

FACTORS AFFECTING STUDENT PERFORMANCE AND SATISFACTION: ONLINE VERSUS TRADITIONAL COURSE DELIVERY

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ABSTRACT

Interest in online course delivery has increased in recent years, and a body of research has emerged regarding this trend. Many of the studies compare student performance online versus in a traditional class (and find none), or differences in student satisfaction (and find online students to be generally less satisfied than their traditional counterparts). The purpose of this study is threefold: (1) to see if careful control between online and traditional sections can alleviate the generally lower satisfaction of online students, (2) to preliminarily propose a set of factors that could lead to increased performance and satisfaction for online students, and (3) to confirm previous work, which indicates that student performance online is no different than performance in a traditional classroom. The study involved senior-level undergraduate MIS students who were enrolled in an E-Business course; results suggest several possible ways to increase student performance and satisfaction in online courses.

Keywords: curriculum, online learning, e-learning.

INTRODUCTION

Student interest in online courses is increasing over time. Students want more materials placed online and they want more online course offerings (15). As a result, more and more courses are now supported by technology or offered online. Entire programs can be found online, providing flexibility for adult learners with varied responsibilities, schedules and geographical locations. With this change in course delivery, a variety of questions has emerged, and published studies have attempted to answer some of them. In some cases, researchers want to learn how various tool features, such as discussion boards and chat, are perceived and used by students (19, 29). Other studies concentrate on the relationship between online learning and a variety of different learning styles (1, 12, 14, 17, 27). Still others try to answer the question "Is there any difference in student learning (as measured by performance) and/or student satisfaction when learning online versus learning in a traditional classroom?" Perhaps this is the most important question from the perspective of the student, and is the topic of this paper, which also attempts to help answer the questions "What factors are related to success online and in traditional classes?" "What factors are related to students' satisfaction online and in traditional classes?" and "Are these factors different for online and traditional classes?" Our study involved senior level MIS students over two semesters. Half of the students took a traditional course enhanced by online support and the other half took an online course enhanced by traditional components (e.g., availability to meet with instructor in her office). However, both

classes were taught by the same instructor in exactly the same manner (virtually no lectures took place in either class). Before describing the study, we define terms and briefly review some relevant literature.

DEFINITIONS

Many studies have attempted to show whether or not one can expect a difference in learning and/or a difference in student satisfaction arising from delivery of a course in a traditional classroom setting or online. Several of these studies will be mentioned in the next section. It should be noted, however, that the definition of "online" varies widely and we can find no generally accepted definition. In the body of reviewed research, an "online" course can alternatively mean:

- 1) A course having materials delivered online that meets synchronously and regularly, perhaps in a chat room, moderated by the instructor;
- 2) A course having materials delivered online that never meets synchronously, and the student learns completely independent of a live instructor;
- 3) A course delivered by videoconferencing, where a live instructor is lecturing in one location and students are viewing the lecture in another location (most often referred to as "distance learning").

Online learning can also mean any permutation of the above descriptions. For our purposes in the remainder of this paper, we will define an online course according to the first definition above while incorporating Olson's (22) distinction between online and distance learning.¹

We further acknowledge that all of the sections *could* be defined as "blended" (2) rather than "online" or "traditional," since the traditional class had access to and utilized an online discussion board, while the online class had full "live" access to the professor. However, since no accepted definition for these emerging course delivery mechanisms yet exists, and since the class periods themselves were conducted in either a classroom or an online chat room, it seems appropriate, for our purposes, to define them as we have.

PREVIOUS STUDIES ON PERFORMANCE

A majority of the published studies have purported to show that performance is the same, regardless of whether a course is taken traditionally or online. This was the finding by Kleinman

¹Online students have access to all the university resources (including the professor in his/her office), but distance learning students do not.

and Entin (11) in a study of students enrolled in an introductory Visual Basic programming course at a community college. While the online students were more positive about the value of the course, no difference in performance could be detected between the online and traditional groups. In another study, students studying Principles of Marketing experienced either a traditional classroom experience or a "web-assisted" course where half of the classes met asynchronously online. Even though students enrolled in the traditional class felt their course was more effective in developing knowledge and skills, no difference between the groups was found on the comprehensive final examination (25). In a study of online versus traditional sections of Computer Literacy, retention and grade distribution was found to be the same for both groups (26). Again, in a study by Lu, Yu and Liu (14), no difference in performance was detected for students enrolled in graduate MIS classes. It should be noted that at least one study reported different results, however (16). In this case, computer science students, enrolled in a traditional networking course, outperformed the CS students enrolled in the online section of networking. However, no difference was found for the CS students enrolled in the two different delivery versions of a database course. Because their findings were not consistent across both courses, the authors felt they were unable to draw any overall conclusions.

