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EFFECTIVENESS OF VIRTUAL LEARNING ENVIRONMENTS IN BASIC SKILLS BUSINESS EDUCATION: A FIELD STUDY IN PROGRESS

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Abstract

This paper describes research investigating the effectiveness of web-based virtual learning environments by comparing them to traditional classroom environments. A conceptual framework is proposed contrasting the effectiveness of these two environments using both objectivist and constructivist learning models. Although technology may serve as a mediator that enhances the implementation of certain features of a learning model, it is evident that the learning model—not the technology—is the primary cause of learning. Theory predicts that a higher level of "learner control" leads to more effective learning. Control and flexibility, among other advantages offered to the learner in virtual environments, lead us to propose that such environments are more effective than the traditional environments regardless of the learning model employed. Furthermore, it is proposed that virtual environments are even more effective when the constructivist model is employed.

Learning effectiveness is measured based on performance, self-efficacy, and satisfaction. A field experiment was conducted to test the components of the proposed research model with about 200 business undergraduate students in an introductory MIS course. The findings will be of interest to both the education and business communities, who are striving to capitalize on information technologies to adequately meet the challenges of this information age.

1. INTRODUCTION

Calls for transforming learning industries and revolutionizing business education are being answered by a proliferation of virtual learning environments. Virtual universities are emerging and more and more universities are developing and offering virtual classes capitalizing on ever-growing and ubiquitous Internet-related technologies. Ives and Jarvenpaa (1996) warn that: "nothing will protect the business school from being swept into the current of technologically driven change" and they call upon business schools to seek an alternative vision built around environments that foster virtual learning communities. Both the IS and the education communities intuitively feel that the virtual learning environments will enhance learning and students' ability to apply knowledge and skills. However, pedagogic practice has not yet fully integrated information technology into the curriculum and classroom activity (Alavi 1994). Computers and other related technologies remain greatly under-utilized in this context.

Our focus is web-based virtual learning environments. Although it has become a common terminology, "virtual learning" might seem misleading. The learning is real, but the environment is what has changed (Schank 1997). Almost any metaphor of a learning environment includes at the outset the elements of "time," "place," and "space" where the learning actually occurs. The incorporation of technology in educational environments has mostly remained within the traditional boundaries of those elements

until the recent explosion in Internet-related technologies. Today, technology allows the student and both the instructor and other students to be decoupled in any of the elements of time, place, and space.

Wilson (1996) defines *virtual learning environments* as computer-based environments that are relatively open systems, allowing interactions with other participants and access to a wide range of resources. Such environments foster the "any time/any place" learning model that is not only a different way of delivering knowledge, but also a powerful means of creating knowledge. These new ways potentially have a wide range of advantages over traditional environments (e.g., convenience, flexibility, lower costs, currency of material, increased retention, and transcending geographical barriers).

2. RESEARCH OBJECTIVES

The important issues related to web-based virtual learning environments are:

* *Effectiveness*—Do they work? When?
* *Financial*—Do they require different business models for revenue generation and investment decisions?
* *Technical*—What are the technical constraints for full exploitation of the advantages of such environments?
* *Societal*—What are the implications for society?

Our focus is on the effectiveness issue. This research specifically investigates the effectiveness of web-based virtual learning environments in a college course focused on basic IT skills for business majors. The following research questions will be addressed:

* How effective are web-based virtual environments when compared to traditional environments?
* Do they provide higher levels of performance, self-efficacy, and satisfaction?
* Are they more effective than traditional environments regardless of the learning model employed?

3. THEORETICAL FOUNDATION

At the heart of any learning activity is a learning model that is either implicitly or explicitly employed. The two major competing models are the "objectivism" model representing the behavioral theory and the "constructivism" model representing the cognitive theory. These models differ in their philosophical assumptions, goals, and implications for instruction. The objectivist model holds that learning is a process for representing and mirroring reality, while the constructivist model holds that it is a process of actively interpreting and constructing individual knowledge representations (Jonassen 1991). The major assumption of objectivism is that the instructor is the source of knowledge to be transferred to the learners for uncritical absorption of facts. The instructor is in control of the material and the pace. On the other hand, constructivism assumes that individuals learn better when they discover things themselves and when they control the pace of learning utilizing the instructor for support rather than direction.

