STUDENTS' PERCEPTIONS OF THE EFFECTIVENESS OF VARIOUS ONLINE LEARNING FORMATS AS RELATED TO COMPUTER AND INFORMATION SYSTEMS COURSES

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ABSTRACT

Online learning has become a rapidly developing educational alternative. As a result, many universities deliver online courses across a variety of disciplines. However, few studies have evaluated students' perceptions of the effectiveness of online courses in Computer and Information Systems. This paper presents an extension of a previous study conducted by the authors at one University. The study examines online Learning in Computer and Information System's curricula. In order to further investigate the influence of various online learning formats on students, the current research includes student respondents from an additional university. The study addresses the following research questions: 1) Do students (who have taken online or hybrid courses) prefer the online delivery method to the on-ground delivery method?, 2) Can a demographic profile be developed that describes students who prefer an online format to a traditional on-ground format?, and 3) Which delivery method (i.e., online, partially online, on-ground with online supplements or on-ground) do students perceive as providing the best learning in regard to Computer and Information Systems subject areas?

Keywords: Online Learning, Distance Learning, eLearning, Web-Based Learning, Technology-Enabled Learning, CIS curricula

INTRODUCTION

There is little doubt that changes in higher education are being driven by technological advances in sophisticated communication technologies and the media-rich extensions of the Internet. These technological advances have prompted universities to use alternatives to the traditional classroom teaching and learning methods and have allowed new developments in the way faculty deliver course content to their students. These new developments have resulted in the growth of a new paradigm in pedagogy: technology-enabled learning environments. Further,

this new paradigm has enabled a proliferation of courses and programs in Computer and Information Systems (CIS) that are available over the World Wide Web.

A recent study by the Babson Survey Research Group reported that online enrollments have continued to grow at rates far in excess of the total higher education student population. Over 4.6 million students were taking at least one online course during the Fall 2008 term; a 17 percent increase over the number reported the previous year [1]. This report also noted that the 17 percent growth rate for online enrollments far exceeds the 1.2 percent growth of the overall higher education student population and that more than one in four higher education students now take at least one course online. Furthermore, online education has become an important long-term strategy for many postsecondary institutions. In short, it is imperative that institutions of higher education provide quality online programs [1].

These new delivery methods, however, move away from the traditional face-to-face relationship between a professor and students. Given this limitation, one important question that must be addressed is how will these new educational delivery methods impact student learning and student perceptions of learning in the area of CIS.

CIS curricula can present unique challenges to the delivery of course content in an online format. These challenges are not found in traditional business and management programs. Many courses in CIS curricula involve instruction in computer programming languages, which require hands-on development and extensive drill and practice. Other CIS courses entail theoretical concepts. Both of these elements can require an increased interaction with CIS faculty. It is not yet clear if online learning methods are conducive to the delivery of such course content. Furthermore, it is not clear as to what degree (if any) online learning is effective in delivering CIS-specific course content.

Although research has been conducted with business and management students in higher education to assess the perceived effectiveness of online learning, additional research needs to be conducted with CIS students.

This study is an extension of a previous study conducted by the authors at one private university that examined online-learning in a CIS curriculum. The current study includes data from students at a second public university and probes deeper into various online learning formats, as well as the students who enroll in the courses.

Specifically, the study was conducted to answer the following research questions:

1. Do students (who have taken online or hybrid courses) prefer the online delivery method to the on-ground delivery method?

2. Can a demographic profile be developed that describes students who prefer an online format to a traditional on-ground format?

3. Which delivery method (i.e., online, partially online, on-ground with online supplements or on-ground) do students perceive as providing the best learning in regard to CIS subject areas?

DEFINITIONS OF TECHNOLOGY-ENABLED LEARNING ENVIRONMENTS

Numerous terms have been used to describe technology-enabled learning environments including Computer-Based Learning, Web-Based Learning, Technology-Supported Learning, eLearning, Distance Learning and Online Learning. For the purposes of this research, the term *online learning* will be used to describe any higher educational course offering in which learning takes place partially or entirely over the Internet. This definition excludes purely print-based correspondence, videoconferencing, broadcast television or radio, videocassettes and stand-alone educational software programs that do not have a significant Internet-based instructional component.

A number of courses that incorporate Web-based supplements are frequently considered to be online courses. These supplements may include one or more of the following: online syllabi, course support software, Web-based assignments, electronic bulletin boards, threaded discussions and chat rooms, electronic books, simulations, text messaging, podcasting, "wikis," and blogs. Courses that make use of these Web-based supplements are not considered online courses for this research but are, instead, regarded as traditional courses with online components or supplements.

More specifically, online courses (i.e., the primary focus of this study) are those in which 100 percent of the course content is delivered online. On-ground courses (traditional or face-to-face instruction) include courses in which zero percent of the content is delivered online. The On-ground with Online Supplement category includes both on-ground instruction and web-facilitated courses. The remaining alternative, partially online (also called blended learning or hybrid learning) involves a course that is partially delivered online and partially delivered in the classroom (i.e., between 30 percent and 80 percent of the course content is delivered online).