Even with these seemingly repetitive findings, the question has been raised "Is there a difference in the type of student who selects an online course versus the type of student who selects a traditional course, and would this difference affect performance in the chosen course?" In the only study found where students were randomly selected for treatment (22), no difference was found in performance. In this experiment, volunteers for an online class were randomly assigned to either an online class or a traditional class. All students who wanted a traditional class took a traditional class. While the non-volunteers in the traditional class outperformed any of the students volunteering to study (Introduction to Computer Science) online, no performance difference was found between the experimental group (volunteers who studied online) and the control group (volunteers who studied in a traditional class). Further supporting this notion is the study by Piccoli, Ahmad and Ives (23). In their experiment, students were randomly assigned to the two groups (online and traditional) without asking the groups which delivery mechanism they preferred. Again, no statistically significant difference was found in performance for the two groups. Thus, the question of whether students who self-select online classes are more likely to perform better online appears to be unimportant, and one can reasonably assume the studies that did not use random selection are likely to be reliable (22). It is worth noting that the study where volunteers were randomly selected for treatment involved an Introduction to Computer Science course, but virtually none of the students were Computer Science majors or minors. They were, instead, students with a variety of majors who enrolled in this course to avoid taking a "pure" science to fulfill the science core requirement. Thus, it appears that regardless of the course level (community college, undergraduate or graduate), and regardless of the course material (programming, introductory technology literacy or marketing), and regardless of the technological sophistication (computer science students, MIS students or general undergraduate students) one would not expect performance to differ as a result of whether a course is delivered online or in a traditional class format.

PREVIOUS STUDIES ON SATISFACTION

Zhang, Zhao, Zhou and Nunamaker (30) identify a number of advantages to traditional classroom learning, such as immediate feedback to the student, familiarity with the experience, and the cultivation of a social community. They also state advantages to online learning, such as its being learner centered, offering location flexibility, and providing archival capability for knowledge reuse and sharing. However, it is possible that the advantages inherent to online learning are often not sufficient to satisfy most students. Indeed, in most of the published studies, students are found to be more satisfied with a traditional class experience than with an online class. For example, in the study mentioned above, which involved students in Principles of Marketing, the students enrolled in the traditional class were more satisfied and their self-evaluation of knowledge and skills gained in the course exceeded the evaluation of their online counterparts (25). One reason for student dissatisfaction could be the perception that they have to work harder online and they perceive that the professor isn't fulfilling his or her responsibility, as noted by students in a study reported by Piccoli, Ahmad and Ives (23). These researchers assigned students enrolled in an introductory MIS course to either a traditional section or an online section, and found that satisfaction was higher for the students enrolled in the traditional class, even though computer self-efficacy was higher for the online students. Some of the online student comments were illustrative, for example "Students should not be responsible for also being teachers," and "I have not taken away anything that I could not have gotten myself." The feeling that "assignments were a lot more difficult to complete because they were never taught to us" is evidence that students attributed their learning to themselves and perhaps found the professor to be superfluous. Empirical evidence has shown that students are more successful when they perceive a technological course enhancement to be in their best interest and to require what students consider to be a "reasonable effort" to overcome the technology hurdle (4).

In another study (11), the online students felt the course had more value than the traditional students, and were more likely to recommend the course to someone else. However, the online students in this case were older (average age 31 versus 23 for traditional section) and that could have had an influence on their perception of the course. Interestingly, Morss (20) found that initial satisfaction was high for the use of WebCT incorporated into courses as a supplement. However, over time (three semesters) the novelty appeared to wear off and student satisfaction decreased.

