

Serious Game Design and Development: Technologies for Training and Learning

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Section 1 **Design Principles for Serious Games**

This section provides several different perspectives on designing and developing serious games. Each chapter offers a design principle or strategy that can be employed to enhance the effectiveness of serious games. Several also include lessons learned drawn from specific serious game development efforts.

Chapter 1	
Mini-Games with Major Impacts.....	1
<i>Peter A. Smith, Joint ADL Co-Lab, USA</i>	
<i>Alicia Sanchez, Defense Acquisition University, USA</i>	

The authors describe a strategy for developing mini games that can be embedded in game-based training. They also present descriptions of several case studies that used mini-games as part of the learning strategy.

Chapter 2	
Serious Storytelling: Narrative Considerations for Serious Games Researchers and Developers.....	13
<i>Rudy Me Daniel, University of Central Florida, USA</i>	
<i>Stephen M. Fiore, University of Central Florida, USA</i>	
<i>Denise Nicholson, University of Central Florida, USA</i>	

This chapter discusses the importance of narrative in serious games. These authors contend that narrative aids can help in game design in several ways, including: increasing the player's motivation to remain in the game; stories can embed learning objectives; narrative can tie together elements in the game into a coherent whole.

Chapter 3

An Adventure in Usability: Discovering Usability Where it was not Expected.....31

Holly Blasko-Drabik, University of Central Florida, USA

Tim Smoker, University of Central Florida, USA

Carrie E. Murphy, University of Central Florida, USA

This chapter describes the goals of usability and how it is traditionally performed using two popular methods. It goes on to discuss appropriate usability measures for serious games.

Chapter 4

Development of Game-Based Training Systems: Lessons Learned in an Inter-Disciplinary

Field in the Making.....47

Talib Hussain, BBN Technologies, USA

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Bruce Roberts, BBN Technologies, USA

Jason Seip, Firewater Games LLC, USA

Vance Souders, Firewater Games LLC, USA

Richard Wainess, National Center for Research on Evaluation, Standards and Student Testing (CRESST), USA

This chapter describes a recent experience developing a serious game for U.S. Navy recruits to describe a multi-disciplinary approach to serious game design. They describe their process in terms of the selection of training requirements, the domain and the gaming platform; knowledge acquisition; story development; game design; initial instructional design; assessment strategy; software development, introductory video; and review, refinement and testing.

Chapters

DAU CardSim: Paper Prototyping an Acquisitions Card Game.....81

David Mewalf University of Central Florida, USA

Sara Raasch, 42 Entertainment, USA

Clarissa Graffeo, University of Central Florida, USA

This chapter describes the development of a multiplayer card game that was first developed as a paper prototype. The chapter provides a post-mortem of the iterative design process that included development of varying levels of simple prototypes for initial design and playtesting, followed by evaluation of game balance and refinement. They also cover the process they employed to digitize the game, and expand the game to cover additional learning objectives.

Chapter 6

Kinesthetic Communication for Learning in Immersive Worlds.....102

Christopher Ault, The College of New Jersey, USA

Ann Warner-Ault, The College of New Jersey, USA

Ursula Wolz, The College of New Jersey, USA

Teresa Marrin Nakra, The College of New Jersey, USA

This chapter discusses a game design architecture that exploits the pedagogical potential of a rich graphical environment using a kinesthetic interface. The authors conclude by describing directions for future testing and application of the kinesthetic input devices in serious games.

Section 2

Applications of Serious Games

Our conception of Serious Games is the use of games for any non-entertainment purpose, although the preponderance of attention has been given to educational or learning games. In this section, we have included several chapters that are not strictly educational in nature to highlight the fact that other applications are possible. That said, we believe that the potential application of games to learning (across settings and age groups) is vast and only beginning to be tapped.

Chapter 7

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

Mathematics and Technology Education.....117

Henry Kelly, Federation of American Scientists, USA

The author addresses three key issues in educational game design: (1) designing the course of instruction so that it is both rigorously correct and constantly engaging, (2) ensuring that the system adapts to the background and interests of individual learners, and (3) evaluating the expertise of learners in ways that make sense to them and to future employers.

Chapter 8

Games for Peace: Empirical Investigations with PeaceMaker.....134

Cleotilde Gonzalez, Carnegie Mellon University, USA

Lisa Czonka, Carnegie Mellon University USA

This chapter describes the use of a video game to conduct empirical investigations designed to build theoretical models of socio- psychological variables that influence dynamic decision making. Specifically,

an investigation on decision making in a dynamic and complex situation, the solution of international conflict and the achievement of peace, using PeaceMaker, a popular video game, is presented.

