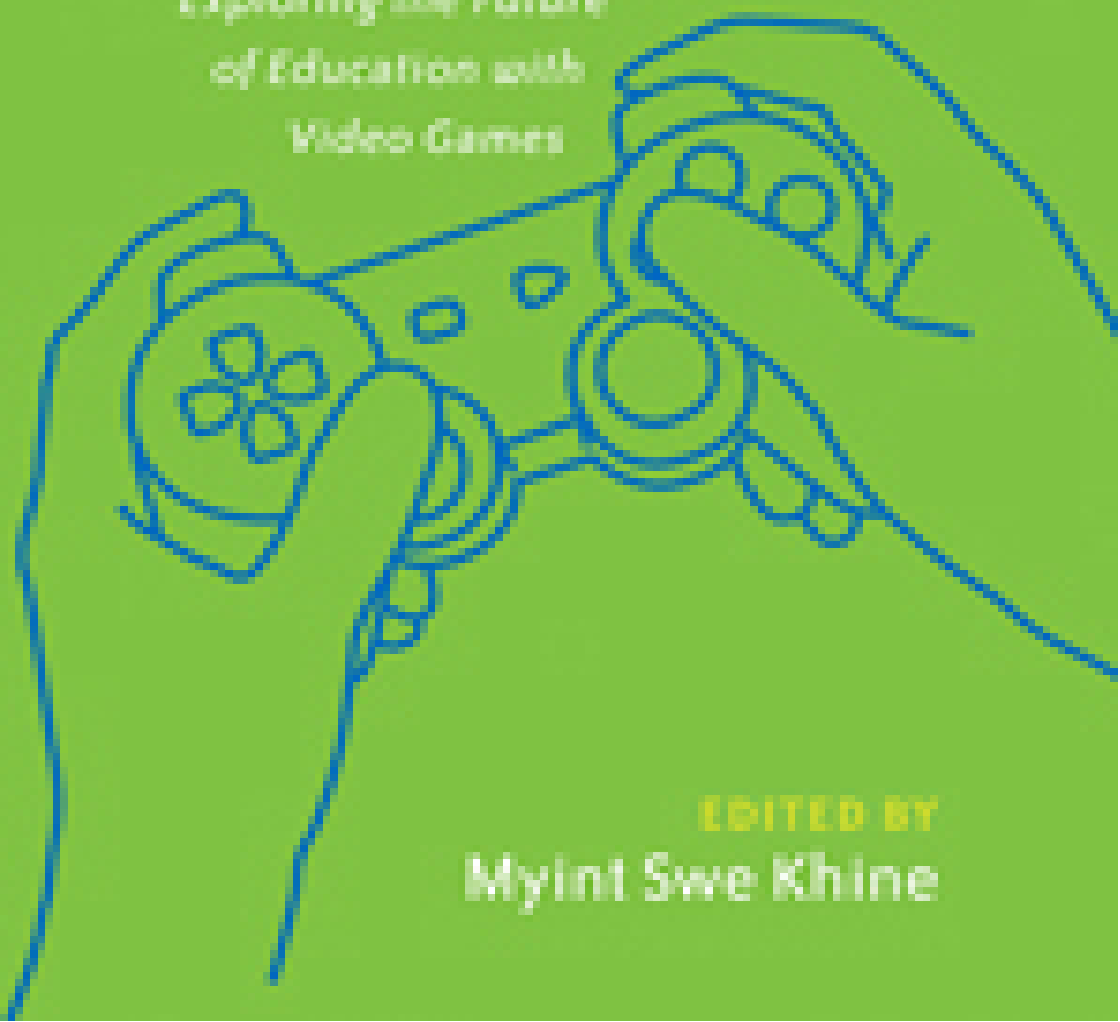


# Learning to Play

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*Exploring the Future  
of Education with  
Video Games*



**EDITED BY**  
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# Let the Game Begin

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## Introduction

Educators around the world acknowledge the fact that we live in a knowledge-based society, and the ability to think systematically is one of the necessary skills in order to function effectively in the 21st century.

