Chapter 2
Design and Implementation of an MMO:
Approaches to Support Inquiry Learning with Games

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ABSTRACT

Games can be a powerful tool for learning not only content knowledge but also skills and ways of thinking. In a classroom, the instructional design that goes into the implementation of a learning game is as important as the game itself. The Radix Endeavor is a multiplayer online game for inquiry-based STEM learning in which players explore mathematical and biological systems and use their understanding of those systems to solve problems in a virtual world. This chapter will present case studies of teachers implementing Radix in their classroom with a wide variety of formats, approaches, and learning goals. The authors will examine how key elements of an implementation impact student and teacher experiences and support problem-solving and inquiry learning. The chapter will explain the importance of implementation decisions, which will aid teachers and instructional designers integrating game-based learning into their own curriculum.

INTRODUCTION

Multiple research studies support the idea that games are powerful tools for learning (e.g. Clark, Tanner-Smith, Killingsworth, in press; Wouters et al, 2013; Squire, 2011; Steinkuehler & Duncan, 2008). Well-designed games provide scaffolding and motivation for a player to learn skills and apply knowledge in service of meeting specified goals. In addition, they create a safe space to fail, enabling players to take risks they might not take in other learning environments (Gee, 2003). However, how games are implemented in classrooms affects the learning and engagement outcomes

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and therefore their efficacy. The problem is that teachers do not always know how to integrate games into their teaching. For example, Fishman et al (2014), found that 33% of the teachers they surveyed as part of the A-Games Project claimed that not being sure how to integrate games into instruction was a barrier to using them. This is a difficult problem to solve because a game that works well in one context may not work well in another. As such, rather than simply identifying successful games for learning, the learning games community must also identify types of successful implementations for games.

Critiquing an implementation is no easy task given the wide array of factors within classrooms and schools. The ideal implementation model for a given game will depend on the goals of the game and how those goals can be met. Whether that model will be successful with a given group of students will depend on what the students are accustomed to and how they respond to changes in their teacher's approach. There are many options for an implementation of even one game, and how that is carried out can have a great effect on the experiences of both students and teachers. The experience of a game or any educational intervention, rather than simply exposure to it, is what ultimately leads to learning and growth. Therefore, implementation style is a key piece in planning any successful game-based learning unit.

It is pointless to try to designate a "best" implementation for learning games, or even one specific game, in the classroom. We can however catalog different types of implementation models and call attention to important considerations and how they may impact the overall experience. We can begin to identify approaches that do or don't support problem-solving and inquiry learning. In this chapter, the authors take the game *The Radix Endeavor* as an example. Radix is a multiplayer online game for inquiry-based STEM learning developed at the MIT Education Arcade. It has been implemented in a number of different ways as part of a pilot research study. After taking a close look at the goals of the game and the player experience, five case studies of Radix teachers will be presented. We will describe the ways in which these teachers implemented Radix in their classroom, along with how they made those decisions. Most importantly, each case study will show the types of interactions that occurred in the classroom – between teachers, students, and the game itself – as a way to characterize the experience for those involved. The case studies will highlight many of the ways that one game can be used, and present choices that led to either successful or frustrating classroom experiences. After considering each teacher's case study we will draw out common themes and identify important factors and the effects they have on teachers' and students' experiences as well as on learning outcomes. The goal of this chapter is to highlight the importance of each implementation-related decision that a teacher makes, as well as to gain a clearer picture of the types of approaches that support deep learning and inquiry activities. Doing this will aid teachers and instructional designers who are integrating game-based learning into their own curriculum.

BACKGROUND

Massively Multiplayer Online Games (MMOGs) are open worlds that encourage exploration and experimentation. Learning in these environments is often situated in problem spaces that involve hypothesizing, probing, observing, reflecting, and recycling these steps (Gee, 2003). Typically in a game of this genre, players find themselves in an unfamiliar virtual world but equipped with an array of tools and in-game abilities. They are presented with a series of tasks, often called quests, which set specific goals but don't tell the players exactly how to accomplish those goals. In order to progress, players must experiment with the tools at hand to see how they can interact with the world and its inhabitants. Through this process of