

## Chapter 2.2

# Cognitive Apprenticeship Inspired Simulations

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### ABSTRACT

How can one bring cognitive apprenticeship into the virtual world? This chapter addresses how to construct a 3D online digital environment that supports the methods of cognitive apprenticeship. As technology rapidly evolves, there has been an increased demand for more interactive and more flexible simulated learning environments that can go beyond the limits of conventional instruction. When carefully designed, a 3D online digital simulation can allow teachers and learners to share and compare their cognitive techniques. By gaining access to experts' "hidden" skills, learners can better develop thinking and learning strategies that are applicable to real-world situations.

DOI: 10.4018/978-1-60960-195-9.ch202

This chapter discusses how to design cognitive apprenticeship tasks in a 3D online digital world.

### INTRODUCTION

As the information age continues to evolve, we have witnessed a dramatic shift of the education paradigm from standardization to customization, from teacher-centered to student-centered instruction, and from a focus on information dissemination through a unidirectional lecture format to an emphasis on information processing through student interaction (Reigeluth, 1999). The underlying basis of this new paradigm is learner-centered instruction that supports learners to "act as explorers of new ideas, cognitive apprentice of their mentors, instructors to their peers, and

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producer of products of real use to themselves and to others” (Tan, 2006, p. 92). There have been consistent efforts to integrate a variety of learner-focused methods into the teaching and learning process. One of the powerful strategies is cognitive apprenticeship.

Cognitive apprenticeship is based on the concept of traditional apprenticeship, in which the expert demonstrates how to perform the task while the apprentice observes the skilled actions (Collins, Brown, & Holum, 1991). The apprentice performs tasks under the watch of the expert and receives feedback. As the apprentice gains more and more skill, the expert gradually reduces supervision. Collins, Brown, and Newman (1989) developed the framework of cognitive apprenticeship, with the basic goal of supporting learners by providing access to expert thinking. Basically, learners observe the expert’s behaviors in solving the task as the expert “works to make thinking visible” (Collins et al., 1991, p. 38), sharing his/her cognitive techniques with learners. Learners also express their cognitive strategies, allowing the expert to better assess the nature and amount of support that is needed to improve performance. By gaining access to the hidden skills while embedded in a real activity, learners can better understand how these skills can be applied to other situations and across disciplines.

Cognitive apprenticeship focuses on fostering active learning in “a community of people who support, challenge, and guide novices as they increasingly participate in skilled, valued sociocultural activity” (Rogoff, 1990, p. 39). The roots of cognitive apprenticeship lie with Vygotsky’s sociocultural theory of learning, which proposes that knowledge is created through social interactions (Woo & Reeves, 2007). Cognitive apprenticeship provides the social context for this to happen, whether face-to-face or in a virtual setting. Through collaboration, experts guide novices’ participation in the community, and perspectives are shared among all members. These experiences

guide novices to gradually internalize the dialogue and construct personal meaning.

According to Collins et al. (1991), students are rarely taught cognitive strategies that experts use when they solve problems in traditional academic environments. For example, students of English are expected to identify the themes of a distinguished author’s short story, but often are not given insight into how the author developed or organized those themes. Because of this lack of understanding the process, students may experience difficulty when faced with an original writing task. In addition, when learners do not have access to expert thinking, they may experience trouble solving creative problems or transferring the skills to other environments. Cognitive apprenticeship allows learners to access thinking processes in order to conceptualize the task in a meaningful manner (Collins et al., 1991). It is a powerful model to support learners in their learning endeavors. Not only does it promote learner-centered higher-order thinking skills, but peers may serve as cognitive resources for one another.

The increased popularity of virtual learning raises the following important question: How can we successfully bring cognitive apprenticeship to a simulated learning environment? A simulation presents an artificial instructional model by “situating education in authentic, virtual contexts similar to the environments in which learners’ skills will be used” (Dede, 1995, p. 47). Gredler (2004) characterized a simulation by (a) “an adequate model of a complex real world situation,” (b) “a defined role for each participant,” (c) “a data-rich environment that permits students to execute a range of strategies,” and (d) “feedback for participant actions” (p. 571). These features have been greatly reinforced and improved due to a continuous drive toward more interactive and more flexible simulated learning environments. The advanced new learning systems support three-dimensional (3D), highly-graphical, network-based social environments that allow multiple users to be immersed in interactions and

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