

Pre-Summit Paper Harnessing the Power of Games for Learning

"..don't use force in training the children in the subjects, but rather games."
Plato, The Republic (421 BC)

The US education system is facing a triple whammy: it must deliver a set of skills more sophisticated than in the past; it needs to do this for a large, highly diverse population; and it needs to do this at a lower cost. What can the video game industry contribute to the educational challenges facing America? Possibly a lot. The overlap between the skills needed to win some popular games are surprisingly close to the skills that are in increasing demand in the workplace – learning on the fly, acquiring knowledge from multiple sources, making decisions with incomplete information, planning and strategic thinking, and collaborating with diverse colleagues. Good games allow players to acquire skills using environments that implement many of the strategies recommended by state-of-the-art learning science: problem-solving in complex systems, creative expression, cooperative tasks; and continuous assessment. While commercially successful games find broad markets for these sophisticated environments, they have had little influence on mainstream education. This workshop is designed to pinpoint the contributions that game designers can make to education and understand how to build markets for their innovations.

The Emerging Economy Requires Quantitatively Different Skills

Success in many business and government organizations hinges increasingly on constant renewal of knowledge, and an ability to develop and master technical advances year after year. This translates into a major change in the level of skills demanded of many Americans. The growing gap between the wages of college graduates and high school graduates is one clear indicator. A person with a bachelor's degree or better today earns twice as much as a high school graduate.

Employer demands are not just for more knowledge and skills, but for qualitatively different kinds of skills. In a recent Department of Commerce report on the information technology workforce, employers who participated in the study articulated the kinds of skills they seek in these workers. While they needed people with solid quantitative, technical, and communication skills, they placed heavy emphasis on a person's ability to adapt and learn in an environment of continuous change. These employers want employees who can:

- accurately assess time, cost, and resources required
- develop, implement, and evaluate work processes and procedures
- think strategically

- analyze problems and explore multiple solutions
- identify and diagnose problems
- perform under stress and time restrictions

The ability to manage continuous change in lean, highly productive teams relies on adaptability throughout all levels of an organization. It requires flexibility, not just from top managers, but by designers, maintenance teams, and customer relations specialists. Truck drivers need to master new navigation and inventory control systems. Customer relations and sales agents need to talk to individual customers about products that change continuously.

Any system of education capable of meeting the demands of this newly competitive workplace will need to provide a solid background in basic knowledge and communication skills, and an ability to learn quickly and perform effectively in complex, rapidly changing situations. And it will need to provide high levels of skills for an increasing number of Americans.

How People Learn

Increasing demands in what must be learned – including the need to provide skills for finding information, assimilating it quickly, and making effective use of the information – cries out for new approaches in education and training. Fortunately, over the past few decades we have learned a lot about the best way to help people learn based on advances in cognitive and learning science. Research tells us that to optimize learning, learning environments should:

- provide clear learning goals, clues on how to organize information into a logical structure, and lots of practical experience.
- provide learners with a broad set of experiences and practice opportunities that continue as long as they are challenging and reinforce expertise.
- continuously monitor the learner's progress and use this information to diagnose inadequate performance and shape instruction to address problems. The rate of learning varies enormously between learners (though different people move at different rates in different subjects).
- encourage inquiry, questions, and provide timely answers appropriate to the learner and the context.

This list is perhaps not surprising since these are the approaches instinctively used by good tutors. The problem, of course, is that these types of learning environments are unaffordable and impractical in today's standard classroom situation.

What Games Offer

The video game industry has employed many of the strategies recommended by learning science, and it has done so with products that are wildly popular and appeal, in one form or another, to Americans in all walks of life. Seventy-seven percent of high school students play electronic games – and enthusiasm for games appears to cross all borders of income and cultural backgrounds.

In a good game, goals are clear - you know why you are learning something and there are plenty of opportunities to apply what you learn. There's little ambiguity about why knowledge is powerful since the power can be put to use immediately. If you watch a player plunge into a new game, you see a pattern of behavior that bears little resemblance to classroom education. Manual, what manual? Players plunge immediately into the context of the game, understand what must be done, and acquire the powers needed to prevail. In many cases the power is provided by knowledge – facts or techniques.

Games provide learners with a broad set of experiences and practice opportunities. In the gamers' world, you can operate the most sophisticated aircraft and avionics, or operate the most powerful scientific or military equipment, fly through the interior of living cells, or talk with wine merchants on the streets of Ur in the year 3000 BC. The body of what is known about the performance of aircraft or living cells or the society of ancient Mesopotamia is encapsulated in these experiences, not as an abstract set of facts but as a world that has the color, complexity, and challenges of a functioning society.

