Chapter 31
Adaptable Learning Theory Framework for Technology-Enhanced Learning

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ABSTRACT

The sheer volume of technological innovations with educational potential along with the myriad of instructional theories and models present quite the challenge for educators. A contemporary framework is needed to connect these components with learning theory and to ultimately serve as a guide to educators grappling with how to align the interrelated components of effective instruction when using educational technologies. The objective of this chapter is to present a viable contemporary framework to fulfill this need. The Adaptable Learning Theory Framework for Technology Enhanced Learning (AF-TEL) provides a framework based on the cognitive presence, social presence, and teaching presence tenets of the Community of Inquiry model (Garrison, Anderson, & Archer, 2003) to achieve desired educational outcomes. Professional Development for STEM Teachers using Discovery Labs (PDSTDL) is a format of teacher professional development that integrates AF-TEL to address the critical need of preparing effective STEM teachers.

INTRODUCTION

In an increasingly connected technological world, theoretical approaches to education and the tools used to educate are continually changing. Learners expect to use technology in education (Sandars, 2012). The use of technology, however, "should not occur without thinking about how people learn best" (Jackson, Gaudet, McDaniel, & Bramer, 2009, p. 71). The sheer volume of technological innovations with educational potential along with the myriad of instructional theories and models present quite the challenge for educators. It can be daunting and confusing to align theories, technologies, content, learner characteristics, instructional strategies, and goals to effectively and efficiently

bring about desirable learning outcomes. Reference to technology simply as a tool "denies the professional responsibility to use available tools both effectively and efficiently" (Anderson & Dron, 2012, para. 4).

Linking pedagogy and technology for information and communication technologies (ICT) in education, Richards (2006) writes "…too often in practice the actual use of ICTs reflects the very 'transmission' and 'reproduction' paradigms of teacher-centered face-to-face learning challenged by the new theories of pedagogy which emphasize the learner-centered implications of new learning technologies" (p. 240). Richards indicated three convergent principles of design and development for linking pedagogy and technology: "the organization of information, the facility for communication, and some convergent mode of user interaction" (p. 244).

The issue this chapter addresses is the challenge of effective technology integration for enhanced learning (Volungeviciene, Teresevicience, & Tait, 2014). Integration of technology in educational environments has revealed mixed results regarding student academic achievement (Means, 2010). The issue may be more pedagogical than technological; "knowing *why* and *how* to use technologies *effectively* in practice is a complex matter" (Price & Kirkwood, 2010, p. 773). A contemporary framework is needed to connect technology components with learning theory and to ultimately serve as a guide to educators grappling with how to align the interrelated components of effective instruction when using educational technologies (Johnson, 2014). The objective of this chapter is to present a viable contemporary framework to fulfill this need. The Adaptable Learning Theory Framework for Technology Enhanced Learning (AF-TEL) provides a framework based on the cognitive presence, social presence, and teaching presence tenets of the Community of Inquiry model (Garrison, Anderson, & Archer, 2003) to achieve desired educational outcomes.

BACKGROUND

Behaviorism, cognitivism, and constructivism are three predominant learning theories that have guided education and instructional development (Ertmer & Newby, 2013; Johnson, 2014; Schunk, 2011). Learning through the lens of behaviorism occurs when an appropriate observable performance of a behavior occurs as a response to an associated stimulus. The desired behavior is further strengthened through reinforcement of the stimulus-response (Schunk, 2011). Interest in the mental activities associated with information acquisition, organization, storage, and retrieval emerged as a focus for educators and psychologists in the 1950s resulting in a shift to cognitivism (Ertmer & Newby, 2013) . Both behaviorism and cognitivism are based on an objective view of reality where a real word exists independent of the learner. Constructivism contends that learning occurs through interpretations of personal experiences of the real world. Knowledge is not seen as independent of the learner; instead learners "*create* meaning as opposed to *acquiring* it" (Ertmer & Newby, 2013, p. 55).

Effective and applicable instructional theories and instructional strategies based on these learning theories are necessary with the advent of the Internet, social media, distance learning, open source learning, cloud storage, multimedia, artificial intelligence, virtual reality, video conferencing, 3D printing, robotics, and wearable computers. While education needs to build upon and integrate past influential theories, reformed instruction must also embrace theories and models of the digital age, an age characterized by connectivity, collaboration, short knowledge half-life, anytime access to stored information, rapidly emerging technologies, and the need for higher order competencies for interpreting, synthesizing, and creating (Al-Khatib, 2009; Frank, 2005; Jackson et al., 2009; Sharkey, 2013; Siemens, 2004).

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