Chapter 7
Effects of Learning Traits and Information Display on Incidental Learning in 3D Virtual Environments

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ABSTRACT
In this chapter, the authors sought to determine if learning style or digital literacy predict incidental learning, that is, learning that occurs without learners being instructed to attend to or learn presented information. One hundred and fifty-five education undergraduate students completed a series of tasks in a virtual environment where additional information unrelated to the tasks was present. The results indicate that in addition to incidental learning taking place in virtual environments, learning style and digital literacy seem to predict incidental learning in some instances. An additional analysis explored learning styles by “strong” and “moderate” indicators and found that there was no significant difference in their incidental learning score by learning style strength. The results also suggest that information display, in this case visual salience, plays a role in incidental learning as the participants performed better on recalling information that was made more salient.

INTRODUCTION
Virtual Learning environments (VLEs) are increasing in popularity in educational contexts (see Eschenbrenner, Nah, & Siau, 2008; Ghanbarzadeh & Ghapanchi, 2018). According to New Media Consortium and EDUCASE Learning Initiative (2007), virtual environments are “richly immersive and highly scalable 3D environments” (p. 18). Users explore virtual environments using an avatar, which is a virtual representation of the user within the world. Dickey (2003; 2011) proposes that VLEs are “networked,
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desktop virtual reality in which users move and interact in simulated 3D spaces” (p. 105). Warburton (2009) suggests, “a virtual environment provides an experience set within a technological environment that gives the user a strong sense of being there” (p. 415). In their research on learning in virtual environments, Voinescu and David (2019) qualify virtual environments as desktop environments that are three dimensional. Although sharing similarities with video games, a key difference between games and virtual environments is that a game is more limited to a particular contextual setting and goal, while a virtual environment can be created and modified for any situation, allowing for greater flexibility. Virtual environments can be created for almost any discipline because they are not as contextually based as games (New Media Consortium and EDUCASE Learning Initiative, 2007).

Virtual learning environments are visually complex spaces that include multiple forms of information as well as opportunities for interaction with others. Although immersive to some degree, it cannot be assumed that learning processes and interactions are comparable to those observed in real-world learning spaces where learners are physically within the environment. In this study, the authors tested several elements of learning spaces that can impact learning to determine if these effects may exist in VLEs as well. First, the authors were interested in the impact of the traits that individual learners bring to the VLE (e.g., learning styles and digital literacy) on learning. Second, given VLEs can be information rich environments, the authors were interested in what information learners may retain beyond their intention to learn or engage in instructed activities. The unconscious retention of information that has not been purposefully studied is referred to as unintentional or incidental learning. It has been posited that this kind of unconscious learning is relatively robust over time because it is resistant to interference from explicit memory processing (Frensch & Miner, 1994). Stadler (1997) suggested that information acquired incidentally may later be retrieved for explicit reporting or manipulation. Hence, it is possible that incidental learning might enhance overall learning without placing additional demands on cognitive resources. Finally, the authors were interested in the form and degree of the visual salience of information that is required to capture attention and result in increased incidental retention (images vs. text, plain vs. bolded text). In addition to these, the authors examined learning styles by strength on the dimension scales in order to determine whether the strength of a given learning style made a difference in incidental learning scores.

BACKGROUND

The background covers the definitions of four key elements of this study: 1) incidental learning, 2) learning styles, 3) digital literacy, and 4) information display: visual salience.

Incidental Learning

Incidental learning is a term that is both similar to, and a subset of, other terms in the learning literature. For example, Schugurensky (2000) considers incidental learning to be “learning experiences that occur when the learner did not have any previous intention of learning something out of that experience, but after the experience she or he becomes aware that some learning has taken place. Thus it is unintentional, but conscious” (p. 4). Paek, Hoffman and Saravanos (2017) in their exploration of incidental learning also consider it to be learning that occurs unintentionally. Incidental learning can be considered both a subcategory and a form of, informal learning. Marsick and Volpe (1999) define informal learning as the