It must be noted that student satisfaction is derived from much more than the course delivery mechanism. For example, an instructor who is able to motivate students in the classroom may not be able to tap into that characteristic when teaching online, and where different instructors are actually used online and in the classroom, so little control exists as to question the conclusions drawn in some studies. Also, the type of online class and the specific features utilized online are likely to affect student satisfaction. For example, Zapalska, Shao and Shao (29) found that students are generally satisfied with the discussion board feature yet dissatisfied with the chat room feature. Therefore, a simple reliance on one or the other of these features in an online class would likely affect student satisfaction. Further, as noted by McDonald, Dorn and Dorn (16), online students must be proficient readers in order to be successful. Yet, in the authors' combined 25 years of university teaching experience, we have noted that more and more students seem to avoid reading as much as possible.

THE STUDY

Background

This study was motivated by the following factors: (1) a hope to overcome the difference in satisfaction that often exists between online and traditional classes; (2) an interest in learning what factors might contribute to performance and satisfaction in online classes; and (3) a desire to confirm the generally accepted idea that no difference in performance exists between online and traditional classes. The subjects were senior level MIS Students enrolled in a required E-Business course during the Fall 2003 and Fall 2004 semesters.

Students self-selected into either the traditional section or the online section. Both sections were taught by the same instructor and were taught in virtually the same exact manner. The only difference found students "speaking and listening" in the traditional class versus "writing and reading" in the online class. According to Beckett (2), e-learning is likely very effective for covering basic concepts, which are subsequently elaborated upon or utilized in more depth in a classroom. This is the way both the online and traditional sections of E-Business, which participated in this study, were conducted. Students were given reading assignments before each class, which consisted of textbook materials and supplementary instructor-created online materials. Each class commenced with a ten-minute quiz on the assigned readings. The quizzes were open book and administered and graded by WebCT. Their purpose was simply to motivate the necessary preparation for class. Then the remainder of the class consisted of the instructor posing questions and the students responding. These questions ranged from simple factual questions, such as "Give me an example of an online business that utilizes an auction business model" to soliciting pieces of code to build an application. In this second example, students would provide one line of code each until the application was built by the class. In the traditional class, the applications were built by the instructor and projected onto a screen. The online class met in a chat room for the class time period, and when a student wanted to answer a question, they would tap the (enter) key, which represented raising his/her hand. The instructor would call on someone by typing the name, to ensure no one dominated the conversation (just like in the traditional class). When building applications in the online class, the code would be typed in the chat window by students, and when the file was completed, the instructor would upload the file to the server and provide the students with the URL for viewing. To ensure the most similar experience possible, the instructor created "scripts" for each class to make sure the same questions were asked and the same material was covered in the same order, both online and in the traditional class. Forty-five students participated on the online sections and forty-six students were enrolled in the traditional sections.

Data Collection and Methodology

As indicated above, the authors sought answers to the following three main questions.

1. If control is exerted over the classes such that the experience online and the experience in the traditional classroom is virtually the same, can the lower level of satisfaction that often exists for online classes be overcome?
2. What factors contribute to performance and satisfaction online and in traditional classes?
3. Does any difference in performance exist between online and traditional classes?

To answer the first question we utilized student feedback at the end of the course. Online surveys were prepared before the Fall 2003 semester and students were asked to complete one survey during the first class and a second survey during the last class of semester. (Students completed these surveys online in the computer lab.) The first survey requested basic demographics such as age, along with information that might ultimately help explain their performance in (and satisfaction of) the class (e.g., how many hours per week they worked, how many courses they were currently taking and what was their experience level with Windows). The second survey (administered at semester's end) asked the students to comment about various dimensions of their experience in the class. These questions dealt with difficulty, effectiveness and satisfaction of the various course material and class components. Students answered using a five-point scale where one meant "not at all – difficult, effective or satisfied" and five meant "very – difficult, effective or satisfied." One of the questions on the second survey was "Overall, how *satisfied* were you with the course?" We used Chi-Square analysis to look at these results. (We could not assume normality, and therefore avoided using a stronger, parametric test in this case.)

Due to the simplicity of the third question (Any difference in *performance*?) and its similarity to the first question, it is discussed here (out of order). We performed a simple Chi-Square test for the same reason that we used it to compare satisfaction – inability to assume a normal population distribution. Student final course grades (A, B, C, D) were used for the columnar values.

