

Chapter 7

How Games and Simulations can Help Meet America's Challenges in Science Mathematics and Technology Education

Henry Kelly

Federation of American Scientists, USA

ABSTRACT

The quality of the U.S. workforce is critical for a competitive economy in today's fast-paced, tightly connected global economy. Given current trends the quality of the U.S. workforce, measured in educational attainment and knowledge of key concepts in science, mathematics, and engineering will actually decline in coming years. Conventional methods will simply not be adequate to the enormous task of improving this situation. The technology and management tools that have been used so successfully to increase both quality and productivity in other service enterprises can play a vital role in improving science and mathematics education and training.

INTRODUCTION

There is universal agreement that a U.S. economy that successfully recovers from the current deep recession must be built around businesses able to innovate and adapt quickly to innovations. Innovation is particularly critical in the operation of the nation's system of education and training that will be forced to meet dramatically increased demand—both in the quantity of what must be learned and in

the number and the diversity of people needing to learn. New information technologies, particularly a new generation of simulations and computer-based games, provide a powerful set of tools for meeting these goals at an acceptable price. The discussion below reviews the nature of the challenge, the ways simulation and game technology can help meet the challenge (with an emphasis on science, mathematics, technology, and engineering education), and outline a path forward that can accelerate development and, where appropriate, rapid adoption of the new technologies.

DOI: 10.4018/978-1-61520-739-8.ch007

WHAT'S AT STAKE

The jobs in this new economy will demand a wide range of adaptive skills including ability to: master new concepts quickly, gather information and make decisions under conditions of uncertainty, work comfortably with people with very different backgrounds and skills, and communicate effectively with peers, specialists in other fields, and novices. Most jobs will also require a solid foundation in the basics of science, engineering, and mathematics. Jobs in everything from trucking to surgery will be imbedded in sophisticated production networks involving information systems, sensor networks, data management, sophisticated labs and testing equipment, and constant series of innovations. U.S. leadership will depend on research labs, staffed by world class scientists and engineers able to push the frontiers of scientific knowledge, convert discoveries into marketable products and services, and build businesses around them.

None of this can happen without a U.S. workforce able to contribute to technologically sophisticated enterprises that are in a continuous process of innovation and renewal. Our ability to compete will depend in essential ways on the quality of the U.S. workforce. Federal Reserve Chairman Ben Bernanke points out that “taking full advantage of new information and communication technologies may require extensive reorganization of work practices, the reassignment and retraining of workers, and ultimately some reallocation of labor among firms and industries” (Bernanke, 2006).

Given this reality, it's unsettling that the U.S. workforce ranks 13th among high income countries in the quantitative skills of its workforce, and 14th in document literacy (National Commission on Adult Literacy, 2008). It's even more disconcerting that the educational quality of the U.S. workforce is likely to decline during the coming generation because of large numbers of poorly educated workers and the fact that a

growing share of population growth will come in minority groups most poorly served by the existing educational system (Kirsch, 2007). The cohort with the largest population growth in the U.S. from 2000 to 2020 will be people with less than a high school education. U.S. high school graduation rates reached a peak of 77% in 1969 but are now 70%. Shockingly, only half of many minority groups graduate. The overall achievement rates of U.S. students are consistently behind other affluent nations and are essentially unchanged since the 1980s. And while the average education level in nations like China and India remain far below those in the U.S., measured in absolute numbers these countries are becoming very large. China's colleges are producing more than 6 million graduates annually while the U.S. produces only about 1.5 million (U.S. Department of Education, 2008; People's Daily Online, 2009). There is undoubtedly still a significant difference in the quality of the degrees granted but it's obvious that a lot of talented people are engaged in the global marketplace who will be in direct competition with U.S. employees in a tightly coupled global marketplace.

The gap separating the U.S. from the countries with the best educational records is so substantial that it cannot be closed in the next two decades even if we solve our problems with college enrollment and high school graduation rates (Jones, 2007). An aggressive program in adult education will be needed if the U.S. workforce is to be competitive in terms of educational quality. While many high school drop outs succeed in getting GEDs, only 27% of GED graduates enroll in post secondary education and 85% of those who do must take at least one remedial course (National Commission on Adult Literacy, 2008). Adult education is, however, largely used only by people who already have a reasonable education. In a recent survey people were asked “did you get any training” in the previous five years. 19% of people lacking a high school degree had gotten some training, 33% of high school graduates, and

15 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/games-simulations-can-help-meet/41070

Related Content

Do E-Athletes Move?: A Study on Training and Physical Exercise in Elite E-Sports

Tuomas Kariand Veli-Matti Karhulahti (2016). *International Journal of Gaming and Computer-Mediated Simulations* (pp. 53-66).

www.irma-international.org/article/do-e-athletes-move/177250

Decoupling Aspects in Board Game Modeling

Fulvio Frapolli, Amos Brocco, Apostolos Malatrasand Béat Hirsbrunner (2012). *Interdisciplinary Advancements in Gaming, Simulations and Virtual Environments: Emerging Trends* (pp. 78-96).

www.irma-international.org/chapter/decoupling-aspects-board-game-modeling/63230

A Phenomenological Study of Games, Simulations, and Virtual Environments Courses: What Are We Teaching and How?

Albert D. Ritzhaupt, Nathaniel Poling, Christopher Frey, Youngju Kangand Margeaux Johnson (2016). *International Journal of Gaming and Computer-Mediated Simulations* (pp. 59-73).

www.irma-international.org/article/a-phenomenological-study-of-games-simulations-and-virtual-environments-courses/157349

Digital Games and Violence

Arzu Kalafat Çat (2023). *Research Anthology on Game Design, Development, Usage, and Social Impact* (pp. 1978-1995).

www.irma-international.org/chapter/digital-games-and-violence/315578

Requirements-Based Design of Serious Games and Learning Software: An Introduction to the Vegas Effect

Brock Randall Dubbels (2019). *Exploring the Cognitive, Social, Cultural, and Psychological Aspects of Gaming and Simulations* (pp. 1-34).

www.irma-international.org/chapter/requirements-based-design-of-serious-games-and-learning-software/218795