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The Effect of Learning Styles on Academic Performance in Technology Mediated Learning

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ABSTRACT (REQUIRED)

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Guides, instructions, length, conference publications.

INTRODUCTION

Research in technology-mediated learning (TML) has been growing since computing capability has been available. The rapid development in storage and memory capacity, CPU speed, network bandwidth, input and display technology since the early 1990's has created a quandary for generalizability over time. In addition, computing equipment has gone from being atypical to ubiquitous during the same period. Finally, software engines, particularly the gaming industry, have made high-speed interactive participation commonplace. Research topics undertaken in the late 1990's, were different even from that in the early 2000's, and ultimately through today. Definitions have changed. The concept of virtual in the 1990's meant non-co-located, whereas ten years later, people participating in virtual environments are into 3-D gaming, Massive Multiplayer Online Role Playing Games (MMORPG), or Second Life activities. The speed of electronic communications, the rapid adoption of new technologies (ie- Instant messaging, Blogging, Web 2.0, etc.), and technology convergence create a largely dynamic environment for researchers to focus their specific field of interest.

| Year | Clock Speed ¹ (MHz) | RAM Access Speed ² (ns) |
|------|-----------------------------------|--|
| 1989 | 25 | 50 |
| 1993 | 60 | 50 |
| 1997 | 233 | 15 |
| 1999 | 450 | 7.5 |
| 2000 | 1,500 | 3.75 |
| 2004 | 3600 | 2.00 |

¹ <http://www.howstuffworks.com/microprocessor1.htm>

² http://www.dba-oracle.com/t_history_ram.htm

The impact of this dynamic environment on TML is substantial. It seems research in this area has largely focused on using technology to enhance collaboration between professor and student and between students. Studies in the 1990's focused on asynchronous email and discussion boards, and the early 2000's started using blogs, Wiki's, conferencing technology, and real time, synchronous chat rooms. Moving toward today, three-dimensional environments such as MMORPGs and Second-life style interactions are developing and gaining adoption.

The combination of increasing network bandwidth, hardware and software capability, and decreasing price have led to widespread adoption in the education industry. Most students have either a personal laptop or easy access to a personal computer with high-speed internet access, often with wireless access. Many universities offer supplemental course material through WebCT or Blackboard style or entire courses through on-line, distance learning capability (Alavi and Leidner 2001). The main goals of TML appear to be related to more efficient delivery (freedom from place and time constraints) or improved learning by the student. The latter is a difficult challenge for researchers to assess. Studies tend to focus on satisfaction of the learner with the TML experience or performance comparisons with traditional environments. Both are latent variables wherein the researcher has directly measured surrogate variables and extended the results to the comparison or experience constructs.

This paper proposes a study employing several virtual learning strategies and compares them. A few of the strategies are more elegant, probably more familiar to students, than they were in the 1990's, but functionality is essentially the same. The next level are those technologies that developed in the early 2000's, and finally, some of the most recent capabilities are employed. Students in core MBA Information Systems classes will use these several TML strategies to complete various assignments. Prior to class, surveys will provide insight into the antecedent variables related to learning as described in prior published research. Student expectations on self-efficacy and learning styles will be used to assess the types of TML strategies that lend themselves to different student expectations.

PREVIOUS RESEARCH

Alavi and Leidner (2001) provide an essay that addresses the need for more research on (TML). A large number of universities are using on-line tools to deliver content as well as a number of suppliers are creating software to present such information. In addition, research outlets are recognizing the area. Many universities are using TML to "enhance the effectiveness and reach of their programs." They suggest there is a paucity of theoretically grounded and rigorous research. One strong area of research from educational psychologists examining the impact of TML on learning has had mixed results. From IS researchers, an important conclusion is that TML outcomes are moderated by characteristics of teachers and learners. Also, much IS research has focused on collaboration. Suggestions for greater depth are to focus on "internal psychological processes through which learning occurs," with research questions that address how technology features engage psychological processes resulting in improved learning ("How does technology enhance learning?"). Instructional strategy is how content is presented, sequenced, and synthesized. Learning outcomes include what is actually learned (knowledge and/or capability), in addition to affective reactions (satisfaction with TML) or efficiency of the TML environment. The thrust of this article related to the student experience is that the past focus was, "Does TML improve learning outcomes," and the future focus should be, "How do various TML environments affect student psychological learning processes and outcomes?" (Alavi and Leidner 2001) The model described below addresses this future focus.

Davis and Wong (2007) combine the Technology Acceptance Model (TAM) with the concept of flow wherein the balance of student skills and challenges present in the TML strategy are balanced. Their study was based on survey responses of 964 students who used a web-based, online Learning Management system provided by the university. They concluded that not all elements of flow were achieved, but that the student's experience was affected by their affective state and technology acceptance. These results indicate that facilitating adoption of an eLearning system should emphasize how to better match learning relevance needs. Also, they should create experiences that allow the user to attain high levels of flow, that is, such that the user is engaged in the activity via the TML application.