The second question was more complicated in that it was somewhat open ended (what are the factors...?) The two surveys consisted of items that we thought would help us to answer this question. Some of the survey items were used directly, such as, "How effective was the instructor for helping you to learn the material." Others, similar in nature, were combined to create factors. For example, the factor "How busy the students were," was comprised of "How many courses are you taking this semester?" and "How many hours per week do you work?" Partial least squares (PLS) was chosen as the method of analysis because no a priori assumption of normality or equal variances is required. Using PLS, we looked at (1) direct relationships between each of the factors and student satisfaction, and (2) direct relationships between each of the factors and student performance (grades). Using PLS, one can also analyze indirect relationships through mediating and/or moderating variables. However, since this is an exploratory study, and since so many factors are being analyzed, we chose to analyze direct relationships only, although we would expect various indirect relationships to exist.

The statistical analysis consisted of two stages. The first stage assessed the reliability of the survey questions used to operationalize the variables in this study. The second stage assessed the relationship among the factors (e.g., study hours). This study employed partial least squares analysis (13). PLS simultaneously assesses the extent to which the survey questions measure the factors, and the extent to which one factor influences one or more of the others. The PLS procedure is a distribution-free procedure and, hence, is valid in cases of smaller sample sizes.

Since this study employed a single data collection method, we tested for common method variance. Podsakoff and Organ (24) suggest conducting an unconstrained, single factor analysis for models that intend to measure multiple factors. A dominance of one factor would suggest that items were related due to common method variance. We conducted an unconstrained, single factor analysis; the total explained variance by the seven

retained factors (using a minimum eigenvalue of one) was 76% and the first factor accounted for 34% of the variance. Since multiple factors were retained and the first factor did not dominate the variance, common method variance was not detected.

The discriminant validity of the analysis was assessed by comparing the intercorrelations among the factors with the correlation of the questions to their respective factors (8). Discriminant validity is demonstrated when the questions are more strongly related to themselves than to the other factors in the model. Discriminant validity was demonstrated for all factors and survey questions.

Convergent validity of the questions was assessed by analyzing the factor loading scores for each; all retained individual loadings were in the range of .35 to .98. Hair et. al. (9) suggest that individual item loadings greater than .3 are significant. Therefore, all items demonstrated convergent validity.

The composite reliability assesses the internal consistency of the factors, and according to the procedure suggested by Nunnally (21), our instruments demonstrate a strong to moderate level of reliability. Another assessment of reliability, proposed by Fornell and Larcker (7), is the average variance extracted. This measure also showed strong to moderate levels of reliability for all variables except prior experience. This implies that subjects might have interpreted the prior experience questions somewhat differently. However, since the violation was minor, and the discriminant validity, convergent validity, and composite reliability measures were sufficient, the prior experience variable was retained. Therefore, we concluded that all factor measures exhibited sufficient levels of internal reliability.

The PLS procedure simultaneously calculates factor loadings for the items and the standardized regression beta values. While the parsimonious data assumptions of PLS provide methodological conveniences, they also limit the ability to assess the statistical significance of the beta values. As a result, the non-parametric jackknifing technique was used in conjunction with t-statistics to determine the statistical significance of the path coefficients (10).

RESULTS

Difference in Satisfaction

Using Chi-Square analysis, we found no significant difference in overall course satisfaction between the two types of course delivery. Thus, we were able to overcome the lesser satisfaction among online students as reported in many studies. We assume this is due to the fact that the "experience" in the classroom was exactly the same for the online class as for the traditional class in terms of the script used.

Difference in Performance

Again using Chi-Square analysis, we found no significant difference in the final course grade between the online students and the traditional students. Thus, this study adds another example to the literature stating that student learning, as measured by performance, does not appear to be different based on course delivery method.

Factors Affecting Performance

What factors most influenced student *grades* in our E-

Business course? The answer to this question differs depending on whether the student was enrolled in an online section or a traditional section. For students studying in the traditional classroom eight factors were significant:

- How busy the students were (i.e., number of courses taken and number of hours worked);
- Effectiveness of other students for helping learn the material;
- Effectiveness of the lab assignments for helping learn the material;
- Difficulty to learn the E-Business concepts from the textbook;
- Difficulty to learn the HTML/ColdFusion coding from the instructor's online materials;
- Satisfaction with one's knowledge of the E-Business concepts;
- Satisfaction with one's ability to create web pages using HTML & ColdFusion; and
- Overall satisfaction of the course.