Many have agreed that games are immersive and promote strategic thinking, planning, communicating, negotiation skills, multitasking, and group decision making. They also observe that games promote high levels of attention and concentration among players. There is a cogent belief that video games can be a powerful tool if we can exploit the affordances and harness the application in classroom settings. There is no shortage of articles in scholarly journals (both print and nonprint media) about the emergence of video games. Some articles address what players learn from the video game, and some focus on how video games can be designed to facilitate learning.

The interest in using games in education has been gaining momentum over the last decades, and it was reflected in articles and case studies published in the scholarly journals. For example, the journal *Learning, Media and Technology* published a special issue on “Digital Games and Learning” (Martin & Murray, 2006). The *British Journal of Educational Technology* also published a special issue that focused on the potential of game-based learning (Pivec, 2007). Similarly, a 2007 issue of the *Journal of Educational Multimedia and Hypermedia* covered learning and teaching with electronic games (Ferdig, 2007). A number of book authors have also added their knowledge and perspectives to the existing literature. Some notable titles include *Re:Play: Game Design and Game Culture* (Scholder & Zimmerman, 2003), *The Game Design Reader: A*

*Rules of Play Anthology* (Salen & Zimmerman, 2005), *Worlds in Play: International Perspectives on Digital Games Research* (de Castell, 2007), *Good Video Games and Good Learning* (Gee, 2007), *Playing to Learn: Video Games in the Classroom* (Hutchison, 2007), *Understanding Video Games: The Essential Introduction* (Egenfeldt-Nielsen, Smith, & Tosca, 2008), *Perceiving Play: The Art and Study of Computer Games* (Mortensen, 2009), *Gaming and Cognition: Theories and Practice from the Learning Sciences* (van Eck, 2010) and *Teaching Digital Natives: Partnering for Real Learning* (Prensky, 2010). From these evidences, it is clear that the study of games and their applications in education will be key research areas in the years to come.

This book critically examines the profound understanding of the role of video games in education from multiple perspectives and presents thought-provoking ideas, innovative approaches, systemic exploration, exemplary and promising efforts, and future-oriented scenarios. The book draws together distinguished researchers, educational and curriculum planners, game creators, educational and social psychologists, and instructional designers to explore how video games can contribute to transforming the future of education. The chapters in this book inform theoretical frameworks and best practices from in-depth investigations, discourse analyses, classroom-based experiments, incisive observations, and narrative studies. The book is divided into three parts, and the following paragraphs acquaint the reader with the substance of the chapters in each of those parts.

## Game Design and Learning

In Chapter 2, Halverson, Blakesley, and Figueiredo-Brown from the University of Wisconsin–Madison discuss how video game design can be used as a model for professional learning. They note that professional preparation programs in education play an important role in the education system, and such programs provide a pathway for practitioners to enter their professions with the appropriate knowledge and skills. They developed a five-step Interactive Cases for School Leadership (ICSL) design process to structure the learning environment by incorporating Gordon's (2004) branching-narrative development model. These five steps involve story selection, story building, prototyping, production, and playtesting. The chapter presents findings from observations of two courses. The chapter authors present an example of how to implement game design as a scalable model for professional learning using common technologies. They also discuss how students used ICSL design to integrate theory and practice while producing playable and reusable learning games. The chap-

ter concludes with the remark that ICSL experience moves the students beyond the learning consequences of case study discussion.

Educational games are used to teach a variety of subject areas, including business, military training and policy analysis. Although we know about the motivational and engagement aspects of games, little is known about what elements of these games influence outcomes (Gredler, 2004; Wilson et al., 2009). In Chapter 3, “A Game-Based Learning Framework: Linking Game Design and Learning Outcomes,” van Staalduinen and de Freitas present a framework that explores the relationship between individual game elements and expected learning effects. The authors believe such a framework could assist game designers in constructing effective serious games and repurpose the existing game contents. When analyzing game design, they define the relationship between “games” and “play.” It is noted that “games are a subset of play” and “play is a subset of games.” They present three educational game design models: Amory and Seagram’s game object model, Kiili’s experiential game model, and de Freitas and Oliver’s four-dimensional framework. Based on these models, they propose a framework combining several aspects of games and learning. They present 25 game elements that can contribute to learning and propose a hybrid framework comprising four consolidated elements, described as learner, context, pedagogy, and representation.

