

## Chapter 7.6

# An Empirical Study of the Effects of Training Sequences on Database Training Tasks and User Outcomes

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### ABSTRACT

This paper introduces the concept of IS training sequences and examines how sequencing of conceptual and procedural training impacts task and user outcomes. Building on assimilation theory, we propose four hypotheses, relating training sequences to task performance, satisfaction, and self-efficacy, and test them using a quasi-experimental study in a database design context. Our empirical results suggest that subjects trained in the conceptual-procedural sequence achieve better far-transfer and near-transfer task performance and higher self-efficacy than those trained in the reverse sequence, although user satisfaction is not significantly different between the two groups. Implications for IS training research and practice are discussed.

### INTRODUCTION

As information systems (IS) are adopted widely by firms as the means of improving task performance and user productivity in today's IS-dominated workplace, such adoption also imposes substantial pressure on firms to continuously train internal users in the knowledge and skills needed to use these systems appropriately. Despite training innovations, such as computer-based, video-based, and online training, the core issue still remains: how to structure training programs best to maximize users' knowledge retention and task performance (Davis & Bostrom, 1993).

The training literature suggests several approaches to IS training, such as instruction-based vs. exploration-based training (Davis & Bostrom, 1993), applications-based vs. construct-

based training (Olfman & Bostrom, 1991), and conceptual vs. procedural training (Olfman & Mandviwalla, 1994; Santhanam & Sein, 1994). Of these, the last taxonomy has gained the broadest acceptance. *Conceptual training* is a top-down approach, where IS users are trained in the nature and associations of semantic objects required for comprehending and solving given problems, while *procedural training* is a bottom-up approach that informs users of action-plan sequences required to complete specific tasks. Because of the direct and immediate applicability of procedural knowledge in specific task situations, procedural training has emerged as the approach of choice for many corporate IS training programs (Quinoñes & Dutta, 1997).

Prior training research has compared the relative effects of conceptual and procedural approaches on IS task performance and reported mostly mixed results (Olfman & Mandviwalla, 1994; Santhanam & Sein, 1994). However, researchers tend to agree that both forms of training are important. Santhanam and Sein (1994) note that procedural training is more useful when the target system is easy to operate; however, users trained in this approach tend to perform poorly on novel tasks. They also state, “conceptual training is likely to provide a better opportunity for a user to form a coherent mental model compared to procedural training” (p. 382). Olfman and Mandviwalla (1994) observe, “some *combination* of concepts and procedures is needed. . . . It is the relative quantity and *sequencing* of the two kinds of content that has not been fully established” (p. 407) (emphasis added).

*Training sequence* can be defined as the ordering of conceptual and procedural training. Though the importance of training sequences was noted in the research already cited, to date, there has been little empirical analysis of such sequences in the IS training literature. The idea of training sequences, however, has some support in learning theory (Glaser, 1990) and instructional design theory (Reigeluth & Stein, 1983), where research-

ers have advocated holistic user training, including both conceptual and procedural components. The rationale is that this strategy integrates two complementary forms of knowledge (concepts and procedures) that are both required for the performance of complex organizational tasks. In light of these suggestions, the goal of this study is to examine which training sequence (conceptual-procedural or procedural-conceptual) has a greater impact of task outcomes (e.g., performance) and user outcomes (e.g., satisfaction, self-efficacy).

To study this issue, we draw on Ausubel's (1978) assimilation theory in the educational psychology literature in order to develop four research hypotheses relating training sequences to near- and far-transfer IS task performance, user satisfaction, and user self-efficacy (terms defined later). These hypotheses are then tested empirically within the context of database design using student subjects via a quasi-experimental laboratory study. Results of the analysis confirm that the conceptual-procedural training sequence improves task performance and self-efficacy more than the reverse sequence, although user satisfaction is not significantly different between the two sequences.

The rest of this paper proceeds as follows. The next section formulates research hypotheses by drawing on assimilation theory and prior IS training research. The third section describes the experimental research design, subjects, treatments, and measurement. The fourth section describes statistical data analysis techniques and results. The fifth section discusses the study's key findings, limitations, and implications for research and practice.

## **THEORY AND RESEARCH HYPOTHESES**

### **Assimilation Theory**

Assimilation theory defines two types of human learning: meaningful learning and rote learning

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