In contrast, for students choosing an online section, only three factors were significant; two of them were in common with the traditional class. The significant factors were:

- Effectiveness of the instructor for helping learn the material;
- Difficulty to learn the HTML/ColdFusion coding from the instructor's online materials; and
- Overall satisfaction of the course.

The beta values and factor significance levels as reported by PLS are provided in Table 1.

Factors Affecting Satisfaction

What factors most influenced student *satisfaction* in our E-Business course? For students in the traditional sections, six factors were significant:

- How busy the students were (i.e., number of courses taken and number of hours worked);
- How many hours per week the students studied;
- Level of prior experience with web page development and Windows;
- Effectiveness of the lab assignments for helping learn the material;
- Difficulty to learn the HTML/ColdFusion coding from the instructor's online materials; and
- Satisfaction with one's knowledge of the E-Business concepts.

For students in the online sections, six factors most influenced their satisfaction, although only three of them were the same as for students taking the traditional class. The factors were:

- How busy the students were (i.e., number of courses taken and number of hours worked);
- Level of prior experience with web page development and Windows;
- Effectiveness of the discussion board for helping learn the material;
- Effectiveness of other students for helping learn the material;
- Difficulty to learn E-Business concepts from the textbook; and
- Satisfaction with one's ability to create web pages using HTML & ColdFusion.

The beta values and factor significance levels as reported by PLS are provided in Table 2.

TABLE 1
Factors Affecting Performance

Factor	Beta	P-value
Traditional Sections		
How busy the students were	.17	.05
Effectiveness of other students for helping learn the material	.22	.01
Effectiveness of the lab assignments for helping learn the material	.24	.01
Difficulty to learn the E-Business concepts from the textbook	-.24	.01
Difficulty to learn the HTML/ColdFusion coding from the instructor's online materials	-.41	.05
Satisfaction with one's knowledge of the E-Business concepts	.61	.001
Satisfaction with one's ability to create web pages using HTML & ColdFusion	.85	.001
Overall satisfaction of the course	.38	.05
Online Sections		
Effectiveness of the instructor for helping learn the material	.43	.01
Difficulty to learn the HTML/ColdFusion coding from the instructor's online materials	-.48	.01
Overall satisfaction of the course	.11	.001

TABLE 2
Factors Affecting Satisfaction

Factor	Beta	P-value
Traditional Sections		
How busy the students were	.22	.01
How many hours per week the students studied	.22	.05
Level of prior experience with web page development and Windows	.17	.01
Effectiveness of the lab assignments for helping learn the material	.24	.001
Difficulty to learn the HTML/ColdFusion coding from the instructor's online materials	-.48	.001
Satisfaction with one's knowledge of E-Business Concepts	.18	.05
Online Sections		
How busy the students were	.35	.01
Level of prior experience with web page development and Windows	.18	.05
Effectiveness of the discussion board for helping learn the material	.18	.05
Effectiveness of other students for helping learn the material	.31	.01
Difficulty to learn E-Business concepts from the textbook	-.14	.05
Satisfaction with one's ability to create web pages using HTML & ColdFusion	.69	.001

DISCUSSION OF THE RESULTS

We explored those factors that seemingly affect performance and satisfaction for both online as well as traditional students. However, our real interest is in the online sections, since this is the newer form of course delivery and because it is still in its infancy. To begin this discussion, we examine those factors that directly influence a student's performance, as well as those that are different depending on whether a course is taken online or in a traditional fashion. For online students three factors have an affect on student performance – effectiveness of the instructor, difficulty of learning the course materials online, and overall course satisfaction, and from a practical perspective, only two of these factors can potentially be controlled – instructor effectiveness and difficulty to learn from online materials. What are the implications for practice here? Instructor effectiveness likely involves several things, such as, (1) quality and speed of communication (e.g., replying to discussion board questions, email, etc.), (2) choice of whether or not to use a chat facility to hold a synchronous class period equivalent to the traditional

class experience (rather than having students study completely independently and asynchronously), (3) comprehensive and clear expectations, etc. Online instructors must be comfortable in the role of facilitator when teaching online (18). That is, the professor's main role is no longer to "tutor" the students, but to facilitate their learning. Perhaps success in this role leads to instructor effectiveness, and ultimately to student performance in an online class.