In Chapter 4, Hirumi and Hall note that instructional game designers are facing the challenge of presenting information and facilitating learning that is both fun and engaging. It seems that when education and entertainment are combined, the power of both practices is often diluted. As such, “edutainment” fails to meet the standards of either high-quality education or high-quality entertainment. To minimize these effects, the authors suggest the use of certain techniques in educational game design. The chapter presents a dozen techniques for conveying content information and facilitating instruction that minimize the disruption of the game flow. Among them are the uses of personal and environmental devices, placing Easter eggs, cinematic cutscenes, and so on. For example, personal devices such as cell phones, PDAs, and e-mail can be used as mechanisms in gameplay to allow the players to remain connected to the game even though they are away from the computer or otherwise not playing the game. The program can be designed in such a way that the “agents” in the game program contact the player through these personal devices. The player is required to work in teams or groups to solve puzzle or overcome problems. Such continuous contact with the game world can immerse the players in the game, blurring the boundary between fictional game experience and real-world encounters.

## Enhancing Teaching and Learning with Video Games

Using digital games and virtual environments to enhance learning is the topic discussed by Green and McNeese in Chapter 5. According to them, the reasons for using games in learning are (1) different genres of games accommodate a variety of learning environments, (2) games provide challenges to the player, and (3) games are multimedia in nature and well-suited for today's students. The authors analyze the various genres of instructional games and classify them according to their features and the discipline areas in which the games can be used for learning. For example, health and physical education games focus on medical problems and how to stay fit with physical exercise. World history and geography games allow students to explore the world without leaving the classroom. Mathematics and science games introduce mathematical and scientific concepts and stimulate students to practice in exciting learning environments. While some drill-and-practice game programs can enhance students' vocabulary, technology games allow integration with other technological devices such as handheld computers, PDAs, and GPS. Another genre of video games is multiuser games—games that are played by more than one person at a time. Multiuser dungeon games (MUDs) and massively multiplayer online role-playing games (MMORPGs) allow gamers to play from different geographic locations. Often these online game environments are partitioned into sections or rooms, and players can only interact with other players in the same room they are assigned. The authors explore other game genres such as multiuser virtual environments (MUVEs), augmented reality (AR), and alternate reality games (ARGs). In conclusion, they note that despite the advantages, the uses of digital games are still limited in the classroom for a variety of reasons.

In Chapter 6, Jackson states a belief that video games can be a powerful tool in the classroom and that their motivational and pedagogical techniques have the potential to transform education. She describes how educators can learn from the principles of video games and apply these principles in the classroom to create an immersive and mastery-based discovery zone. Although some of the pedagogical principles in game design are not new, educators can learn from the innovative ways video games use these techniques. For example, educators talk about “zones of proximal development” (ZPD) that link to an individual student's capacity to learn. Most video games are designed to enable the player to set the optimum level he or she can handle. Video games often require a certain level of mastery before moving up to another level. While it would be time consuming and labor intensive to design curriculum at individual levels, educators can provide students with new learning experiences based

on the previous learning and allow them to progress at their own pace. It is often said that today's students are the gamer generation and gaming is part of their social life. Game players are able to take on new identities and perspectives and see themselves as active problem solvers (Gee, 2003). Citing de Castell and Jenson (2003), Jackson presents guidelines for successful games.

Motivating science education through games is the topic of discussion by Egert and Phelps in Chapter 7. They look closely at the game-playing process and the cognitive and affective domain models of learning. They examine how the steps involved in game playing support the classification of the learning models. The cognitive domain model is divided into six stages: knowledge, comprehension, application, analysis, synthesis, and evaluation. At the lowest level (knowledge), players are able to recognize and recall game objects, players, and basic interaction. At the highest level (evaluation), players are able to formulate which situation will provide the maximum advantage in game play. In the affective model of learning, five levels have been identified: receiving and attending, responding, valuing, organization, and characterization. At the level of receiving and attending, the player is presented with stimuli and, through repeated exposure, is able to differentiate the game characteristics. Egert and Phelps also note that players need to discover the rules of the game and the behavior of the objects and characters and how they interact with each other. They urge that games can be considered as collaborative learning environments and tools for inquiry. The authors conclude that game playing has potential for exploration of the sciences. They stress that scientific inquiry through interaction, collaborative and cooperative activities with like-minded individuals, and the use of complex simulations and visualization methodologies are distinct methods of inquiry into new models of science.