The explosive growth in information technologies had profound implications on the field of instructional design. Hackbarth (1996), in his discussion of the scope and promise of technology, elaborates on how educational technology has enriched instruction and made it more individualized, valid, accessible and economical. Jonassen, Mayes, and McAleese (1993) argue that modern technology should support knowledge acquisition in open learning environments, which are need driven, learner-initiated, and intellectually engaging. The component display theory, proposed by Merrill (1983), prescribes formulating instruction in such a way as to make it easy for learners to control pace, content, and presentation display. Virtual learning environments are appealing because one of their basic empowerment characteristics is the control they offer to the learner.

4. RESEARCH MODEL

Previous research has produced mixed results with no conclusive evidence on the effectiveness of technology in the classroom. One reason for this conflicting evidence may be that some studies are not using the same learning model when comparing a technologically enhanced environment with a traditional one. Recent studies (e.g., Leidner and Jarvenpaa 1995) have called upon IS researchers to compare the effectiveness of information technology incorporated into the model of learning vs. that same model without technology. Another dimension in the framework of investigating the effectiveness of any learning environment is the content. In this research, the learning content is focused on developing basic IT skills. Future research is encouraged to replicate this study considering different types of content (e.g., problem-solving skills, etc.).

The consensus among scholars in this field is that technology does not cause learning: learning and teaching behaviors do (Chickering and Ehrmann 1997). Technology can enhance certain behaviors or methods. Almost any learning behavior makes use of one or more old or new technologies: chalk, pens, classrooms, books, overhead projectors, computers, and now the Web.

A primary goal in studying any new medium of communication for educational delivery is the identification of its effectiveness (Hiltz 1993). Thus the objective of this research is to investigate the effectiveness of web-based virtual learning environments when employing the two different learning models. The first proposition is:

> **Proposition 1: Virtual Learning environments are more effective than traditional learning environments regardless of the learning model employed.**

Many educational technologists seem to have accepted, often by default, the cognitive learning theory as the prominent theory in this field. Viadro (1997) believes that educators began favoring classroom environments in which students take charge of their own learning, learn to think critically and analytically, and create products to demonstrate what they have learned. By putting learning in the hands of students, the "constructivist" model drastically upsets the old style of schooling in which a teacher stands in front of students in a classroom and lectures.

It seems that virtual environments lend themselves to supporting the constructivist model more than the objectivist model, because of the learner control and flexibility features they offer. Leidner and Jarvenpaa (1995) proposed a taxonomy for technology fit with learning models. They argue that incorporating technology with the objectivist model is a matter of automation only; however, incorporating technology within the constructivist model would create the potential for long-term effect on the self variables (e.g., performance, self-efficacy, etc.), since the control has been shifted to the learner. The trend toward constructivist learning is relatively new, and technology has been used to support it only in the past few years. As reported by Viadro (1997), "There hasn't been enough time to accumulate a huge amount of evidence," says Christopher Dede, a senior program director for the National Science Foundation. "The literature is positive. There's just less of it." Thus, we propose that:

> **Proposition 2: Virtual learning environments are more effective with the constructivist model than they are with the objectivist model.**

Several hypotheses are formulated to investigate the above propositions. In measuring the learning effectiveness, performance and self-efficacy are considered for the purpose of hypotheses testing. Merrill (1994), in illustrating the scientific method in instructions, notes that the primary outcome of concern is the increased instructional effectiveness, defined as fewer errors on the achievement test following instruction.

Self-efficacy is defined as the belief that one has the capability to perform a particular task. The social cognitive theory implies that higher levels of self-efficacy have an important influence on the individual's behavior (Bandura 1986). Self-efficacy has been found to influence the actual performance attainments in a variety of behaviors. Compeau and Higgins (1995a) have cited several studies supporting that self-efficacy has influenced decisions about the choice of behavior to undertake, effort exerted, and persistence in attempting those behaviors. However, very few studies addressed self-efficacy in the context of the computer. For example, Hill, Smith, and Mann (1987) reported that computer self-efficacy of college students was a factor in determining
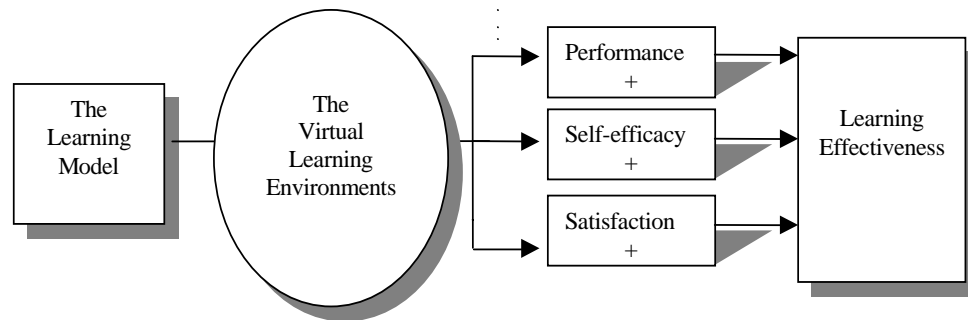
their decisions to use computers. Gist, Schwoerer and Rosen (1989) extrapolate from these findings to argue that trainees with high self-efficacy may experience a greater success in training than those low in self-efficacy. Since the subject matter is basic skills, higher levels of self-efficacy seem to be a desirable outcome. Ultimately, it is hoped that the learner will apply the skills learned to real life situations. The proposed model is depicted in the diagram.

