Chapter 6

Strategies to Teach Game Development Across Age Groups

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**ABSTRACT**

The process of game development can be used as a highly motivating learning experience geared to the teaching and learning of a variety of skills in students of varying ages. This article presents a description of a conceptual framework for teaching and learning based on game creation, including pedagogical foundations, a model of instruction for game development, age-related issues relative to learning tasks, and the basic aspects of game development. The authors compare the expectations for types of concepts and technologies employed with middle and high school students versus those employed with college-level students in game development. Projects that illustrate these differences are then presented, and the article closes with a summary and conclusions.

**1. INTRODUCTION**

There has been considerable research on the use of computer and video game development as an engaging medium to teach a range of concepts to students in a variety of disciplines. In this approach, game development is used as the vehicle through which students learn other subjects such as programming, math, and physics, rather than as the ultimate goal in itself. As technology has matured, a wider group of individuals have had the opportunity to create their own computer-based games. With the advent of PC-based games, many novices, especially students, have attempted to
modify or develop games (Youngblood, 2007). Skills used in game development are beneficial, as they promote use of higher-order thinking skills (Prayaga & Coffey, 2008).

In the years after 2000 in which considerable declines in enrollment in computer science programs took place, many universities and colleges have created degrees or minors in game development that cater to student demand for game-related curricula. Computer Science programs, at the same time, have used courses in game development to increase student enrollment. In addition, student interest at earlier ages has led to the creation of Career Academies and courses at the high school level that focus on game design and development.

Existing research however, does not provide a framework that can be used to teach game programming across age groups and education levels. Such a framework to teach game programming to students of different ages is the subject of this article. The framework includes a motivational model by Keller (1989) and an instructional model proposed by Cunningham, Hansman, Laxer, and Shi (2004) for graphics instruction. The latter model has been adapted for game programming by Prayaga (2005). Additionally a study by the authors in teaching game development to different age groups, students from middle school and high school (MS/HS), and students at the university level, is presented.

The remainder of this article contains a review of literature pertaining to the teaching and learning of game programming across age groups, followed by a description of the framework for teaching game development to students of different ages. The framework includes the pedagogical foundations for the framework, a model of instruction, and some issues pertaining to adaptation of the model to students of different maturity levels. Several typical game projects for students of various ages are described. A summary of expectations for these categories of students are presented, followed by conclusions drawn from the work. The next section contains a description of relevant literature.

2. LITERATURE ON GAME DEVELOPMENT ACROSS AGE GROUPS

It is clear that computer games provide a highly motivating medium for teaching and learning. Jones (2003) and Oblinger (2004) indicate that nearly 60% of students in the age group of six and older play computer games. Although games have been used as a source of entertainment, they might also be used in a variety of ways for serious purposes such as training employees, developing strategic and psychometric skills, providing education, and building social skills, in an umbrella description called “serious games” (Whatley, 2005).

The idea of using games for instruction is emerging as an effective, efficient and motivating strategy (Jenkins & Hinrichs, 2003). Batson and Feinberg (2006) observed that in addition to improving students’ academic performance, the gaming context also improved student attitudes and social interaction skills. In addition, the gaming environment is beneficial to the unmotivated failing students (Dede, 2005). Dede observed that students who are distracted and cannot concentrate on classroom proceedings can be highly focused and motivated to complete a task when engaged in games.

Game development is one pedagogical application of games. Game development is inherently multi-disciplinary. While it is a challenge to develop curricula that integrate art, design, and technology including programming (Baer, 2005), game development is one of the best mediums for doing so. Furthermore, game development both encourages and requires collaboration, and it tends to break down disciplinary walls (Masuch & Rueger 2005; McCallum et al., 2004).

Essential aspects of game development include graphics development, collision detection and response, creation of rules, mapping out choices, creating sound effects, coding, developing narration, and game play. (Bateman & Boon, 2005;