The second potentially controllable factor involved the difficulty of learning course material from the online resources provided (specifically, learning to code using two tag languages – HTML and ColdFusion). This factor can be controlled in two different contexts. The first context is to make the materials less difficult to learn from, that is, elaborate upon them and made them clearer. As they are improved, one might expect them to be less difficult from which to learn. (Recall that in this study MIS students were learning how to write code to create dynamic web sites.) In another context, perhaps online learning is more amenable to less difficult or a different "type" of material. Along these lines, it is worth noting that the factor "difficulty to learn e-business concepts from the textbook" did not have a

significant impact on student grade. Is this because the textbook was more clear and "better" than the online materials prepared by the instructor? Alternatively, is it the different *type* of material that makes a difference here? Material in the e-business textbook was fairly declarative and didn't require much "action" to learn it (just reading and discussion). Learning how to code, on the other hand, requires the student to "do something" to learn (i.e., write code to achieve a particular solution). Thus, the issue here could be the type of learning that is expected from online courses. We are unable to assert any conclusion based upon this study. However, future research to ferret out these specific factors would be useful.

Next we'll take a look at student *satisfaction*. Two factors affected all students' satisfaction of the course, regardless of their class section – how busy they were and level of prior experience. The additional factors that affected online student satisfaction were effectiveness of the discussion board and other students, difficulty to learn the e-business concepts from the text and satisfaction with ability to code web pages using the two tag languages. Of these factors affecting satisfaction online, only three are potentially controllable by the instructor. Each one will be discussed in turn. An instructor can improve the effectiveness of the discussion board by starting the semester with a finite set of discussion topics that are mutually exclusive. This will help students narrow down their search for information. The instructor can also explain to students the importance of naming new threads within a topic, and rename threads when this will add to clarity. The easier it is for students to scan a discussion board for answers, the more likely it is they will find the resource to be effective for them. The second important aspect of the discussion board is the speed of replies to posted questions. The more frequently an instructor replies to postings (e.g., several times each day versus once each day or less frequently) the more likely a student will find the discussion board effective, and lead ultimately to his/her higher satisfaction.

The second potentially controllable factor is the difficulty to learn course material from a selected text. Of course, a better textbook can always be sought out. It is interesting to note that the difficulty to learn coding from the online materials negatively affected student *performance* yet not satisfaction, and difficulty to learn conceptual material from a textbook negatively affected student *satisfaction* but not performance. We can't really be sure why this was so. However, it is possible that students expect to work harder when learning to program than when learning what they consider to be basic factual material. This second type of material is often delivered to them via a lecture, and when it is, perhaps students don't even bother to read the textbook. Therefore, the fact that they had to work harder to learn these materials may have been what led to lower satisfaction.

The third potentially controllable factor affecting satisfaction was the effectiveness of other students for learning the material. Instructors do have some ability to affect the behavior of students in their class. For example, requiring and/or rewarding collaborative learning or other forms of teamwork might increase the effectiveness of other students on learning, which could in turn affect overall student satisfaction of the online learning environment. If students are part-time and don't have an established cohort of friends in the major, they can feel isolated in an online course, and won't have any way to reach out to other classmates when they have a question or need help. Motivating students to help one another can alleviate this.

SUMMARY AND CONCLUSIONS

This study supports many of the previously published studies, because no difference was found in performance between students who studied online and students who studied in a traditional manner. Additionally, no difference was found in overall course satisfaction between the two groups. In an attempt to minimize confounding factors, the present study attempted to create very similar student experiences between the online and traditional classes. However, recent research suggests that the design of online course material can significantly influence the effectiveness of the course. Specifically, White and Ploeger (28) suggest that while a traditional class is instructor-centric and sequential, a properly designed online class is learner-centric and more interactive (whereby students are able to non-sequentially review and refer back to materials). Furthermore, an online course is able to provide richer instructions and content designed to reduce the students' cognitive load. Thus, the lack of difference in satisfaction and performance in this case could be the result of providing a "traditional experience" in two different environments, rather than redesigning the content to utilize the relative advantages of each environment.