5. METHODOLOGY

A field with the following features study was set up to evaluate the research propositions.

The Course is an introduction to MIS offered within the school of business at a large state university in the Untied States. All undergraduate business students are required to take the course. It covers a brief introduction to computers and the use of personal productivity tools. Microsoft Office 97 is used to introduce the basic concepts of word processing, spreadsheets, and database management systems.

The Subjects. Four sections were randomly selected out of 17 sections offered during the spring semester. A total of 192 students were enrolled in these four sections. Two of the four sections are conducted in a virtual learning environment and two sections are conducted in a traditional classroom. Students did not have prior knowledge that their sections were selected for a research study and signed up based on fit with their particular schedule; we therefore assume the subjects were selected in a nearly random manner. All subjects were surveyed in the first week of the class to establish a baseline on some demographic information as well as their attitude toward using computers, Internet accessibility, and previous self-perceived knowledge about the software packages that would be taught in the course. An objective skill assessment was also conducted.

The Independent Variables are the learning environment (virtual/traditional) and the learning model (objectivist/constructivist). *The Dependent Variables* are (1) student performance, which will be measured by student grades on two exams given at the end of first half and at the end of the semester; (2) self-efficacy, which will be measured by a survey instrument used by Compeau and Higgins (1995b); and (3) satisfaction, which will be measured by an instrument used by Green and Taber (1980).

The Manipulation. Two sections will receive the virtual learning treatment while the other two will be conducted in the traditional classroom setting. The semester is divided into two halves: the "objectivist" learning model will be employed in the first half, and the "constructivist" model will be employed in the second. For the sections receiving the treatment, after a brief introduction to computers and the facilities offered by the virtual environments, the class will be completely conducted over the Internet except for midterm and final examinations. This web-based course was developed in a Lotus Learning Space environment, which offers four "virtual" areas to conduct the classroom activities:

- **The Schedule**: where student can access the course materials and assignments organized by date.
- **The Media Center**: where students can access general information, multimedia material, grades, etc.
- **The Course Room**: where students can interact with each other and with the instructor in a threaded discussion.
- **The Profiles**: where students can post information about themselves and check others.

The two learning environments are based on the same learning model. Assignments and exams are standardized, as are the deadlines. Strict teaching procedures are enforced and the instructors are briefed and monitored to ensure that the correct teaching model was employed.

6. CONCLUSIONS

Results from the study will be available for presentation at the Conference. It is intended to shed light on the effectiveness of the web-based virtual learning environments with a focus on developing basic IT skills in business education. While building on the excitement of what the technology has to offer, this study recognizes the well-known educational principles about technology, which basically emphasized that technology per se has "no" predictable effect on educational outcomes, while teaching and learning models do. However, technology does play a role in employing these models effectively.

The outcome of the research could be of particular interest in business education, as institutions begin to migrate some (or all) of the basic skill courses to virtual learning environments. The findings also may have implications for training organizations and business corporations as they seek efficient and effective ways to satisfy their growing training needs. Furthermore, distance education programs and individuals embracing the "life-long learning" concept will also benefit from the findings of such research. After all, a major goal of MIS is to help organizations manage the vital operations necessary to survive and grow. Upgrading the skills of the workforce is increasingly becoming a vital objective of organizations in this day and age. Analysts estimate that the Web-based training market could hit $1 billion by the year 2000 (Ouellette 1998). Although the use of the web is perhaps inevitable, investments in its deployment for education must be justified. To provide that justification, it must be proven effective through vigorous research under a wide range of learning situations. The one we have chosen to look at here, basic IT skills, is already a common target of online educational offerings.

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