necessarily to design games per se, but to at least understand how and why they work and then use this understanding as a means for designing other forms of educative media. One example of this, also described to me by Jon Goodwin, was to allow users choices in customizing characters, enabling them to think about different variables at work in a situation (such as business or accounting). Such ideas are also described in *Games to Teach’s Design Principles for Educational Games*.⁵⁷

Perhaps most importantly, underlying digital cultures embody a different set of values and ideas about learning – a set which next generation workers are already bringing to the workplace and to training.⁵⁸ To date, most e-Learning is designed along the lines of the old paradigm of

instruction – resulting in something akin to a trivia contest – as opposed to the instantiating the kind of experimentation, problem solving, and collaboration that characterizes new the gaming age.

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