BRIAN C. NELSON & BENJAMIN E. ERLANDSON

DESIGN FOR LEARNING
IN VIRTUAL WORLDS

Design for Learning in Virtual Worlds

Design for Learning in Virtual Worlds, focused specifically on how to design virtual worlds for educational purposes, explores:

■   The history and evolution of virtual worlds;
■   The theories behind the use of virtual worlds for learning;
■   The design of curricula in virtual worlds;
■   Design guidelines for elements experienced in virtual worlds that support learning;
■   Design guidelines for learning quests and activities in virtual worlds.

The authors also examine the theories and associated design principles used to create embedded assessments in virtual worlds. Finally, a framework and methodology is provided to assist professionals in evaluating "off-the-shelf" virtual worlds for use in educational and training settings. *Design for Learning in Virtual Worlds* will be invaluable both as a professional resource and as a textbook for courses within Educational Technology, Learning Sciences, and Library Media programs that focus on gaming or online learning environments.

Brian C. Nelson is Associate Professor of Educational Technology at Arizona State University. An instructional designer and learning theorist, he has published and presented extensively on the viability of educational virtual worlds for situated inquiry learning and assessment. Dr Nelson's recent writing addresses issues related to the design and evaluation of educational games, with a focus on theory-based design principles. He is currently a Co-Principal Investigator on the SAVE Science Virtual World project, and was the Project Designer on the River City project. He was a researcher on two MacArthur Foundation Digital Learning grants and was also a Co-Principal Investigator on the SURGE project, creating video games to teach high school physics.

Benjamin E. Erlandson is Assistant Professor of Instructional Science and Technology with an emphasis in Digital Media in the School of Information, Technology, and Communication Design (ITCD) at California State University, Monterey Bay. In addition to teaching several courses in interactive media design/development and instructional design, Dr Erlandson runs the Virtual Environments for Situated Inquiry of Complexity (VESIC) Lab, conducting various research studies investigating the usefulness of meso-immersive 2D and 3D virtual environments—much like those used for many popular computer games—for learning about complex systems.

Interdisciplinary Approaches to Educational Technology
Series Editor: J. Michael Spector

Current and forthcoming series titles:

Design for Learning in Virtual Worlds

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AND
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Dedication

Brian: This book is dedicated to those who shaped my understanding of virtual worlds for education: Chris Dede (virtual worlds guru and my doctoral advisor at Harvard), Diane Jass Ketelhut (a virtual worlds for science learning researcher and my best friend), Jim Gee (educational games researcher and designer), and an incredible group of PhD students at ASU who teach me more every day about virtual worlds design (Kent Slack, Younsu Kim, Cecile Foshee, and Andre Denham). This book is also dedicated to my family: to my wife Akiko Wakao, who got me interested in virtual worlds when we were graduate students together, and to my son Kohei who always comes up with the best ideas for curriculum that will actually be fun.

Ben: This book is written for all past, present, and future brave souls that don twenty hats and build virtual worlds for learning. I would like to dedicate this book to my father Stephen Erlandson, who taught me how to see the world with hiking boots and a fishing rod – and still teaches me to this day. It is also dedicated to my young nephew Bennett, who helps me experience the world through brand new perspectives. He also thinks I live in a computer, which isn't entirely false.

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Preface

This is a volume in the Routledge series entitled "Interdisciplinary Approaches to Educational Technology." This book follows a four-part, problem-centered framework similar to that used in other books in the series, customized to our exploration of virtual worlds for learning.

Part One of this volume provides an introduction and overview of the field of virtual worlds for education. Chapter topics include an articulated definition of virtual worlds, a brief history of virtual worlds for education with an overview of several educational virtual worlds, and a discussion of the mechanics of virtual worlds including the virtual world space, movement and interaction with elements in virtual worlds, and graphical user interfaces.

Part Two provides an elaboration of the theoretical perspectives that inform the assertion that virtual worlds can be powerful spaces for learning. Chapter topics include theories of learning that are often used to justify the educational use of virtual worlds, including situated learning, constructivism, cognition, and behaviorism; an exploration of the contexts in which virtual worlds for learning are typically used, along with a discussion of the learner populations who take part in virtual world-based learning experiences, and an overview of assessment and measurement in virtual worlds.