STUDIES PERTAINING TO VARIATIONS OF WEB-BASED LEARNING FORMATS

Much of the literature addresses student achievement and satisfaction as two measures to assess the quality of online education. Although, studies centered on academic achievement have shown mixed reviews; some researchers indicate that online education can be at least as effective as traditional classroom instruction. Research studies on student satisfaction in online courses or programs reported both satisfied and dissatisfied students.

Several studies related to courses in CIS show that performance is the same, regardless of whether a course is taken traditionally or online. Kleinman and Entin [5] contrasted in-class and online teaching from both the student and instructor perspective based on two sections of 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 traditional and the online students. Another study undertaken by Lu, Yu and Liu [6] found that none of the factors, except ethnic groups, showed any significant impact on students' learning performance in graduate Management Information Systems classes. Finally, in a study of online instruction utilizing the WebCT versus traditional sections of Computer Literacy, retention and grade distribution was found to be the same for both groups [10]. However, one study concluded that computer

science students enrolled in a traditional networking course outperformed the computer science students enrolled in the online section [7].

Several studies indicated mixed results. Analysis of the data in a study undertaken by Ury illustrated a significant difference between the online student grades (81 percent) and the traditional student grades (85 percent) in a Management Information Systems course [13]. The same held true of a beginning programming course: online student grades averaged 78 percent while the traditional student's average score was 84 percent. These results strengthen the argument that online students are missing something that the classroom students are not. Another, more comprehensive study, involved seven courses in Computer Science and Information Systems showed mixed results: In some courses, online students have not performed as well as traditional students [12]. The authors found that in four upper-level courses (Programming Languages, Survey of Algorithms, Computer Organization II and Theory and Implementation of Programming Languages) taken by computer science majors, no significant differences in performance were found. However, three courses (Introduction to Programming Visual Basic, Management Information Systems and Database Systems) taken by students from many majors and minors showed significant differences in student performance. The authors concluded that some students taking an online course (who are academically equal to students taking a traditional course) are satisfied to trade a low grade for convenience. Additionally, students taking a course outside of their major do not want to spend much time on the course and will choose the online format because they do not have to attend class.

The results of a study that involved business students indicated that students perceived online courses as having a significant relative advantage over traditional methodologies. These advantages include a better fit with course schedules, saving time and enabling students to take more courses. The students indicated that they did not believe that they learned more in an online course and had that they had concerns related to being able to contribute to class discussions. However, the students' attitudes tended to be contradictory when comparing online to traditional methodologies. Ironically, they reported that they *preferred* traditional courses to online courses, although they *wanted* more online courses [9].

Although students' perceptions of the advantages of online education may be positive, there are also disadvantages for students who have never taken an online course or who have little computer experience. A study by Wang, Newlin and Tucker [14] found that many students taking Web-based courses expressed feelings of intense anxiety about the technology. In addition, it was found that there are disadvantages in online courses for individuals who need a great deal of structure. Online courses are often self-paced and students who lack self-discipline may struggle.

A comprehensive study by Zhao, Lei, Yan and Tan [15] investigated factors that affect "effective" distance education by applying meta-analysis to 51 articles meeting specific selection criteria. The empirical findings varied greatly and were not found to be significantly different from those of traditional instructional methods. However, the authors concluded that not all implementations of distance education were "created equal," which may be attributed to the small differences in effectiveness. Their findings also offer evidence that not all content is appropriate for distance education; human interaction is critical and some students may not be able to benefit from the distance education delivery method.

A recent comprehensive 12-year experimental and quasi-experimental study utilizing meta-analysis conducted by the U.S. Department of Education found that blends of online and face-to-face instruction has been more effective, which provides a rationale for the effort required to design and implement blended approaches [8]. This research also indicated that, despite what appears to be strong support for online learning applications, the studies in this meta-analysis do not demonstrate that online learning is superior as a medium. In many of the studies showing advantage preference for online learning, the online and classroom conditions differed in terms of time spent, curriculum and pedagogy.

In their study involving undergraduate management courses, Drennan, Kennedy and Pisarski [3] found that research subjects believed it important to achieve a balance between the use of traditional face-to-face lectures and emerging technologies. In another study involving undergraduate accounting students, researchers found that the hybrid or blended approach to online learning was superior to course content delivered entirely online. Specifically, the researchers determined that using technology as an exclusive course delivery method was considered insufficient. According to the authors, "Group learning and face-to-

face tutorials were vital to both student confidence and the learning process" [4].

Finally, industry has typically favored the hybrid approach, choosing a combination of online learning and on-ground instruction. Sometimes labeled a "blended approach," the combination of classroom education and online learning has been used by industry to maintain educational quality and to foster better experiences in interpersonal relationships [11].

