Chapter 27
Mathematics Gaming in Early Childhood: Describing Teacher Moves for Effective and Appropriate Implementation

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ABSTRACT

Use of technology and video games are highlighted as important mathematical practices as part of the Common Core State Standards (2010). However, research around technology use in early childhood classrooms, particularly the use of video games that target specific content, is sparse. This chapter briefly reviews the existing literature around these topics. Moreover, it describes the moves an expert teacher incorporates into her practice to effectively and appropriately integrate instructional video games as a tool for learning mathematics in a kindergarten classroom. Results of this case study indicate that when integrated appropriately, video games and the use of Interactive White Boards (IWB) can lead to an increase in children’s motivation and engagement with learning mathematics.

BACKGROUND

Since the mid-1960s, research has supported the often self-evident decree that the quality of teachers plays a significant role in student learning (Coleman et al., 1966; Goldhaber, 2008). Although the definition of what it means to be a quality teacher varies, one that is consistently considered is a teacher’s instructional practices (e.g.: Darling-Hammond, 2002; Rowan, Correnti, & Miller, 2002; Stronge, Ward, Tucker, & Hindman, 2008). In other words, the actions and decisions teachers take in the classroom affect student learning. Large-scale research indicates that a single teacher practice is not sufficient but that combinations of practices can lead to significant differences in student achievement and engagement (Chapin,
O’Connor, & Anderson, 2009; Rowan, Correnti, & Miller, 2002). Rowan, Correnti, & Miller (2002) hypothesize that the key to improving the impact of U.S. schools on student learning “lies in finding situations in which many instructionally desirable conditions co-exist in classrooms and in situations where students experience such powerful combinations of instructional practice across their careers in school” (p. 23). Teacher moves, which we define as a specified set of instructional actions that teachers perform as part of their practice, therefore have the power to transform student learning. Although some teacher moves have been widely studied, such as those around promoting classroom discussions, (Chapin, O’Connor, & Anderson, 2009), teacher moves around the implementation of content-based video games in early childhood settings have not been studied in detail.

Due to recent technological advances, current research in education has begun to focus on the impact of technology on young children who grow up as digital natives (Zevenbergen, 2007). Since not all children have access to technology at home, a technology gap occurs between the haves and the have-nots beginning in early childhood (Gutnick, Robb, Takeuchi & Kotler, 2010; Warschauer & Matuchniak, 2010). Although somewhat controversial, research indicates that integrating technology use in early childhood settings allows all students to have access and experience with technology through the use of games and IWB with beneficial results (Gutnick, Robb, Takeuchi & Kotler, 2010; Jang & Tsai, 2011). With the rise of touch screen technology and the accessibility that it offers for users to navigate through programs, researchers are looking to see how such innovations might be used in early childhood classrooms (Northrop & Killeen, 2013). Moreover, this research has become more relevant in light of the Common Core State Standards which state that appropriate tool use, such as technology, is an important mathematical practice as early as kindergarten (2010).

One specific line of research investigates the effects of video games as an instructional tool on motivation and efficacy in young children (Gee, 2003). The available research supports the use of video games created for the purpose of supporting certain learning criteria and demonstrates how this can help promote positive learning experiences (Gee, 2003; Zevenbergen, 2007). However, there is very little research addressing the effect of technology on mathematics-related outcomes through the use of games in early childhood settings. Similarly, there is sparse research to explain what early childhood teachers should do to appropriately and effectively integrate video games into their classroom practice. This chapter addresses this gap in the literature by describing one kindergarten teacher’s effective use of video games and use of IWB to increase her students’ engagement and efficacy with mathematics. It begins to answer the question “how can early childhood teachers effectively model the appropriate use of technology?” as recommended by the Common Core State Standards for Mathematical Practice.

OVERVIEW OF THE CASE STUDY

Mrs. Sally Matthew has been teaching for 12 years in an urban school setting. She has been teaching kindergarten for the past nine years. We use the term children to refer to the kindergarteners in her class. At the time of this study, Mrs. Matthew has been using online instructional games produced by the Public Broadcasting System to supplement her mathematics curriculum for two years as part of a research intervention¹. In addition to the games, she has been provided with researcher-developed tips for integrating online instructional games into her practice through the use of an IWB. The teaching tips were purposefully aligned with both the curriculum and practice standards explicated by the Common Core State Standards.
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