

Chapter 8

Effective Online Learning for Older People: A Heuristic Design Approach

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ABSTRACT

This chapter examines the cognitive constraints related to older people in learning, particularly in e-learning, and proposes a new design approach that: (1) assists the instructional designer and Web development in identifying issues related to older people's involvement in e-learning; (2) helps reduce the mental load in designing and developing e-learning for older people; and (3) uses heuristics to systematically support the designers in making decisions about meeting the needs of older people in their learning and searching for information online.

INTRODUCTION

The aging process is associated with gradual declines in cognitive functioning, which include reduced working memory capacity, processing speed, and physical and mental coordination (Gardner & Hill, 2012; Rhodes & Kelley, 2005). Because of the decline in cognitive functioning, older adults face increasing challenges when

learning new materials, especially learning new materials via the World Wide Web. Research shows that the extent to which how well older people learn is dependent on the amount of cognitive load imposed on the learner during the learning process (Hawthorn, 2007; Low, Jin, & Sweller, 2012; Ouwehand, van Gog, & Paas, 2012; van Gerven, Paas, van Merriënboer, & Schmidt, 2002). In an early study, Sweller and Chandler (1994)

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identified the relationship between the level of element interactivity and the challenges associated with learning. They noted that high-level element interactivity could impose high cognitive load, which makes the learning process difficult. It is thus agreed that reducing cognitive load by reducing the level of element interactivity in complex learning can significantly improve the effectiveness and efficiency in learning (Zheng & Cook, 2011; Low, et al., 2012; Ouwenhand, et al., 2012; Tindall-Ford, Chandler, & Sweller, 1997). Previous research has established that cognitive strategies such as worked examples, integrative instructional format, cueing, gesturing and signaling can significantly alleviate the cognitive load that the learner experiences in learning (Kirschner, Sweller, & Clark, 2006; Ouwenhand, et al., 2012; Sweller, 2010).

Along the same line researchers investigated ways to apply heuristics to E-learning design in an effort to reduce cognitive load in learning (Darabi, Arrastia, & Nelson, 2011; Hwang, Kuo, & Yin, 2010; Sweet & Ellaway, 2010). Hwang et al. (2010) employed a heuristic algorithm to guide the learning activities in a natural science course. The researchers found that students' learning behaviors had significantly improved through a heuristic design that aimed at personalizing the support for learners. Sweet and Ellaway (2010) argued that heuristic design, compared to conventional instructional design, results in heightened levels of critical thinking and sensitivity to learners' cognitive needs. They further pointed out that heuristics which use simple, experience based rules to guide instructional design not only serve as an effective tool for diagnosing the usability issues related to the physical design of the e-Learning but also function as a cognitive walk-through which identifies malpractices in e-Learning that often cause cognitive dysfunction and misunderstanding in learning. Lee and Reigeluth (2009) pointed out the benefits of applying heuristics to

the design of e-learning. They demonstrated that heuristic task analysis, a method developed for eliciting, analyzing, and representing expertise in complex cognitive tasks, provides a clear path for effective learning.

Nonetheless, research on cognitive load reduction via heuristic design is far and few between. There are some challenges associated with the use of heuristics in e-Learning design. One challenge is the alignment of heuristics with specific content in e-learning. As Lee and Reigeluth (2009) pointed out, due to the myriad contextual factors that arise in each individual work setting, it becomes extremely challenging to apply heuristics as a universal design rule for e-Learning. The other challenge is to identify what Simon (1990) called the "rules of thumb" so that the instructional designers and other professionals can follow those rules as they design and develop e-Learning for older adults who will not be cognitively overload as they surf the Web for personal, entertainment, health, and social needs. The current chapter offers a discussion of the above challenges in heuristics design by (a) examining the limitation of human cognitive architectures in general and older adults in particular, and (b) identifying ways that employ heuristics to effectively integrate instructional strategies (e.g., worked examples, instructional format, etc.) to develop e-Learning for older people. Specifically, the chapter focuses on:

1. literature in human cognitive architecture and how it affects learning,
2. instructional design, especially online design for older people,
3. heuristics as a design strategy for E-Learning for older people.

Finally, the chapter proposes some heuristic guidelines for designing effective online learning for older adults.

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