Chapter 6

STEM Inquiry Through INPLACE Mobile Games

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ABSTRACT

To make STEM learning meaningful, students need to feel the relevance and authenticity of the learning activity. Games—particularly mobile games—offer a unique opportunity for students to be immersed in collaborative STEM inquiry. INPLACE mobile games combine the best practices of what the games and learning field knows about using the affordances of mobile devices to engage students, to support collaboration, and to promote authentic practice in a discipline. INPLACE is an acronym that stands for Interdependent, Networked, Participatory Learning, Augmented, Collaborative Experience. School Scene Investigators is a game series designed according to the INPLACE framework; students playing it demonstrated higher engagement and scientific inquiry than students in a control activity. Ultimately, INPLACE provides a design framework that teachers and researchers can use for building mobile games that heightens engagement and increases inquiry-based learning.

INTRODUCTION

In the past century, we have seen a societal paradigm shift that has rendered the traditional educational system obsolete. In the Industrial Age, leadership was autocratic and factory workers were compliant (Reigeluth, 1994). The factory model of education was sufficient at providing students with enough knowledge and skills to live out full lives as factory workers. However, with the onset of the Information
Age, the workplace is evolving (Kanter, 2001). Mass collaboration is changing how business is conducted, leadership is shared, competitive principles include openness and sharing, and knowledge workers expect a participatory democracy (Tapscott & Williams, 2006). As discussed by Thomas and Brown (2011), the world is changing—and in accordance, so is knowledge. We need a system that prepares students for working in the Information Age, not the Industrial Age (Reigeluth, 1994).

Cultivating human resources is particularly urgent in the fields of science and technology (National Research Council [NRC], 2007). Low-level skill sets will not solve critical scientific issues such as climate change and the energy crisis; the country’s most pressing problems need innovative problem solvers (Gee, 2010). According to the report published by the NRC (2012), “Science is fundamentally a social enterprise, and scientific knowledge advances through collaboration and in the context of a social system with well-developed norms” (p. 27). The ability to collaboratively participate in inquiry-based problem solving is of the utmost importance in scientific careers. Unfortunately, students are not prepared for such collaborative work because school environments place too much emphasis on individual work (Bransford, Brown, & Cocking, 2000) and standardized testing (Ravitch, 2011).

The new digital medium that warrants the most educational potential at this moment is mobile technology, because we are at a tipping point. For years, mobile phones have been a vital part of teenagers’ social lives (Katz, 2006); young people live in a mobile world, and their devices connect them to it. Mobile technology has had time to incubate outside the K-12 system; now, it is ready to be a “disruptive innovation” (Christensen, Horn, & Johnson, 2008). More and more schools are inviting students to bring your own device (Norris & Soloway, 2011). We need to create and enact curriculum activities that ensure students will garner important skills and benefit from the unique affordances of mobile technology—no more business as usual.

The body of research is growing that demonstrates how mobile technology can promote the types of skills desperately needed by those entering the scientific workforce. Research supports the effectiveness of mobile activities to scaffold collaborative problem solving (Bressler & Bodzin, 2013; Dunleavy, Dede, & Mitchell, 2009; Squire & Jan, 2007). Mobile devices also afford portability, making them effective tools for situated learning (Dede, 2009; Rosenbaum, Klopfer, & Perry, 2007) and science inquiry (Chang, Chen, & Hsu, 2011; Looi et al., 2011). Integrating mobile technologies into the classroom holds promise, but to be successful, it requires rethinking “business as usual” modes of instruction because mobile technologies can support collaborative learning and active, inquiry-based learning.
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