Chapter 9

Play's the Thing: A Wager on Healthy Aging.....150

Mihai Nadin, antE - Institute for Research in Anticipatory Systems

University of Texas at Dallas, USA

This chapter centers on the hypothesis that the aging process results in diminished adaptive abilities resulting from decreased anticipatory performance. To mitigate the consequences of reduced anticipatory performance, the addresses brain plasticity through game play.

Chapter 10

Re-Purposing a Recreational Video Game as a Serious Game for Second

Language Acquisition.....178

YolandaA. Ran kin, IBMAImaden Research Center, USA

Marcus W. Shute, Clark Atlanta University, USA

The authors report their efforts to re-purpose a recreational game as a serious game to promote learning in the context of Second Language Acquisition. They outline the process of game transformation, which leverages the entertainment value and readily accessible developer tools of the game.

Section 3 Games in Healthcare

Given the number of high quality proposals we received in the healthcare area, we decided to create a separate section to highlight this important area. The chapters in this section offer a sampling of the types of Serious Games being developed in this area. These include: games being used in the therapeutic process, games to promote healthy behaviors, games to train healthcare professionals and pervasive health games. These applications, as well as others related to healthcare, have the potential to play an important role in the future of healthcare in the U.S. and across the world.

Chapter 11

Application of Behavioral Theory in Computer Game Design for Health Behavior Change.....196

Ross Shegog, UT-School of Public Health, USA

The chapter introduces serious game developers to processes, theories, and models that are crucial to the development of interventions to change health behavior, and describes how these might be applied by the serious games community.

Chapter 12

Avatars and Diagnosis¹ Delivering Medical Curricula in Virtual Space.....233

Claudia L. McDonald, Texas A&M University-Corpus Christi, USA.

The author describes Pulse!! The Virtual Clinical Learning Lab—a project designed to explore the use of games in health care by developing a reliable and valid learning platform for delivering medical curricula in virtual space. She uses the Pulse!! example to describe lessons learned in the general area of collaboration, including issues such as funding, technology and evaluation.

Chapter 13

Using Serious Games for Mental Health Education.....246

Anya Andrews, Novonics Corporation, Training Technology Lab (TTL), USA

Rachel Joyce, University of Central Florida, USA

Clint Bowers, University of Central Florida, USA

The chapter addresses the mental health training and education needs of modern "at risk" populations and discuss the potential of serious games as effective interventions for addressing those needs.

Chapter 14

Pervasive Health Games.....260

Martin Knoll, University of Stuttgart, Germany

The author describes the potentials of serious game applications in a health context to improve user's motivation, education and therapy compliance. He focuses on "Pervasive Health Games", which combine pervasive computing technologies with serious game design strategies.

Chapter 15

Influencing Physical Activity and Healthy Behaviors in College Students: Lessons from an Alternate Reality Game.....270

Jeanne D. Johnston, Indiana University, USA

Lee Sheldon, Indiana University, USA

Anne P. Massey Indiana University, USA

The authors investigated the effectiveness of a prototype Alternate Reality Game —called The Skeleton Chase - in influencing physical activity and wellness of college-age students.

Section 4

The Way Ahead: The Future of Serious Games

This section includes chapters that focus on looking toward the future of serious games. Specifically, it addresses how to establish a science of serious game design that is meant to stimulate research and applications. In addition, it includes a commentary on the way ahead in Serious Games.

Chapter 16

Establishing a Science of Game Based Learning.....290

Alicia Sanchez, Defense Acquisition University, USA

Jan Cannon-Bowers, University of Central Florida, USA

Clint Bowers, University of Central Florida, USA

The authors offer a simple framework for organizing variables important in the learning process and then discuss findings from psychology and education as a basis to formulate a research agenda for game-based training. The goal of the framework is to stimulate researchers to conduct systematic, appropriately controlled experiments that will provide insight into how various game features affect motivation and learning.

Chapter 17

The Way Ahead in Serious Games.....	305
<i>Jan Cannon-Bowers, University of Central Florida, USA</i>	

The author summarizes the major themes that emerge from the previous chapters and offers some observations and presents suggestions for the way ahead in Serious Games and their application to important societal challenges.

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