

Chapter 15

The Future of Assessment for Personalized Naturalistic Learning

Lauren Reinerman-Jones

University of Central Florida, Institute for Simulation and Training, USA

Martin S. Goodwin

University of Central Florida, Institute for Simulation and Training, USA

Benjamin Goldberg

U.S. Army Research Laboratory, USA

ABSTRACT

Education in general has transcended boundaries of a physical classroom and given rise to the phenomenon of ubiquitous learning (u-learning) and the ability to access knowledge on-demand. To understand the effect of learning as it is evolving, the present chapter puts forth a framework of formal, non-formal, and informal virtual learning environments discussed on the basis of nine components. As the learning environment changes, the role of assessment within this new learning paradigm must be reconsidered. The chapter concludes with a discussion of integrating assessment into intelligent tutoring systems and the importance of designing such systems as open architecture for accommodation of a variety of domains.

INTRODUCTION

The virtual learning landscape is changing. Emerging technologies and an increasing focus on learner-centric instructional practices are driving the need for more personalized, engaging, and flexible educational interactions. Learning environments are a large part of this changing landscape. Virtual learning is no longer constrained to desktop and laptop computers and learning management systems. The proliferation of smartphones, tablets, and other devices allows virtual learning experiences to be increasingly manifested through social networks, specialty apps, and online collaborative tools. Learning, and education in general, has transcended other boundaries as well, giving rise to the phenomenon of ubiquitous learning (u-learning) and the growing realization that the ability to access knowledge on-

DOI: 10.4018/978-1-5225-2182-2.ch015

demand transforms education into a continuous resource that is available anytime and anywhere a need for learning exists (Yahya, Ahmad, & Jalil, 2010).

This shift toward learner-centrism, the expansion of education beyond the virtual classroom, and the continuous, long-term nature of learning empowers individuals with greater control over the learning process, while simultaneously increasing their personal responsibility for successful educational outcomes. The role of assessment within this new learning paradigm must be reconsidered, particularly with respect to the influence of learner self-regulation and metacognition on assessment metrics and frameworks. This involves pedagogical practices and assessment techniques that focus on higher-order cognitive functions that empower individuals to learn and solve problems on their own. Indeed, the *Roadmap for Education Technology* (Wolff, 2010), which was commissioned to articulate a vision for educational technology through the year 2030, identifies assessing student learning as one of the grand challenges in education. Further, the National Education Technology Plan (U.S. Department of Education, 2016) calls for the integration of learning and assessment systems to facilitate more effective formative assessment tools to support personalized learning. This should involve the incorporation of evidence-centered design principles that associate observable procedures with performance outcomes for better inferences on knowledge and skill levels.

This chapter addresses the future of assessment for personalized naturalistic learning. It begins by establishing the parameters for performing effective learning assessments by exploring the concepts of modern virtual learning and the environments in which learning occurs. Building on this foundation, the current state of learning assessment is examined and important gaps are identified and analyzed. Next, the types of assessments that support personalized learning are described with a specific focus on closed-loop systems that use assessment outcomes to inform actionable feedback interactions. Finally, the future of learning assessment is contextualized through a description of personalized learning systems that operate on a synergism between formative data inputs and learner self-regulation.

AN UPDATED PERSPECTIVE OF VIRTUAL LEARNING

There are many nuanced definitions of learning. For the purposes of this chapter, learning is defined simply as the process by which new knowledge and skills are acquired. It follows, then, that virtual learning is the process of acquiring new knowledge and skills facilitated by technology. In common practice, virtual learning is an umbrella term used to describe any form of technology-enabled instruction (Anohina, 2005). It may include computer-based instruction, online courses (synchronous and asynchronous), a combination of traditional and technology-enabled instruction (blended learning), and the use of Web 2.0 tools for instruction (wikis, blogs, apps, etc.). This broad characterization of virtual learning may be sufficient for instructional methods that are enhanced by technology, typically follow a prescribed curriculum, are structured to support formal individual or collaborative learning, and are most often delivered by educational institutions to meet specific academic objectives. However, while such generalizations may apply to technology-supported learning, they no longer appropriately capture the full range of technology-driven learning. It is one thing to use technology to accommodate an instructional strategy. It's quite another when the technology becomes an integral part of the instructional strategy itself.

Virtual learning must be reconsidered in terms of the vast array of technological advancements that have transformed learning and the environments in which learning occurs. The pedagogical potential

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