

## Chapter 86

# Expertise Development for Next-Generation Digital Learners

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### ABSTRACT

*As the nature of work has become much more complex and sociotechnical, the needs for developing expertise are high. Research on expertise development are diverse (Bjork, 1994; Einstein & McDaniel, 2005; Schneider et al., 2002), but empirical studies intended to bridge expertise development and instructional design theories are relatively scarce (Ertmer et al., 2008; Fadde, 2009). This chapter addresses why and how scholars and practitioners should foster expertise development skills for Next-Generation digital learners.*

### INTRODUCTION

The nature of work has become much more complex and frequently involves multiple teams for greater productivity (Hoffman & Hanes, 2003; Moon, Hoffman, & Ziebell, 2009). Preparing for the complex nature of work, it seems critical to promote learners' core competencies related to learning, such as metacognitive skills. Research on expertise development are diverse (Bjork, 1994; Einstein & McDaniel, 2005; Schneider et al., 2002), but empirical studies intended to bridge expertise development and instructional design theories are relatively scarce (Ertmer et al., 2008; Fadde, 2009). Jung, Kim, and Reigeluth (2016) claimed that traditional instructional design theories have focused on initial-competence learning, while expertise development has concentrated on the competence-to-expertise learning process. In other

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words, instructional design theories are oriented to take a rule-based approach by providing effective applications for learning concepts, whereas expertise-based training utilizes an instance-based learning approach (Gonzalez et al., 2003) with an emphasis on teaching experts' know-how.

This chapter is intended to identify why and how scholars and practitioners should foster expertise development skills for Next-Generation digital learners. Specifically, this research addresses (1) an overview of expertise, (2) expert vs. novice, (3) research on expertise development and learning, (4) competencies for expertise development, (5) methods of learning and training, and (7) technologies for expertise development. The study concludes with future research directions.

## **EXPERTISE STUDIES OVERVIEW**

Developing expertise takes a substantial amount of time. Ericsson (2009) stated it could take up to 10 years of experience and deliberate practice to declare having expertise. However, schools as well as non-profit and for-profit organizations have always been interested in advancing training methods that help learners/trainers learn faster and more efficiently. To this end, researchers and practitioners have begun developing methods to help non-experts perform like experts by developing theories and models to identify what to teach. Some of the tools and methods that are widely recognized in the field include Macrocognition (Patterson & Miller, 2012; Schraagen et al., 2000), Human-Centered Computing (Hoffman & Militello, 2012), Naturalistic Decision Making (Zsombok & Klein, 2014), Cognitive Systems Engineering (Hollnagel & Woods, 2005), Cognitive Task Analysis (Clark & Estes, 1996; Crandall, Klein, & Hoffman, 2006; Feltovich et al., 1997; Hollnagel, 2003; Jenkins, 2009; Lukas & Albert, 1993), and the field of Expertise Studies in general (Ericsson, 2009; Ericsson et al., 2006; Hoffman, 2007). In order to synthesize these efforts, Hoffman et al. (2013) proposed a concept called Accelerated Expertise, that suggested ways by which to accelerate the learning process to make a non-expert appear to be an expert.

Research that has received a great deal of attention, partially due to the emergence of machine learning and *AlphaGo*, is the cognitive revolution and its productions, such as artificial intelligence and expert systems. The essence of these inquiries entail articulating the unique characteristics of expert minds and the methods with which experts approach problems. By far, studies on expertise have made meaningful contributions that enhanced our understanding of what constitutes expertise as well as the methods used to identify experts' actions and decision-making processes.

### **What Is Expertise?**

Knowledge about the development of expertise starts with a definition of expertise. Gobet (2015) defined an expert as "somebody who obtains results that are vastly superior to those obtained by the majority of the population" (p. 5). In his book, Gobet dissected his definition and other dictionary definitions of expertise into two components: 'know-how,' which surrounds advanced skills, and 'know-that,' which distinguishes higher developed thought. Simply put, an expert is a person who is exceptional at what he or she does. Experts are looked to for guidance and advice as well as for examples.

The process in which expertise is developed is particularly interesting for a variety of reasons. Jipp (2016) defined expertise development as an active process of constructing knowledge by overcoming simplifications and their safeguards. From this definition, the core process of expertise development is connecting knowledge and learning.

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