Chapter 5
The Gamification of Code:
Programming Through Play in Blended Classrooms

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ABSTRACT

Teaching an introductory web design course is already a blended environment. Students meet face-to-face, yet have access to a myriad of online resources, YouTube videos, blogs, and forums to support their learning. However, the challenges of learning to understand code can inhibit students and diminish their motivation to look for resources. The authors have attempted to address this issue by focusing on the use and design of games for learning to code, as well as providing video lecture material in combination with the traditional face-to-face learning environment. By using games and gamification in the course design, the authors have found that students are able not only to bridge their knowledge between modalities more smoothly, but that they understand that there are multiple ways to solve a problem and feel empowered to search for solutions in innovative ways.

INTRODUCTION

In some senses, computer programming itself is one of the best computer games of all. In the "computer programming game," there are obvious goals and it is easy to generate more" (Malone, 1980, pg.7).

Learning to code can be challenging as it requires students learn new ways of thinking and processing information. Challenges can be particularly strong in scenarios where students are at many levels to begin with, and may have different learning preferences and paces. There are currently many resources available to help students learn to code—including books, blogs, online video tutorials, online code camps

and competitions, forums where they can ask questions, and repositories of existing code they can use to start with. However, there are not as many resources that use games and playful approaches to teach code.

In our University level Creative Technologies Program, the beginning web design class is the first coding class students take. Many of them are scared of coding because it sounds like math; using abstract concepts to learn "code"—a hidden, mystical set of concepts that are not easily grasped. However, once students start diving in, the common response we see is that they "get it" much more quickly than they expected, are proud of themselves, and are motivated to explore more deeply. Performance throughout the course is quite high and students become excited about the content, but individual students grasp the course concepts at different paces.

We decided to explore the application of games to the learning process for a few reasons: multisensory approaches in playful situations have been shown to support the comprehension of abstract concepts (Katai and Toth, 2010); the combination of multisensory and playful situations, with online reference material, could support the variety of students' learning paces; and, these playful situations encourage collaborative and competitive learning.

Our current students prefer to learn through video tutorials, or following along with an instructor as opposed to reading resources. Although the approach of follow-along programming can encourage active learning, the nature of code can still be difficult and relies heavily on concepts, memorization, and practice. We have found that the logic and procedures of coding are similar to those in gameplay and creative processes, and can be made transferable if the points are created, especially across mediums. We wondered how students would bridge the two forms if they could map the structure of code from one of play to one of learning. To leverage this as a blended learning classroom, we developed multiple games over a variety of platforms (traditional and online) to support a gameful way of teaching code, in addition to using existing games. Some games are played individually, some in small groups, and some in large groups to include a variety of approaches.

We used several games for teaching, including Simon Says with HTML, a CSS Scavenger Hunt, a computer pathfinding game, and Jeopardy. This chapter will highlight the games we designed for teaching specific concepts and the existing games we found that support relevant concepts. We will discuss our assessment of using the games across in-person and online platforms, in both individual and group situations, and how students felt these learning opportunities supported their experience.

BACKGROUND

Blended Learning as a Multisensory Process

With the rise of accessible technology and students coming in to the classroom as digital natives, blended learning has been emerging as a teaching strategy that supports both engagement and efficiency (Bonk and Graham, 2006). Some approaches focus on the effective use of blended learning for corporate job training situations (e.g., flight simulations) (Bonk and Graham, 2006), but term describes meaningfully constructed learning environments that leverage both face-to-face and technological options (Katai and Toth, 2010). Blended learning is noted as a way to combine the best of face-to-face and online learning (Bourne and Seaman, 2005), and also emphasizing that a thoughtful fusion is important to provide more engaging learning experiences (Garrison and Vaughan, 2008). In higher education, interaction and collaboration-based learning experiences are noted as supporting more complex knowledge acqui-

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