

Chapter 15

Integrating iPads in Middle School Science Instruction: A Case Study

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ABSTRACT

With the appropriate support and experience, iPads and other mobile devices can be used for collaborative scientific inquiry moving beyond individual skill practice and assessment appropriations. The mobility and access the iPad provides opens up the classroom for innovative instructional practices, allowing students to physically explore their world, though the devices themselves are not enough to guarantee student engagement and learning. The Gradual Increase of Responsibility (GIR) model for teacher coaching (Collet, 2008) is used as the instructional coaching model of professional development. Through GIR, coaches model, make recommendations, ask probing questions, and affirm teachers' decisions over the course of several months to increase the teacher's independence in using technology to transform instruction for students. This study aims to examine how middle grades teachers' integration of one-to-one technology moves beyond drill and practice and using apps as extension activities.

INTRODUCTION

Portable, handheld devices are commonplace in today's modern society. With the majority of adults in the U.S. owning smart phones, our use of technology on a daily basis has grown. Everyday use of technology has allowed for mobile devices, such as the iPad, to seep into the classroom. The age of the single computer lab for an entire school is slowly fading and in its place are ubiquitous mobile devices for each student. The iPad, and other such mobile devices, have been used in classrooms for a variety of activities, such as note taking, games, simulations, formative assessment purposes, as well as for student research (Alvarez, Alarcon, & Nussbaum, 2011). However, the possibilities for the use of mobile devices,

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like the iPad, are endless when teachers and students are provided support and guidance for developing technology enabled learning environments.

Mobile devices, such as the iPad, offer the potential to bridge the gap between school-specific tools (i.e. calculators) and everyday tools (Looi, et al., 2009) that can be used to enhance learning in the classroom. However, teachers' limited experience with technology integration and instances of one-time professional development encourage technology use to be centered on reinforcement of previously taught disciplinary content. As a result, integration resembles drill and practice rather than the integration of technology to create an inquiry-learning environment (Minshew & Anderson, 2015). This chapter will examine three middle grades science teachers' experiences in the integration of one-to-one technology (iPads) into their instructional design. The teachers participated in a coaching or modeling professional development technique that took place at their school, working with our research team for an academic year to design, construct, and implement inquiry-focused science curricular units. This work contributes to a developing body of research that examines the impact of integrating technology into science instructional practices through the use of TPACK and coaching models. Additionally, it allows for the examination of how targeted professional development and coaching helps (or does not help) teachers integrate technology into their core disciplinary instructional design and implementation. In these case studies, we examine the integration of iPads in instructional design.

BACKGROUND

Mobile Devices and Inquiry Science

The mobility and access the iPad provides opens up the classroom for new and innovative instructional practices, allowing students to physically explore their world, and share these experiences with others (Squire & Klopfer, 2007). However, mobile devices themselves are not enough to guarantee student engagement and learning (Prieto, et al., 2011). Looi and colleagues (2009) found that placing the technology into the hands of students was not enough to ensure student learning; teacher lesson design and their support during implementation were critical components needed in order to achieve the goal of student learning. These findings suggest that in order for mobile devices to reach their full potential teachers need to develop engaging and active learning opportunities for students that purposefully integrate and orchestrate the iPad into instruction.

How teachers chose to integrate iPads and other mobile devices into their classroom instruction also impacts student learning. Sharples and Pea (2014) note that mobile technology in the classroom should be conceived around the learner's mobility rather than the technology and that a goal for utilizing mobile technology in the classroom is seamless learning. Meaning that what were once conceived as distinct, independent learning experiences can be bound together to create a continuous learning environment (Sharples & Pea, 2014). Looi, Zhang, Chen, Seow, Chia, Norris, and Soloway (2011) support this idea when they describe mobile devices as learning "hubs" that provide students and teachers the ability to learn on the move and across contexts. These unique capabilities of iPads and other mobile devices require that teachers become learning orchestrators and leave direct instruction behind.

Teaching science as inquiry while utilizing technology is not an easy feat. Gusey & Roehrig (2009) found that it was necessary to provide the teachers sustained, follow-up assistance while designing and implementing their technology-enriched science lessons. They also note that providing teachers time to

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