

## Chapter 4

# Investigating Assistive Technologies using Computers to Simulate Basic Curriculum for Individuals with Cognitive Impairments

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### **ABSTRACT**

*Providing assistive technologies to cognitively impaired students, in the form of computer-based simulations, may improve the transfer of learning at a greater rate than other training media. The underlying premise for using computer-based simulations is that the cognitively impaired student is no longer the passive learner normally found in traditional classrooms. Instead, the cognitively impaired student becomes an active participant with the simulation and learning. In addition, this type of assistive technology provides the student with an opportunity for repeated exposure and practice at a speed in which the student feels comfortable. This chapter discusses the benefits of using computer-based simulations, defines the theoretical foundations that support the transfer of learning, and presents the processes that facilitate individual acquisition and refinement of knowledge and skills. It concludes with a review of the cognitive elements in the creation of mental models and schema.*

### **INTRODUCTION**

Let me set the stage for this chapter—Thomas is a middle-school student who has been labeled as a slow learner, not only by his teachers, but by his classmates. Thomas is not slow at all of his school subjects, but reading is the hardest for him

to comprehend. He gets picked on in class and is tired of it! Thomas has been heard saying, “I just can’t keep up”! Unfortunately, Thomas is not alone. Based upon my readings, many individuals are not aware they have a learning disability and many are never diagnosed. In 1997, the Individuals with Disabilities Education Act (IDEA) helped to broaden the definition of the use of assistive technologies (AT) in the educational system to include special

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education “services” (Rapp, 2005). According to Families and Advocates Partner (FAPE, 2001), AT includes “any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device.” This act helped to open many doors for students who are considered cognitively impaired. As noted in most AT literature, AT devices are widely used in the educational system but have mainly been provided for those who are physically challenged, such as computer screen readers for the visually impaired. However, there is an entire student body with learning disabilities at the cognitive level, such as those with attention deficit disorders (Harty, Miller, Newcorn, & Halperin, 2008), that are not being targeted as candidates for AT devices (Bausch & Hasselbring, 2004).

Addressing the concern of Thomas for “just not getting it” can be supported by the longitudinal study conducted by Juel (1988) which indicated that over eighty-eight percent of first graders who were noted to be poor readers were still considered poor readers as fourth graders. To further complicate the situation, you have the cycle of a student who is unlikely to fit in with their peers (especially if there are feelings of low self-esteem, like Thomas) as they continue to lag behind. Stanovick (1986) supports Juel’s (1988) findings by calling this continual lag as the “Matthew Effect”—those who excel at reading continue to do so, while those who lag behind continue to do just that.

It was noted in a report generated by the National Institute of Child Health (2005) that although assistive devices for those with mental retardation and development disabilities exists, it is not always easy for the Mental Retardation and Development Disabilities (MRDD) individual or for those involved in their health care or as care-givers to gain access or to know these devices exist. Hasselbring and Bausch (2005) also indicated that it is not the lack of availability of AT services and devices that have caused this gap but the lack of knowledge by teachers about AT

and how and when to implement. Many teachers, it appears, rely on specialists in the area of AT to implement the program, thus eliminating the immediate connection the teacher may have in the classroom to identify AT services and devices for their students. However, this gap is another topic of discussion. This chapter addresses a narrow part of AT devices, classified as computer-based simulations, that can provide the cognitively impaired a method for learning in their own context—a style of learning that could benefit a student like Thomas. Context is referring to a preferred method of learning on subjects in which the cognitively impaired individual is weak; subjects such as math, science, and reading. These contexts can use a single piece of media or hybrid approach to include animation, graphics, audio and text as a way to impart information that is in alignment with the person’s cognitive impairment.

As clarification, and for the purposes of this chapter, computer-based simulations or systems, although there are many, only refer to desktop or personal computers. This topic does not address console systems, large immersive systems, or systems using haptics or head-mounted displays. In addition, the focus of the cognitively impaired examples will be on the task of reading in which the student should be able to grasp principles and derive meaning from text. The proposed chapter addresses: (a) a brief background on simulation history, its limitations, and benefits, (b) the theoretical framework fundamentals in the process of learning, (c) the mechanics of the transfer of learning that promotes knowledge/skill acquisition, and (d) a cognitive perspective.

## **BACKGROUND**

### **Why Computer-Based Simulation**

Simulation devices provide a means to replicate some form of reality so that an individual, or individuals, can increase their ability by applying

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