To engage the learner as suggested above in a specific TML application, Hawk and Shaw (2007) suggest using learning style instruments to match style to application. They review five instruments (Dunn and Dunn, Felder-Silverman, Gregorc, Kolb, and VARK) and discuss what types of activities are appropriate for the different learning styles. These different styles can then lend themselves to the design and use of TML applications throughout a course. To an extent, this is further support that the learner who has a positive perspective of the match between the TML application and their personal perspective on what works for them will achieve more learning. Lee and Lee (2008) present a model that uses self-efficacy as a moderating variable between elements from TAM and academic performance. Their perspective is that the learner's satisfaction with the learning environment mediates the relationship between academic performance with elements of TAM and that satisfaction

and performance are moderated by self-efficacy. Their findings are consistent with Hawk and Shaw ((2007) in that satisfaction with the environment is a necessary pre-cursor to flow. The use of self-efficacy as a moderator allows for the perceived learning style to influence use. Interestingly, Bates and Khasawneh (2007) found that self-efficacy serves as a mediator for antecedent variables (ability, acquired skill, anxiety, feedback, training, previous success) to self-efficacy and the outcome variables (expectations, mastery perception, hours per week).

MODEL

The model in Figure 1 merges the discussion above. The goal is to investigate different TML strategies to investigate how an individual student's learning style, self-efficacy, and use profile affect academic performance. It is hypothesized that use of technology has a positive effect on academic performance moderated by the appropriate strategy for the student's learning style. Students with different learning styles will be more likely to use certain technologies based on their past experience and personal perception (self-efficacy).

Further discussion of the operationalization of this model is left to the next revision of this paper.

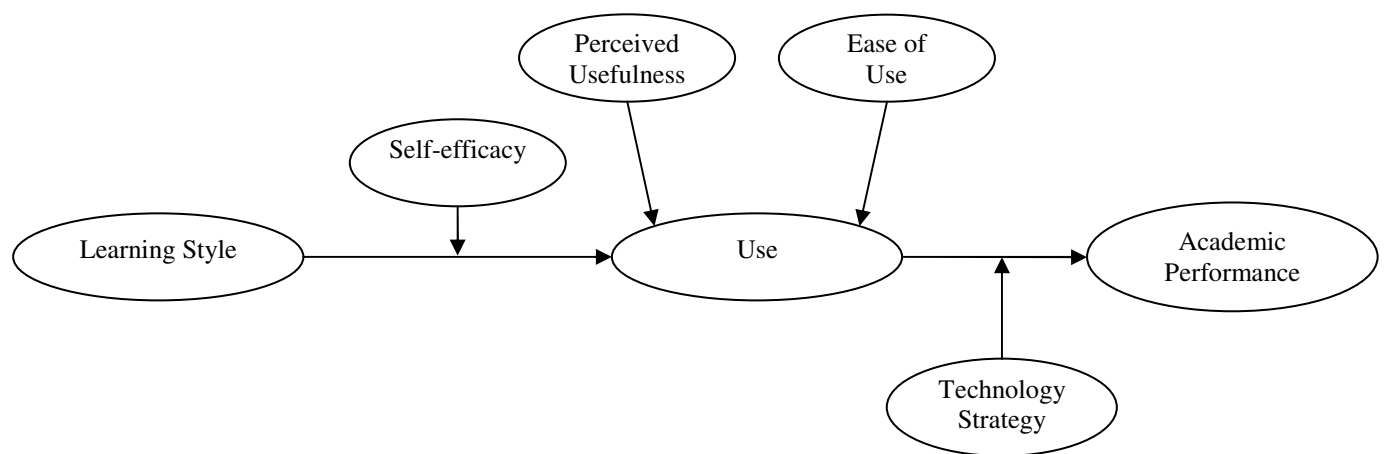


Figure 1. Research Model

METHODOLOGY

This model will be tested in four sections of an MBA core course (approximately 100 students). Different learning style inventories will be measured using on-line survey instruments.(Hawk and Shah 2007) At that time, demographic data and self-efficacy survey data will also be collected. Self-efficacy scales from those validated in prior research will be used.

The technology strategy will be applied at four levels: (Stephenson et al. 2008)

- Traditional classroom interaction (synchronous, co-located).
- Discussion board (asynchronous, non-co-located).
- Chat room (asynchronous, non-co-located).
- 3-D space (Second Life) (synchronous, non-co-located).

Each section will be divided into teams of 4-5 students. For each of four content areas, different sections will participate in one of the four technology strategies shown above. This will alleviate the issue of grading different students in the same section on content areas using different technology strategies. It is assumed that the sections will be relatively similar in terms of learning styles and self-efficacy and that the overall grades on the four content areas will be largely similar.

RESULTS

The results will be analyzed using common factor analysis and regression. The intent of this model is to verify the relationships exist as outlined. Using regression the investigation will identify if self-efficacy moderates or mediates the

relationship between learning style and use. A similar investigation will identify if the technology strategy employed moderates or mediates the relationship between use and academic performance.

CONCLUSIONS

This section will be completed following the end of Spring, 2008 semester.

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