Chapter 26
New Literacy Implementation: The Impact of Professional Development on Middle School Student Science Learning

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ABSTRACT

With advancing technology, "literacy" evolves to include new forms of literacy made possible by digital technologies. "New literacy" refers to using technology to research, locate, evaluate, synthesize and communication information. The purpose of the study is to develop a framework to guide science teachers' new literacy practices, and examine the impact of new literacy approach on students' science learning and new literacy skills. The authors worked with 25 middle school science teachers through a two-year professional development (PD), and followed their implementation to investigate the PD impact on their classroom practices and students' learning outcomes. The authors adopted mixed-methods to examine change in teachers' new literacy practices, students' science learning outcomes, and students' confidence in new literacy skills. The study results showed increases in teachers' frequency and types of new literacy practices, positive impact on students' science learning and confidence in new literacy skills. Factors affecting teachers' new literacy practice are also reported.

INTRODUCTION

Literacy skills are critical to build knowledge in science. Advancing technology has redefined "literacy" to include new forms of literacy made possible by digital technologies. "New literacy" refers to using technology to research, locate, evaluate, synthesize, and communicate information. The definition of literacy has evolved to include a set of skills broader than reading, writing, and comprehending (Leu et

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al., 2004). These new forms of literacy are required to succeed in the 21st-century college and workforce. It is imperative to investigate how teachers are prepared to strengthen students' new literacy skills to facilitate their learning in science. The purpose of the paper is to report our effort to provide professional development to middle-school science teachers and prepare them to integrate technology into their classroom through the new literacy framework.

Need for New Literacy Practices in Science Instruction

Sophisticated literacy skill is the foundation of learning science content and conducting scientific practices. Students need to understand scientific vocabularies and comprehend and analyze information, in order to form research questions; collect, analyze and interpret data; form explanations; and communicate results (Conley, 2008; Norris & Phillips, 2002; Osborne & Wellington, 2001). However, literacy strategies are often treated as separately from content learning (Moje et.al, 2004). Traditional content literacy usually decontextualizes them from the content textbook and often introduces and practices them in non-content text or in isolated instances. Students see a strategy introduced in one content area instead of seeing how that strategy travels from class to class (Shanahan & Shanahan, 2008). Effective integration of literacy strategies in science classrooms are scarce (Greenleaf et al., 2010; Romance & Vitale, 2008). Attempts to study new literacy practices in the science classrooms are even scarcer.

New technologies have expanded to include a broader set of literacy skills. "New literacies," are new forms of reading and writing from new technologies for literacy that redefine what it means to become literate in today's digital world (Street, 1993, 1997, 2003; Leu, 2004, 2007). These evolving information and communication technologies (ICTs) include Internet use, search engines, wikis, blogs, email, gaming, and social media. They have become important new texts for literacy in our daily function, including learning, leisure, and work. To be considered literate in the information age, one needs the ability to read, write, and communicate in "multimodal" texts. This profound change in the nature of literacy has affected ways we comprehend and communicate, particularly through the Internet, ICTs, and mobile devices. These tools allow us to access to information faster than ever in rich, complexly networked e-learning environments. Leu et al. (2004) stressed five essential skills one needs to process the over-abundance of the electronic information, organize data, and achieve great productivity: (1) identifying important questions, (2) locating information, (3) evaluating information, (4) synthesizing information, and (5) communicating information to others. These five skills represent integrative reading processes and transaction with multimodal texts to communicate learned data (Leu et al., 2007).

Though crucial, the evidence of the impact of new literacy practices on learning is scarce. Most new literacy studies focus on reading instruction and rarely subject areas. Leu, Castek, Hartman, Coiro, & Henry (2005) worked with one science teacher and 89 of her students to investigate how the intensity of Internet integration affects students' science learning. The results indicated that even though students in the high-intensity Internet integration group performed better on the online reading comprehension exam; they did not learn content as well as those who received low or no Internet integration activities. This challenges the assumption that "digital natives" (Prensky, 2001) are more technology-savvy than "digital immigrants" (such as their teachers) (Authors, 2014; Bennett, Maton & Kervin, 2008). School students maybe skilled at using technology for entertainment and communication, but rarely meaningfully to learn inside of schools (Authors, 2014; Kolikant, 2012). Schools should adopt the pedagogical