What we hope to offer from this study is a preliminary look at those factors that could directly affect student performance and satisfaction. It was interesting to note that the majority of the factors affecting performance and satisfaction differed depending on whether one was enrolled in an online course or a traditional course. Why this is so still needs much investigation. Because this is a preliminary study into those factors that affect performance and satisfaction online, it's not surprising that there appear to be more questions than answers at this point. However, those questions that we have posed would be worth exploring, if we hope to learn how to improve the online learning experience for our students. Table 3 summarizes those strategies (and situations) that would be expected to increase student performance and satisfaction as suggested by our study.

We feel serious caution is needed before asserting that these factors would apply to all situations, and before anyone could do so, similar comparison experiments would need to be conducted by other instructors (e.g., to eliminate the potential instructor effect) in other contexts. Also, it must be kept in mind that the group used in this study consisted of reasonably savvy technology students with sufficient computer knowledge to remove any potential "technology hurdle" that might be experienced by non-computing students. It is possible that these factors may only be applicable to that type of major (e.g., MIS, CS, engineering).

Finally, as mentioned in the introduction, an important area of research considers student learning styles and its affect on student performance in an online class. We had hoped to gain some insight into why different students selected the traditional versus the online class, and asked students to indicate (in an open ended question on the initial survey) why they chose the section they did. Unfortunately, the overwhelming majority of students indicated "convenience of the time period offered" rather than learning style or other motivations as the reason for their choice. This result is the same as found by Dunning and Vijayaraman (6) with respect to MBA students. However, learning styles and other factors for success online remain important areas to consider in future research, so that faculty may ultimately have the ability to advise students appropriately when students must choose between online versus traditional courses.

TABLE 3
Strategies for Improving Student Performance & Satisfaction

<i>If the instructor were to...</i>		In a <u>traditional</u> class, one would expect to find higher...	In an <u>online</u> class, one would expect to find higher...
1	Enforce appropriate prerequisites	Course satisfaction	Course satisfaction
2	Effectively develop supplemental course material	Performance	Course satisfaction and Performance
3	Choose a particularly good textbook	Performance	Course satisfaction
4	Encourage student collaboration	Performance	Course satisfaction
5	Effectively utilize an electronic discussion board		Course satisfaction
6	Instill satisfaction in the students' ability to create solutions	Performance	Course satisfaction
7	Create practical computer lab experiences	Course satisfaction and Performance	
8	Succeed in having students study more often	Course satisfaction	
9	Have students who assess the instructor as being effective		Performance
10	Have students with a high level of work and/or study responsibilities	Course satisfaction and Performance	Course satisfaction
11	Have students who were satisfied with the course	Performance	Performance