## **Approaches to Research on Game-Based Learning**

In Chapter 8, Travis and Young examine the development of games and how games were adapted to educational use in the early years. Some early games were based on behaviorist theory that results in stimulus-response reinforcement, but recent designs allow players to explore and discover new information. They note that game design and instructional design are not in sync. Following the list of nine principles for educational game design proposed by Warren et al. (2009), the authors analyze the game program *Operation KTHMA*. The game is set in ancient Greece and consists of alternate-reality and role-play components. The students are presented with important conflicts that need to be resolved. Throughout the chapter, the authors discuss

how the game design principles were implemented in *Operation KTHMA* and in teaching the works of Greek historians Herodotus and Thucydides.

Many educators voice that teachers, instructors, and trainers should learn the structure and language created by game designers to improve their teaching, learning, and training practices (Prensky, 2001; Shaffer et al., 2005; Gee, 2003). In Chapter 9, Squire analyzes *The Legend of Zelda*, a role-playing game (RPG), and discusses how such games can enhance learning. Most RPGs are immersive and provide complex scenarios for problem solving. Players need to align themselves with the fantasy world, and this requires orientation skills and the ability to memorize routes or pathways provided in the game. The players experience intensive involvement in the game-playing process and make connections with the imaginary characters in the fantasy world. Squire urges that the notion of taking on an alternative role has inherent learning benefits. At some stage, the player needs to discover, examine, and manipulate objects and resolve a puzzle that enables him or her to progress to the next level. For example, when puzzles are resolved, players are rewarded with access to hidden areas and gain powers or weapons they can use in confronting their enemies. This process allows the player to develop experiential and reflective cognition. The chapter concludes with remarks on a new simulated learning and gaming experience, situated in virtual settings but transferable to the real world.

Foster, Mishra, and Koehler (Chapter 10) analyze games with the use of the Technological Pedagogical Content Knowledge (TPACK) framework to determine the affordances of a game in learning. In particular, they closely examine *RollerCoaster Tycoon 3 (RCT3)*, a computer-based economic simulation strategy game for building amusement parks. The games present a different pedagogical stance from traditional direct or guided instructional practices (Foreman, 2004), and the attributes include the ability for contextualizing, individualizing, collaborating, and experiential learning. The TPACK framework provides a focused analysis of how technology integrates with content and pedagogy. The authors note that by knowing what content a game offers, the game analysis facilitates what to focus on for assessment of learning. The chapter presents detailed analysis of *RCT3*, which involves understanding of economic principles by using the TPACK framework and Playing Research Methodology (PRM). They conclude that *RCT3* combines knowledge of economics, social studies, and information and technology literacy skills. The players can also learn basic physics principles and mathematics while playing the game.

## Conclusion

The study of video games in education and its implications for teaching and learning are at a critical point. Kafai (2006) notes that educators have paid no real attention during the past several years to the promise and challenges of games for learning. She believes that the special role of games in contemporary children's culture creates an opportunity to study playing and making games for learning. If we are to teach the next generation of students effectively, video games may provide progressive and complex learning environments that will prepare them to face the challenges in their real lives.

The contributors to this volume have considered challenges and potentials in this area. This book sums up the innovative use of video games as learning resources and assesses the prospects of education through edutainment. It considers creative educational game design; the psychology of gaming; cognitive, motivational, and affective processes in games; game-based learning; integrating games in learning; and how video games can be used in education. This book will be a valuable compendium for those teachers, educators, game designers, and researchers who believe in gaming as a potentially useful and effective educational tool.

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