

## Chapter 2.9

# Designing Web-Based Training Courses to Maximize Learning

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### ABSTRACT

This chapter presents results from a meta-analysis that compares the effectiveness of Web-based instruction (WBI) to classroom instruction (CI). The results suggest that when the same instructional methods are used, WBI and CI are equally effective for teaching declarative knowledge. However, the instructional methods and course design features incorporated in WBI are critical factors in determining trainees' knowledge acquisition. Specifically, the chapter examines the influence of lecture, human interaction, and learner control on the effectiveness of WBI. Based on the findings, the authors provide the following recommendations for increasing learning in WBI: (1) require trainees to be active, (2) incorporate a variety of instructional methods, (3) offer computer and Internet skills courses, (4)

provide trainees with access to lecture notes, (5) incorporate synchronous human interaction, and (6) provide trainees with learner control.

### INTRODUCTION

Web-based instruction (WBI) is becoming an increasingly popular delivery medium for training and education. Recent surveys report that 37% of companies used technology-delivered instruction in 2005 (Rivera & Paradise, 2006) and 63% of traditional undergraduate institutions offered undergraduate courses online in 2004 (Allen & Seaman, 2005). The *Washington Post* reported that in 2007, 1.78 million college and university students were enrolled in online courses (Mendenhall, 2007). When properly employed, WBI can reduce training costs while simultaneously increasing training accessibility and strengthening human capital for

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organizations (Welsh, Wanberg, Brown, & Simmering, 2003). Due to the potential benefits and increasing prevalence of WBI, it is important to understand how instructors and course developers can design Web-based training programs that optimize learning outcomes.

The overarching goal of the current chapter is to examine the influence of instructional methods on the relative effectiveness of WBI and classroom instruction (CI). Specifically, this chapter will address three important issues relevant to the effectiveness of WBI. First, we will examine if any observed differences between WBI and CI are driven by the delivery media (i.e., WBI vs. CI) or the instructional methods (e.g., lecture, tutorials). Second, we will investigate whether the incorporation of lecture, human interaction, and learner control during WBI influence the extent to which trainees learn during training. Third, we will synthesize our findings and present practical implications for designing Web-based training courses that research suggests will maximize learning. Specific examples of training courses that follow the recommendations from the study results will be provided to help instructors visualize how training courses can incorporate the current guidelines.

A few key terms are necessary to understand the study results and their implications. WBI refers to courses where all of the training materials are delivered via the Internet, whereas CI refers to courses where the training materials are delivered face-to-face via an instructor. We define instructional methods as techniques used to convey course content such as lecture, group discussion, reading, and assignments. Delivery media is defined as technological devices such as computers, video-teleconferencing, and the Internet used for the purpose of instruction. We conducted a meta-analysis to compare the effectiveness of the two delivery media for teaching declarative knowledge, and to examine the effect of instructional methods on learning. Meta-analysis is a statistical technique for combining the results

of studies that address a set of similar research questions. Finally, declarative knowledge is trainees' memory of the facts and principles taught in training (e.g., trainees' ability to define key terms and to describe a theory covered in training).

## **INSTRUCTIONAL METHODS VS. DELIVERY MEDIA**

Our review of the education and training literature identified 76 studies that compared declarative knowledge outcomes from WBI and CI, and were included in the meta-analysis. Each study evaluated Web-based and classroom-based versions of a course on the same topic. All of the courses were adult work-related training, and included both organizational and university courses. For example, Weems (2002) provided data comparing test scores from Web-based and classroom versions of a university algebra course. Combined, these studies report data collected from 11,943 trainees across 155 courses.

We calculated an effect size for differences in declarative knowledge between the Web-based and classroom versions of courses.<sup>1</sup> The results indicate that across 155 courses, WBI was 5% more effective than CI for teaching declarative knowledge. This suggests that if the average test score in classroom training is 75%, then the average test score in the comparison Web-based training course will be 80%. Additionally, the relative effectiveness of WBI compared to CI for teaching declarative knowledge was similar for both college students and organizational employees, suggesting these results are valid for both groups of trainees.

Educational theory can be used to shed light on the meaning of the current results. Clark (1983) proposed delivery media are "mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes change in our nutrition" (p. 445). In making this assertion, Clark (1983, 1994)

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