Influences of Gender and Computer Gaming Experience in Occupational Desktop Virtual Environments: A Cross-Case Analysis Study

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ABSTRACT

This study used a cross-case analysis methodology to compare four line-of-inquiry studies of desktop virtual environments (DVEs) to examine the relationships of gender and computer gaming experience to learning performance and perceptions. Comparison was made of learning patterns in a general non-technical DVE with patterns in technically complex, occupationally-specific DVEs. Two oppositely-gendered occupations were sampled in the technical studies: surgical technology and policing. The cross-case analysis confirmed in the occupationally-specific DVEs the gender effect in favor of males on spatial learning that has been documented in previous research literature. It also supported a gaming experience effect in favor of more experienced gamers, but did not clearly demonstrate a relationship between gender and gaming experience. Several implications and recommendations are presented for practitioners and researchers in adult vocational, career, and technical education.

Keywords: Computer Gaming, Desktop Virtual Reality, Gender Differences, Trait/Treatment Interaction, Virtual Environments, Vocational/Career/Technical Education

INTRODUCTION AND CONCEPTUALIZATION

Exploration and comprehension of complex environments is a common feature of many adult vocational, career, and technical education (VCTE) programs. Construction sites, manufacturing shops, animal facilities, hospitals, laboratories, merchandising outlets, emergency sites, and many other complex and sometimes dangerous locations are critical environments for VCTE teachers and students engaged in...
workforce preparation and development. Spatial understanding of these environments and their structures and contents is frequently a crucial occupational learning requirement. An innovative and unique computer-based technology now allows VCTE teachers to immerse students in such environments digitally with a high degree of visual fidelity, learner control, and interactivity. These unique characteristics can create a sense of presence or “being there” so powerful it makes learners feel they are actually inside the environment and what they are doing is actually real (Ausburn & Ausburn, 2010; Chen, Toh, & Wan, 2004; Di Blas & Poggi, 2007; Inoue, 2007; Lombard & Ditton, 1997; Mikropoulos, 2006). This new technology places high-fidelity panoramic images on conventional desktop and laptop computers. Learners can explore within an on-screen virtual environment or world as they choose. They can move around at will by panning, zooming, and using clickable hot-spot navigation to examine specific objects; jump to different locations in the environment; and activate embedded text, images, and video clips. These screen-based spheres of reality (Ausburn & Ausburn, 2010) are generally referred to as desktop virtual environments (DVEs).

While DVEs offer strong intuitive appeal and potential as a VCTE instructional strategy for environment exploration and mastery, this technology has been slow to enter the instructional mainstream. Three issues that have impeded DVE implementation are 1. technical quality and complexity, 2. cost, and 3. research challenges. New technical developments in desktop virtual reality (DVR) technology have dramatically improved the quality and reality of DVEs, making them capable of remarkable presence and learner immersion. However, as these technologies have increased in capability, they have also become more costly and technically demanding, thus creating difficulties for research and instructional implementation. Studies with DVEs currently require an array of sophisticated production hardware and software, a technical learning curve, and considerable time to design and create virtual environments for testing. The research is further complicated by difficulty finding research sites and participants and by long time frames required for individualized testing procedures.

As a consequence of these issues, studies of DVEs in VCTE have generally been small in scale and hampered by methodological limitations. This situation has resulted in findings that are important in developing an emerging knowledge base for this new technology, yet are frequently inconclusive and limited in generalizability. One way to extend the scope of small-scale research on DVEs is to employ a cross-case analysis strategy that compares variables and results across two or more related studies to examine patterns and trends. This research strategy formed the methodological basis for this study in its examination of learner gender and computer gaming experience in occupationally-specific desktop virtual environments.

The conceptual framework for the cross-case analysis in this study is found in Cronbach and Snow’s (1977) Aptitude-Treatment Interaction (ATI) or Trait-Treatment Interaction (TTI) model. In the ATI/TTI model, learning outcomes are viewed as products of interacting learner characteristics (aptitudes or traits) and instructional treatments in the context of a specific learning task. In the present study, the TTI learner traits were gender, prior computer gaming experience, and heavily-gendered occupations; the treatments were occupationally-specific DVEs and instructional environment variables; learning task variables included spatial/environment orientation, memory of scenic details, confidence, and perceived difficulty. In this study, it was the logic and structure of the TTI model rather than its typical statistical method that was important. The statistical analyses typical of TTI research were replaced by a more qualitative analysis using cross-case techniques. However, the logic of interactions among learner characteristics, instructional treatments, and learning tasks to produce specific outcomes served as the conceptual model for this study.
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