REFERENCES

- Ayersman, D. and A. Minden. "Individual Differences, Computers and Instruction," **Computers in Human Behavior**, 11: 3/4, 1995, pp. 371-390.
- Beckett, H. "Blend Skills for a Better Class of E-Learning," **Computer Weekly**, January 20, 2004, p. 20.
- Cappel, J. and R. Haven. "Evaluating E-Learning: A Case Study," **Journal of Computer Information Systems**, 44:4, Summer 2004, pp. 49-56.
- Chen, Y., H. Lou and W. Luo. "Distance Learning Technology Adoption: A Motivational Perspective," **Journal of Computer Information Systems**, 42:2, Winter 2001-2002, pp. 38-43.
- Clear, T., A. Haataja, J. Meyer, J. Suhonen, and S. Varden. "Dimensions of Distance Learning for Computer Education," Working Group Reports from the Conference Integrating Technology into Computer Science Education on Innovation and Technology in Computer Science, Helsinki, Finland, 2000, pp. 101-110.
- Dunning, K. and B. Vijayaraman. "Motivational Factors, Characteristics, and Computer Skills of MBA Students in Web-Based Courses," **Journal of Computer Information Systems**, 41:2, Winter 2000-2001, pp. 95-98.
- Formell, C. and D. Larcker. "Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics," **Journal of Marketing Research**, 18:3, 1981, pp. 382-387.
- Formell, C., G. Tellis, and G. Zinkhan. "Validity Assessment: A Structural Equation Approach Using Partial Least Squares," **American Marketing Association Educators' Proceedings**, Chicago, IL, 1982, pp. 405-409.
- Hair, J., R. Anderson, R. Tatham, and W. Black. **Multivariate Data Analysis with Readings**, 3rd ed. New York: MacMillan, 1992.
- Igbaria, M., N. Zinatelli, P. Cragg, and A. Cavaye. "Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model," **MIS Quarterly**, 21:3, 1997, pp. 279-305.
- Kleinman, J. and E. Entin. "Comparison of In-Class and Distance-Learning Students' Performance and Attitudes in an Introductory Computer Science Course," **Journal of Computing Sciences in Colleges**, 17:6, 2002, pp. 206-219.
- Liu, M. and W.M. Reed. "The Relationship Between the Learning Strategies and Learning Styles in a Hypermedia Environment," **Computers in Human Behavior**, 10:4, 1994, pp. 419-434.
- Lohmoeller, J. **LVPLS 1.6 Program Manual: Latent Variable Path Analysis with Partial Least-squares Estimation**. Universitaet zu Koehn, Zentralarchiv fuer Empirische Sozialforschung, Cologne, Germany, 1984.
- Lu, J., C. Yu, and C. Liu. "Learning Style, Learning Patterns, and Learning Performance in a WebCT-Based Course," **Information and Management**, 40, 2003, pp. 497-507.
- Lundgren, T.D. and K.S. Nantz. "Student Attitudes Toward Internet Courses: A Longitudinal Study," **Journal of Computer Information Systems**, 43:3, Spring 2003, pp. 61-66.
- McDonald, M., B. Dom, and G. McDonald. "A Statistical Analysis of Student Performance in Online Computer Science Courses," **Proceedings of the 35th SIGCSE Technical Symposium on Computer Science Education**, Norfolk, Virginia: 2004, PP. 71-74.
- McFadzean, E. "Supporting Virtual Learning Groups. Part 1: A Pedagogical Perspective," **Team Performance Management**, 7:3/4, 2001, pp. 53-71.
- McFadzean, E. and J. McKenzie. "Facilitating Virtual Learning Groups: A Practical Approach," **Journal of Management Development**, 20:5/6, 2001, pp. 470-494.
- McFarland, D. and D. Hamilton. "Use of WebCT to Support Multiple Learning Models," European Applied Business Research Conference, Edinburgh, Scotland, 2004, CD-ROM Proceedings.

20. Morss, D. "A Study of Student Perspectives on Web-Based Learning: WebCT in the Classroom," **Internet Research**, 9:5, 1999, pp. 393-405.
 21. Nunnally, J. **Psychometric Methods**, 2nd ed. New York: McGraw-Hill, 1978.
 22. Olson, D. "A Comparison of Online and Lecture Methods for Delivering the CS1 Course," **Journal of Computing Sciences in Colleges**, 18:2, 2002, pp. 57-63.
 23. Piccoli, G., R. Ahmad and B. Ives. "Web-Based Virtual Learning Environments: A Research Framework and a Preliminary Assessment of Effectiveness in Basic IT Skills Training," **MIS Quarterly**, 25:4, 2001, pp. 401-426.
 24. Podsakoff, P. and M. Organ. "Self-reports in Organizational Research: Problems and Prospects," **Journal of Management**, 12:4, 1986, pp. 531-544.
 25. Priluck, R. "Web-Assisted Courses for Business Education: An Examination of Two Sections of Principles of Marketing," **Journal of Marketing Education**, 26:2, 2004, pp. 161-173.
 26. Reeves, T., P. Baxter, and C. Jordan. "Teaching Computing Courses – Computer Literacy, Business Microcomputer Applications, and Introduction to Programming Online Utilizing WebCT," **Journal of Computing Sciences in Colleges**, 18:1, 2002, pp. 290-300.
 27. Schipper, R. and P. Krist. "Consideration of Learning Style, Field Orientation, Format, Citizen Status, and Time in Online Internet Instruction," **Journal of Computing Sciences in Colleges**, 17:3, 2002, pp. 73-83.
 28. White, G. and F. Ploeger. "Cognitive Characteristics for Learning Visual Basic," **Journal of Computer Information Systems**, 44:3, Spring 2004, pp. 58-66.
 29. Zapalska, A., D. Shao and L. Shao. "Student Learning Via WebCT Course Instruction in Undergraduate-Based Business Education," Teaching Online in Higher Education (Online) Conference, 2003.
 30. Zhang, D., J. Zhao, L. Zhou, and J. Nunamaker, J. "Can E-Learning Replace Classroom Learning?" **Communications of the ACM**, 47:5, 2004, pp. 75-79.
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