Games continuously monitor progress and feedback is clear and often immediate. In games, players know that they are constantly being tested and are powerfully motivated to succeed and move to new levels. A good game moves at a rate that keeps the player at the edge of their capabilities – they are neither bored by repetition when they have mastered a task nor frustrated by being advanced so quickly that they are confused and overwhelmed. Every player moves at a different speed. And you succeed not by knowing facts but by applying your knowledge, and learning on the fly. The measure of success is what you can do: Can you feed your people? Can you land your airplane in a thunderstorm? Can you cure the patient?

The challenges created by the games are so compelling that players will spend dozens, sometimes hundreds of hours wrestling to achieve a series of often difficult goals. Players are willing to try repeatedly to gain the mastery of a topic needed to get them to a new level of the game. And they are often anxious to get help and ask for suggestions about strategies and concepts from their friends (online and otherwise).

Challenges in Commercialization and Adoption

Providing a diverse population with the knowledge and skills needed for today's competitive workplace pressures is a daunting challenge. It seems highly unlikely that any modest tinkering with the current educational system can address the challenges. What is needed is a disruptive change that can radically change our expectations about the possible.

The tools emerging from the electronic gaming industry may provide one such disruption. Of course, game techniques will not make all other learning techniques obsolete, and it is not likely that they will provide the best way to teach every student every subject in every situation. But there's powerful evidence that many of the features of video games are directly applicable to learning, and the technologies and approaches developed by the video game industry may make it possible to affordably implement the types of learning environments learning scientists recommend.

If games provide such powerful opportunities, however, it's reasonable to ask why investors haven't stampeded into the market. Over the past few decades many of our most conservative industries have transformed themselves by taking advantage of advances in computation, telecommunications and biotechnology. Manufacturing industries and service industries, such as banking and insurance, went through a major re-design of their business processes, realizing substantial gains in product quality while lowering cost. The rewards for undertaking similar innovations in the education and training sectors are potentially enormous; the United States alone spends nearly a trillion dollars a year on education and training, and international demand is at least twice as large.

If there's even a good chance that game-based strategies can help more Americans achieve more needed skills while lowering costs in education, surely there's an incentive to find out why ordinary market forces aren't working. The first step is to agree that there is a problem. The second is to pinpoint the origin of the failures with enough precision to design solutions. This will be a central aim of the Summit.

Two problems may be impeding the development and commercialization of games for learning: (a) the absence of a coherent market in education that could motivate investors to develop products capable of driving such a transformation, and (b) the absence of exemplar products that can demonstrate the kinds of benefits that would encourage change on the part of educational institutions. The two problems are related since no investor is willing to make the long-term, high-risk investment in research and development given the uncertainty of any return. This adversity to risk-taking is deepened by the past experience of firms that lost substantial investments in the educational technology market by

underestimating the difficulty of developing good products and the complexity of educational markets.

Ordinary market forces do not operate in conventional education markets. And there is even an argument over whether they should. The argument is always made that education is simply unlike other businesses and the spiritual elements of education would be demeaned if we reduce learning to a business-like commodity. It's hard, however, to see much spirituality in college lectures attended by 600 students or bored high school students sitting through lectures that they don't understand. Just as other industries used new technologies to personalize their products and services, successful innovators are likely to find ways to make education far more personal using tools that allow instructors to behave much more like individual counselors and tutors. A core policy challenge is to find a way to make use of creative competitive markets to deliver the kinds of engaging, personalized educational services that students, parents, teachers, and employers would like to see.

Challenges in Research

One problem created by the difficulty of marketing innovations to educational institutions is that incentives to conduct research in innovative gaming and other educational technologies are very weak. This is a familiar charter for public investment in research. Working with experts in fields including game design, learning science, computer graphics, assessment and other fields, the Federation of American Scientists' Learning Federation Project developed a detailed roadmap for the research needed to make progress. The plan (see www.learningfederation.org) defined five distinct areas of research focus:

- Instructional Design (how to learn outside the standard classroom environment)
- Question Generation & Answering Systems (encouraging questions and providing timely answers)
- Simulations and Exploration Environments (building accurate, compelling, accurate models)
- Learning Modeling & Assessment (measuring complex skills in ways that are meaningful to students, teachers, parents, and employers)
- Building & Maintaining Learning Systems

It's clear that game technologies can contribute to many of these research areas and we hope that this Summit will develop a list of the most promising areas of investigation. A preliminary research and development plan, or "roadmap," for the development and application of games for learning in education and training settings is being distributed to the Summit participants and will be the topic of one of the panel discussions.

Conclusion

In his 1964 classic *Understanding Media*, Marshall McLuhan posited that “the medium is the message” because it is “the medium that shapes and controls the scale and form of human association and action.” He argued that some media have such new power that they do not simply let us do familiar things more easily but they utterly change the landscape of what we thought was possible. The technology of simulations and games has this potential. It will take a lot of technical, political, and business creativity to capture it.

The purpose of this Summit is to explore potential of games in providing the learning tools needed to support a 21st century economy and propose practical strategies for realizing their potential. We look forward to the discussion.

Henry Kelly
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