Part Three provides a more detailed elaboration of practical approaches to designing virtual worlds for learning. Chapter topics include an overview of a framework for critiquing existing virtual worlds as learning platforms, followed by a detailed discussion of the processes used for designing a virtual world-based learning curriculum, the activities within the worlds that make up such a curriculum, and the assessments that help to demonstrate whether and to what extent learning has taken place as a result of completing virtual world-based curricula.

Part Four shifts focus from design of virtual worlds to development and implementation issues. This section includes an overview of the development

process of virtual worlds, providing a practical look at moving from design to development. Implementation and evaluation issues are also covered, including practical tips for evaluating the success of a virtual world implementation in various learning contexts.

Each of the chapters is structured to provide introductory remarks followed by a discussion of the major points covered. Each chapter also includes one or more self-check quizzes and suggested learning activities related to the chapter topic, along with references to literature cited in the chapter, web links to other material, and other resources.

Acknowledgments

Brian: I must first thank Ben for being an excellent co-author, colleague, and friend. I also want to thank J. Michael Spector, the series editor, for his example, expert modeling, and encouragement; and my editor at Taylor Francis/Routledge, Alex Masulis, for his patience with this newbie author and for allowing a long time extension.

Ben: First and foremost, I wish to thank Brian for taking me on as his first doctoral student and surviving all the way through my dissertation! Your continued support, collegiality, and friendship are cherished. I wish to thank James Klein for showing me the ways of instructional design and Wilhelmina Savenye for enlightening me on the subject of evaluation. Finally, Joanna Gorin ignited and sustained my interest in measurement and assessment.

part one

Introduction and Overview

one
Definition and History of Virtual Worlds for Education

Introduction

In the popular press, virtual worlds are almost always talked about in breathless tones of wonder and newness. They are described as the latest, emerging technology that has captured the hearts, minds, and funds of players young and old. The way you hear virtual worlds discussed, you would think that they appeared on the world stage just moments ago … a sudden miraculous arrival in their present high-definition, full-color, ultra-realistic glory. If virtual worlds were sold in cereal boxes, the labels would all shout "New!" "Improved!" or "Now even better!"

In reality, though, those boxes should read something like "New look, same great taste!" Virtual worlds have been around in some form or another for decades. If you include mechanical virtual worlds, we can trace their origins back even further. In this chapter, we will follow the winding trail of the evolution of virtual worlds over time. We will pay particular attention to the history of virtual worlds used for education. And we will look at some current and recent examples of virtual worlds designed especially for education. Before that, though, we need to define what we mean when we say "virtual world." We need a working definition to provide a foundation for the rest of the book!

What's a Virtual World?

What's a virtual world? On first thought, this seems a pretty easy question to answer. *A virtual world is a computer-based 3D world that you can explore*

by yourself or with other people. In a virtual world, you either explore as yourself (first-person) or are represented by a computer-based character called an avatar (third-person). This definition is a good starting point, but like most definitions, the more you think about the topic, the more complex the definition becomes.

   Let's start expanding our definition by describing what virtual worlds are not, at least as we are going to talk about them in this book. In this book, virtual *worlds* are distinct from virtual *reality*. So what is virtual reality? Virtual reality consists of fully immersive 3D simulations. By fully immersive, we mean that the experience of the user in a virtual reality environment is a close functional simulation of reality, or a simulation of reality with some added "superpowers." To achieve this, virtual reality-based simulations rely on a collection of software and related hardware. Virtual reality users wear head-mounted displays through which they view a simulated world or environment (Figure 1.1). These displays often include motion tracking. With motion tracking, as you turn your head from side to side or up and down, the simulated world tracks your head's movement. So when you turn your head left or right, you see what is on either side of you in the virtual world displayed through the head-mounted display. Some head-mounted displays include headphones that similarly include motion tracking connected to audio. You hear the sounds of the virtual reality environment all around you, and the sounds move appropriately has you turn your head. For example, if you hear a dog barking off to your left and turn your head in the direction of

FIGURE 1.1 Virtual reality hardware