Pedagogy and Curriculum for Video Game Programming Using Scratch

Cameron L. Fadjo, JeeHye Hong, Chun-Hao Chang, Ellen Geist, Jeong-han Lee, John B. Black
Institute for Learning Technologies, Teachers College, Columbia University, New York, NY
Email: {clf2110, jh2896, che2137, eag2147, jl747, jbb21}@columbia.edu

Abstract: Programming a video game involves coordinating a multitude of disciplines and skills. In this presentation, researchers from the Institute for Learning Technologies at Teachers College, Columbia University will present an interdisciplinary curriculum for teaching video game programming to elementary school students using Scratch. Utilizing a constructionist learning approach, students design, develop, and program their own individual visual novel, sports or platform game. We will discuss curricular alignment with core content areas and outline a topic sequence that was used for an after school program with urban 5th grade students during the 2009-2010 academic year. Based on previous research using video game construction as pedagogy and work by Fadjo and colleagues, we will showcase the academic aspects of our interdisciplinary video game programming curriculum that guides young students through the design and development process while integrating core curricular topics, such as coordinate geometry and narrative structure, into the creative process.

Overview

Programming a video game involves coordinating a multitude of disciplines and skills. During the development process a game designer must coordinate design, development and programming requirements simultaneously as the project grows from a simple idea into a complex system of coordinated tasks and behaviors. Similarly, the instructor who is charged with the task is often caught ‘off guard’ as the scale and scope of the seemingly simple project of making a video game becomes a complex and challenging topic to teach. In this presentation, researchers from the Institute for Learning Technologies at Teachers College, Columbia University will present an interdisciplinary curriculum for teaching video game programming to elementary school students using Scratch.

Since the spring of 2008, the iWorld research team has been teaching elementary and middle school students in NYC how to make video games in Scratch. Previous research on video game construction as pedagogy has been used in the instruction of such areas as 3D virtual worlds (Barab, Hay, Barnett, Squire, 2001), teaching writing (Robison, 2008), mathematics (Harel & Papert, 1990; Kafai, 1995; Fadjo, Hallman, Harris, & Black, 2009b) and science (Li, 2009, 2010). Based on this work, our current research examines both the construction of video games as pedagogy in the teaching of Cartesian coordinates (Fadjo et al, 2009b) and conditional logic (Fadjo, Shin, Lu, Chan, & Black, 2008; Chan, Fadjo, Lu, Shin, 2008; Fadjo, Lu, & Black, 2009a; Fadjo, Hong, Chang, Geist, & Black, 2010). Additionally, we have explored how individuals incorporate urban cultural artifacts (Hong, Fadjo, Chang, & Black, 2010) into an individual video game artifact. From our experience conducting these studies, we have developed a comprehensive curriculum that provides students with adequate instruction on varied topics such as prototyping, narrative structure, conditional sequences, numerical range, and event-driven programming while they are creating their own individual video games.

In our presentation we will discuss how to design an after school program that integrates mathematics, language arts, music, and digital arts with a video game design, development and programming. Utilizing a constructionist learning approach, students design, develop, and program their own individual visual novel, sports or platform game. We will outline the different types of game formats and how they are appropriately designed to support the instruction of video game programming to elementary school students while continuously emphasizing core academic areas which are the foundation of the formal instruction environment. Similarly, we will discuss curricular alignment with core content areas and outline the topic sequence that was used for an after school program with urban 5th grade students during the 2009-2010 academic year. We will also showcase the results of our interdisciplinary video game programming curriculum and explain how each step guides young students through the design and development process while integrating core curricular topics, such as coordinate geometry and narrative structure, into the creative process.
References


