Chapter 21
Effects of Assistive Technologies Combined with Desktop Virtual Reality in Instructional Procedures (2)

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ABSTRACT
Twenty-four practical nursing and health careers students were introduced by random assignment to the four treatments. Specifically, the study compared the learning effects on an instrument connection procedure used in a medical setting of four different learning treatments: text-only instruction, image-only instruction, desktop virtual reality (DVR) with assistive technologies (ATs) (i.e., audio combined with closed caption) instruction, and hands-on demonstration instruction. This study used descriptive statistics, analysis of variance (ANOVA), and qualitative comments and observation to discover important design and implementation challenges for DVR.

INTRODUCTION
In this chapter the methodology, results and findings, discussion, future research directions, and conclusion are presented as a follow-up to Chapter 20.

DOI: 10.4018/978-1-61520-817-3.ch021

METHODOLOGY
Sample
Twenty-four subjects from Northeast Technology Center in Oklahoma (USA) participated in this study. They were post-secondary Practical Nurs-
ing students and Health Careers Occupations students aged 18 years or older, and were selected to participate based on the criterion of having no previous interaction with an electrocardiography machine (ECG or EKG).

**Testing Instruments and Procedures**

Subjects were randomly assigned to one of four web-based treatments: (a) text-only that included only text with no visual aides; (b) image-only that included visual imagery with no supportive text; (c) DVR/ATs that included a QuickTime Virtual Reality (QTVR) Movie, audio with closed captioning and text-based support for documentation; (d) hands-on instructional training that included instructor-presented instructional demonstration supported by text-based documentation. Figures 1, 2, and 3 illustrate the three media-based treatments. These treatments were presented via desktop computer. All four treatments were presented to subjects individually by the researcher.

Students assigned to image-only and DVR/ATs treatment were given a video to train them on interaction and navigational tools used by the QTVR Player. These subjects were allowed to view the instructional training video as long as they wanted. All students were individually given their assigned instructional presentation on how to hook up an EKG. Upon completion of their training treatment, students were individually shown the actual EKG, lead cables, sensors, and electrical power cord and ask to successfully hook up the machine to a mannequin according to what they learned from their treatment. Subjects were given a maximum of ten minutes to complete this task. This performance test was the source of the quantitative data for the study. Additional qualitative data were recording subjects’ verbal comments and researcher observations.

**RESULTS AND FINDINGS**

Analysis of the number of correct responses on the hands-on EKG exercise was done with descriptive statistics and one-way ANOVA. Descriptive data are shown in Figure 4.

ANOVA results are shown in Figure 5. There was a significant difference among the four instructional treatments ($F = 31.43; df = 3; p = .000$) with a very large effect size ($\eta^2 = .97$) and a large corrected $R^2$ (.80). These results allowed rejection of the null hypothesis that learners receiving text-only, image-only, DVR/ATs, and traditional hands-on instruction perform no differently.

To locate the sources of significant differences among the four instructional treatments, post-hoc...