Chapter 22
Puttering, Tinkering, Building, and Making:
A Constructionist Approach to Online Instructional Simulation Games

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ABSTRACT

Instructional simulation games are models of the real world that allow students to interact with events and objects that are normally inaccessible within a classroom setting. Yet, simply using an instructional simulation ignores powerful learning opportunities. Papert advocates going beyond simply using models. He promotes a fundamental change in how children learn through his theory of constructionism. Instead of constructivism with a "v," Papert advocates a theory of learning called constructionism with an "n." Constructionism aligns with constructivist theory with learners actively constructing knowledge from their experiences. But constructionism adds that new ideas are more likely to emerge when learners are actively engaged in designing or building an artifact or physical model that can be reflected upon and shared with others. Papert's theoretical approach to learning is relevant to teacher education and should be applied to instruction via interactive, multimedia, and computer-aided simulations.

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INTRODUCTION

The prevailing assumption in education is that more content knowledge is better, which is based on the positivist assumption that the knowledge a learner must know is clearly identified (Rieber, 1996). The pressure to have students perform well on high-stakes tests continue to proliferate the tell and test methods of instruction (Federation of American Scientists, 2006). This traditional pedagogy naturally propagates students who are disengaged, disinterested, and discouraged to think at higher levels. The transmission of knowledge approach is contradictory to higher order thinking because it ignores the constructive nature of knowledge and fails to encourage rational questioning of evidence to enhance student understanding of the world. Constructivism provides a counter approach to the transmission of knowledge with simulation games offering a particular pedagogical toolset to promote higher levels of thinking. Teacher educators as gatekeepers have an important opportunity and obligation to share the research, theory, and practice regarding simulation games. In particular, this chapter details the complementary nature of simulations and constructivist learning, but greater theoretical emphasis is placed on Papert's (1991) theory of "constructionism" and the potential implications of a constructionist approach for teacher education and instruction that involves simulation games.

Papert (1991) describes how computers provide students and teachers with an excellent platform for learning. Used effectively, computers allow students and teachers to move about in a nearly endless virtual space where they can create meaning through their virtual interactions. Instruction utilizing digital mediums affords students the opportunity to manipulate objects, events, or processes and provides learners an opportunity to learn technology by doing technology. Papert (1998) writes that students disengage from school not because it is too hard but because they believe school is boring. According to Papert (1991), children enjoy computer games because they are challenging and because computer games force the child to engage in meaningful learning experiences. The point, according to Papert (1991), is that students are not afraid of challenges, but they hate boring work. Papert's (1991, 1998) assertions are echoed by Resnick (2007) who writes that digital mediums provide students with an instructional environment that is more dynamic and interactive than the traditional classroom allowing students to create powerful and lasting meanings out of their learning. However, learning is very complex and not all computer games are meaningful and not all traditional education is boring. According to educational theorists like Resnick (2007) and Papert (1991), simulation games provide teachers and students with the opportunity to engage in the meaningful creation of knowledge in the classroom that is authentic and lasting.

THEORETICAL BACKGROUND

Simulations as Authentic Learning Experiences

For nearly a century, education reformers have advocated for the immersion of students in authentic learning experiences, where content and skills are embedded in real-world contexts (Dewey, 1938). Constructivist teaching and learning strategies seek to shift the role of the student from passive recipient of content to active participant in constructing knowledge. Simulations model real world events or processes and provide students with authentic learning experiences. However, reviews of a half-century of research on the ability of simulations to produce intellectual gains reveal inconsistent findings and inconclusive data (Clegg, 1991; Feinberg, 2011). Simply promoting active learning is not the solution. For example, "Even highly active students can produce work that is intellectually shallow and weak" (Newmann, Marks, & Gamoran, 1996, p. 281). To be accepted