End User Training:
An Experimental Comparison of Lecture versus Computer-Based Training

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Prior research into the question of how to train end users reveals an important lesson. To provide useful insights, researchers must study alternative training methods that are based on rich distinctions between realistic training methods. The experiment reported here illustrates this lesson. Lecture-based and computer-based training are experimentally compared for end users with different learning styles (as measured by the Kolb Learning Style Inventory). The end user training outcomes measured were achievement, efficiency, and satisfaction. The end users who participated in the study were college students learning to use a word processing package. The results suggest that computer-based training is more effective than lecture based training except for Assimilators, who appear to learn equally well under either method. Given the limitations of the study and taking into account suggested cautions, these results should be replicated before being widely accepted.

Effective methods of instruction for learning computer software applications are continually sought by educators in both academic and business settings. Effective training has become more important as computer users interact more directly with software programs in developing and using their own computer-based systems for personal and business uses (Sein and Robey, 1991). End users are now expected to develop their own information systems (e.g., see Rivard and Huff, 1988) without the constant aid of IS professionals. The emergence and increasing importance of end user computing has created a challenge for the IS department, and using effective training to ensure the success of end user computing has been emphasized by several researchers in information systems (Bostrom, Olfman, and Sein, 1990; Davis and Bostrom, 1993). The significance of end user training in practice makes it important for researchers to seek answers to the question, “How should we train end users?”

Bostrom et al. (1990) provide a framework for understanding the broad variables involved in developing an answer to this important question. Their framework and research has led to subsequent work (Davis and Bostrom, 1993; Ruble and Stout, 1993; Bostrom, Olfman, and Sein, 1993). Their research and the research of others have lessons that are critical for researchers to recognize. This research uses the Bostrom et al. (1990) framework to investigate the effect of instructional method and individual differences and their interaction on the effectiveness, efficiency and user satisfaction of end users learning computer software. In this research, learning style is used as the measure of individual differences. The results of the lessons learned from a review of the literature and the lessons learned from this research suggest directions for future research.

Prior Research

Frameworks

Instructional Design

Reigeluth and Merrill have proposed a framework for instructional design models called Methods - Conditions - Outcomes or M-C-O. This framework consists of three major components as follows (Reigeluth, 1983):

a. Methods: Methods are the means of instruction used.
b. **Conditions:** Conditions are items that cannot be changed. Reigeluth further defines conditions as factors which interact with the methods and cannot be manipulated in a given situation. For example, an individual characteristic such as an individual’s preferred learning style is a condition that cannot be manipulated in a given situation. The concept is that the conditions interact with the method to affect the outcomes.

c. **Outcomes:** Outcomes are defined by Reigeluth as effectiveness, efficiency, and appeal.

A special case of Reigeluth’s M-C-O framework is the Aptitude - Treatment - Interaction (ATI) model proposed by Cronbach and Snow (Cronbach and Snow, 1977). The Aptitude is the Condition, the Treatment is the Method and the Interaction is the interaction of the method and the condition.

**Bostrom et al. Framework**

The Bostrom et al. (1990) framework is an M-C-O/ATI framework. It suggests that training method, individual characteristics, and the interaction between individual characteristics and training method all affect learning outcomes. Sein and Robey (1991) have found that performance can be enhanced by tailoring instructional methods to accommodate individual differences in learning style. In this case, learning style is the condition.

**Training Methods**

Davis and Bostrom (1993) describe the elements of exploration and instruction-based training to include process and structural features. The exploration-based process features include induction, trial and error, and high learner control, while the structural features include incomplete learning materials, and task focus (such as modifying a document). The instruction-based process features include deduction, programmed learning, and low learner control, while the structural features include complete learning materials, and features focus (such as deleting text strings). Elements of both of these training methods are embedded in common approaches used to teach computer software to end users, including audio/visual tapes, standard classroom instruction, interactive video instruction, computer-based training, and any combination of these methods.

**Classroom Instruction**

Classroom instruction has always been popular and is still the traditional teaching method used in most schools and businesses. The primary advantage of classroom instruction is the human element: instructors are available for discussion and questions. For business, however, it is becoming increasingly expensive, often involving additional costs such as travel and accommodation. Other problems are that it is difficult to maintain consistency between different instructors, and it is not always available when needed.

Brophy and Good (1986) summarize the research on teacher behaviors during a lesson by breaking them into categories of (a) giving information, (b) asking questions, and (c) providing feedback. Each of these should be present for effective instruction.

These three categories of teaching considered essential by Brophy and Good do not pose a problem for the supporters of computer-based training (CBT). CBT packages are capable of providing all three categories, but the difference is in the delivery of the three categories and the type and amount of interaction between student and instructor/computer.

**Computer-Based Training**

Because of the growing advancements in training technology in the last decade, training departments are increasingly using technology to teach. Gerber (1990) reports that IBM has indicated over half of its training will be outside the traditional classroom and involve technology of some sort by the end of this decade. Several factors are leading to this form of delivery. Besides competition, these factors include a greater demand for training along with improvements in technology. The use of CBT has also increased in recent years due to the gradual acceptance of CBT as an effective method of instruction (Fauley, 1983). Siegel and Manholm (1992) conducted a test where two computer-based training programs were developed to provide audit training. Their evaluation found that CBT has advantages over traditional classroom training when enough participants are involved. With a critical mass of participants, CBT is less expensive and more efficient.

Harrap (1990) writes that “good PC-based CBT should be: self-paced; interactive; self-contained—no other materials or equipment are required; productive—material is covered in half the time it would take using classroom instruction; consistent—the same high quality is maintained regardless of usage; cost effective—is paid for once and is reusable; efficient — knowledge is retained longer than with other training media; available - there is no need to wait for a class” (p.38).

Bowman, Grupe and Simkin (1995) investigated the effectiveness of CBT in teaching specific microcomputer software applications, specifically the operating system, word processing, spreadsheets and database. The control group was taught using the traditional lecture format and the experimental group was taught using CBT. They found no statistically significant differences in effectiveness (student achievement on total homework and “in class” examinations). Both groups were found to be equally satisfied with the teaching methods despite the differences in methods. CBT students did respond more favorably to the question regarding ability to learn at their own pace.

Although it is projected that 75% of all companies with 50 or more employees will use some form of computer-based training (CBT) in the near future, barriers still remain to the acceptance of CBT. The design and development process is enormously expensive as well as time-consuming. The
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