Chapter 5.9
Simulation, Games, and Virtual Environments in IT Education

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INTRODUCTION

The rapid change in information technology presents several problems to IS educators and trainers. In particular, the number of concepts that must be mastered is constantly increasing while the time available is not. This makes it essential to use class time efficiently as well as effectively. Simulations and games provide interesting and useful tools to help in this effort.

BACKGROUND

The idea that students learn better by doing goes back at least to Dewey (1938). The key idea underscoring this approach is that people learn better from experience than from reading or listening (Corbeil, Laveault, and Saint-Germain, 1989). This sort of experience can be gained in a simulation or game. By compressing time, the simulation allows the students to experience the consequences of their own actions or to see how a system operates.

Simulation, case studies, role playing, and gaming are related teaching methods based on experiential learning. They permit experience or experimentation with a situation modeling the real world (Senge, 1990). On a deeper level, simulation is claimed by some to be a fundamentally new way of studying the world (Pagels, 1998). Narayanasamy, Wong, Fung, and Rai (2006) distinguish between games, simulation games, and training simulators. Simulators are models used for

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systems analysis or policy formation. Simulators may use mathematical models and Monte Carlo or discrete event methodologies. They argue that training simulators offer real-world environments and challenges are focused on skill development rather than entertainment, and are not goal oriented. Klassen and Willoughby (2003) discuss the importance of assessment and present data supporting the notion that games help students learn more quickly than do lectures.

Case studies are a time honored approach of instruction in strategy courses (see, for example, Burgelman, Maidique, and Wheelwright, 2001). Barker (2002) suggests that they can also be very valuable for teaching technical skills such as software development. In some sense, a case study is a role play with the student acting the part of an analyst examining the case situation.

Role playing and simulation gaming are similar approaches in that they use simulated worlds, but instead of creating, or observing or analyzing that world, students are immersed in it. Role playing is a method in which students are presented a scenario simulating some real situation, and assigned roles in that scenario. The scenario can be based on real or simulated situations (Barker, 2003). Participants then assume the roles of relevant persons in the scenario and act out the situation to see what happens. Role playing is a commonly and successfully used tool in IS education (for example, Christozov, 2003).

According to Greenblat (1988), simulation gaming includes role playing as an element. Whereas role playing allows participants to play the roles as they please, simulation gaming emphasizes the interactions of the roles and constraints of various types on the players. In some sense, a simulation game strives to teach about a specific situation while a role play or game may have a more general lesson.

Greitzer, Kuchar and Huston. (2007) describe cognitive principles for learning and a process for designing and improving game based education. In particular, they argue that experience should be presented in realistic contexts. They identify features of games that attract extended play including levels, adaptability, clear goals, interactions, and shared experience with others. They describe the use of these principles in a security training game.

The use of modern information technology in developing these games and simulations, stimulated, no doubt, by the vibrant computer game industry, has led several authors to create "virtual" environments for training. This seems a good umbrella term to include all simulation and gaming approaches to training, as they do indeed create virtual realities in which the students operate. Summerfield (2004) suggests that role playing is superior for learning soft skills (like dealing with people) while technically based simulations are useful for learning hard skills.

Simulation and gaming have been used to enhance training in a variety of non IS areas including incident management (Jain and McLean, 2003), mass casualty medicine (Müller, Martens, Willen, and Müller, 2000), military technology (Meeds, 2001), military tactics (Chatham, 2007), and immunology (Kelly, Howell, Glinert, Holding, Swain, Burrowbridge, and Roper, 2007). Mayo (2007) argues that video games can be used to teach science and engineering better than lectures.

After many years of using such exercises at all levels (undergraduate, graduate, and executive), it is the author's opinion that they are very useful and that major benefit accrues to the instructor in preparing the simulation as well as to the students when they play the game. Simulation and gaming are student centered learning, that is, the student is actively involved in the learning rather than passively observing the instructor (Greenblat, 1998). The student does the work, makes decisions and sees the impact of the decisions. Role playing and simulation gaming attempt to take advantage of this by creating a situation in which a student may "play a game" in which time is compressed and attention can be focused on a few key ideas. Finally, these kinds of exercises are fun. The class gets to move around, talk, and frequently laugh.