Chapter 6
Tracking Children's Interactions with Traditional Text and Computer–Based Early Literacy Media

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ABSTRACT

Early literacy skills have been the focus of considerable research for the past two decades. Many instructional interventions have been developed to help improve children's acquisition of key skills – among the most recent is an array of software programs. In this chapter we review the foundations for software design, instructional theories related to computer media-based instruction and an assessment of how children interact with the visual information provided in children's software. In particular, the chapter will highlight current research examining what features of software design impact children's ability to attend and learn from this media. Eye tracking technology has been used in research on early literary to better understand how learning occurs. This chapter identifies how eye-tracking technology can facilitate understanding of how young children interact with literacy tools in computer-mediated contexts.

INTRODUCTION

Computer technologies are a ubiquitous part of everyday life for most children today. The introduction of smaller, less-expensive and yet more powerful portable digital devices has seen the expansion of technology into more contexts than ever, including traditional contexts such as early childhood care environments, elementary/primary schools, homes, and newer venues such as restaurants, malls, and automobiles. The prevalence of technologies, combined with children's attraction to computers and persistence while engaged with computers has encouraged many educators and parents to consider computer-mediated instruction as a potential means to facilitate learning (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013; Lysenko, & Abrami, 2014; Pynoo, Devolder, Tondeur, van Braak, Duyck, & Duyck, 2011; Willoughby & Wood, 2008). Evidence of learning gains has been demonstrated across the range of educational contexts from higher education to early childhood (e.g., Tamim, Bernard, Borokhovski, Abrami & Schmid, 2011), across many domains including science, math and reading (e.g., Kafai, 2010; Tamin et al., 2011) and across a diverse array of activities (e.g., creating presentations, gathering information, gaming, using digital cameras, listening to music and watching television: Burnett, 2013; Gronn, Scott, Edwards, & Henderson, 2014). However, the mechanisms that explain how computer-based learning motivates children and how they facilitate learning continue to be examined. Eye tracker technology is one tool that has recently been employed in early literacy contexts, especially computer-mediated learning contexts, to better understand how learning occurs. The following chapter identifies how eye tracker technology is beginning to help us understand how young children interact with literacy tools in traditional and computer-mediated contexts.

What Are the Early Literacy Skills that Children Must Acquire?

Literacy involves mapping oral language onto written language. One component of literacy, mapping letter-sound relationships, requires the development of many prerequisite skills. Phonological awareness, for example, is the insight that words are made up of sounds. Early phonological awareness skills, specifically the detection of phonemes (i.e., the basic sounds in a language) or rhymes (i.e., knowing when groups of phonemes sound alike), are significantly related to learning to read (Bryant, MacLean, Bradley & Crossland, 1990) and to later reading performance (Lonigan, Burgess, & Anthony, 2000; Wagner, Torgesen & Rashotte, 1994). Therefore, early interventions typically target these important foundational skills. Training in phonological awareness is most effective when it is combined with the teaching of the alphabetic principle, that is, how sounds map on to specific letters (Bus & van IJzendoorn, 1999; Byrne & Fielding Barnsley, 1993; Cunningham, 1990; Hatcher, Hulme & Ellis, 1994; Elbro & Petersen, 2004). There is general agreement that phonological awareness develops based on the size of the units being manipulated with the most accessible units and the easiest level being syllable awareness, followed by onset-rime awareness, which is the manipulation of groups of sounds at the beginning or at the end of the word (Anthony & Lonigan, 2004; Stanovich, Cunningham & Cramer, 1984; Torgesen, Wagner, & Rashotte, 1994; Ziegler & Goswami, 2005). The final stage of phonological awareness is phoneme awareness or awareness of individual sounds within words (Yopp, 1988). Phonological awareness is measured through segmentation (saying words one sound at a time), deletion of sounds, substitution of individual sounds or blending sounds to create a word. This continuum of sensitivity from large units (syllables) to small units (phonemes) is manifested differently based on the child's age and ability level (Anthony & Lonigan, 2004; Stanovich, 1992). In addition to these critical skills, young learners must

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