METHODS AND PROCEDURES

The current research involved the administration of an online survey instrument that consisted of 23 closed-ended questions. This survey was administered during the academic years 2008 to 2010 to students enrolled in CIS courses at two universities. One university was private and the other was public; both of which were medium-sized institutions. The respondents of the private university consisted of undergraduate, graduate and post-graduate students; whereas, the respondents from the public university consisted only of undergraduate students. A total of 376 students responded to the survey. The students completed the online survey on their own time and submitted their anonymous results directly into an electronic database for analysis. The survey results were analyzed using SPSS statistical software. Statistical frequencies and statistical tests were used to answer the research questions posed in the introduction section.

RESULTS

In order to answer the first research question (i.e., do students who have taken online or hybrid courses prefer the online delivery method to the on-ground delivery method?), the survey instrument asked participants: "I have taken (or am currently taking) a course that is completely online or is partially online?" The results were then compared against a second question: "If given a choice to take the same course in an online format or an on-ground format, would you select the online format?" The results are summarized in APPENDIX A, Table 1.

The Pearson Chi-Square test was used to determine the statistical significance of any existing difference between those students who have taken an online course (complete or partial) and those students who have not.

As Table 1 illustrates, taking an online course in the past *does not* influence one's preference for online

courses verses on-ground courses. However, those individuals who have *not* taken an online course in the past indicated that they prefer a traditional *on-ground* delivery method as opposed to an online delivery method. The Pearson Chi-Square value indicates that this relationship is significant at the .01 confidence interval (x^2 = 13.74, p = .000). This result indicates that students, who have not taken an online course, tend to hold a *negative* perception of online courses.

In order to answer the second research question (i.e., can a demographic profile be developed that describes students who prefer an online format to a traditional on-ground format?), the survey instrument asked participants numerous demographic questions. The results from these survey questions are summarized in APPENDIX B, Table 2.

As the results in Table 2 indicate, a number of demographic factors appear to differentiate a student who prefers any online format over a traditional (i.e., on-ground) format. Students at the undergraduate, graduate and doctorate levels did not prefer the online format. Whereas, those who were enrolled in Adult Continuing Education (ACE) or the Integrated (Bachelor's and Master's) degree format preferred online. The most significant difference in preference existed with Doctorial students, who preferred on-ground to online 3:1. The sex of the student had no impact on the preference of delivery method. All age ranges preferred on-ground, however, the most significant difference in preference existed in the 18 – 21 age range and the 51 – 60 age range. Similarly, regardless of employment status, on-ground was preferred to online; however, those not employed preferred traditional instruction at the highest level. Part-time students seemed to have a slight preference for online over on-ground; whereas, full-time students preferred on-ground to online 60 percent to 40 percent. Both resident and commuter students preferred on-ground to online; however, commuters showed a slight preference for online. As previously discussed in detail in question one, those students who have not taken an online course in the past strongly prefer the on-ground format. In terms of student location (except for those students residing 6-10 miles from campus) all students preferred on-ground.

In order to answer the third research question (i.e., which delivery method: (online, partially online, on-ground with online supplements or on-ground, do students perceive as providing the best learning in regard to CIS subject areas?). The survey instrument asked participants to select the instructional method of

course content delivery that provides the best learning for each grouping of CIS-related topics. The available delivery methods were: on-ground, completely online, partially online and on-ground with online supplement. The results from these survey questions are summarized in APPENDIX C, Table 3.

Most research participants selected *On-Ground* as their primary course delivery method to provide the best learning (i.e., 10 of the 11 subject areas). Furthermore, *Completely Online* was the least selected delivery method for all subject areas, with the exception of the *Office/Productivity Software* category.

CONCLUSIONS

The present research surveyed undergraduate, graduate and post-graduate students to examine the questions: 1) Do students (who have taken online or hybrid courses) prefer the online delivery method to the on-ground delivery method?, 2) Can a demographic profile be developed that describes students who prefer an online format to a traditional on-ground format?, and 3) Which delivery method (i.e., online, partially online, on-ground with online supplements or on ground) do students perceive as providing the best learning in regard to CIS subject areas*?*

As presented in the results section, a relationship does exist between taking an online class in the past and preference for delivery method. Taking an online class does *not* directly influence a student to take another online class; however, students who did not take an online class are *discouraged* from trying the online format. One conclusion may be that students are unfamiliar with the online format and feel uncomfortable trying that delivery method.

If a profile must be determined from the demographic data, the student who would be most likely to take an online course would have the following demographic characteristics: non-traditional or Integrated student, 31 – 40 years of age, has full-time job, enrolled as a part-time student, commutes to school, and lives 6 – 10 miles from campus.

In regard to the last research question, respondents perceived a combination of *Online* and *On-Ground* methods as providing the best learning. Specifically, respondents reported *On-Ground*, *On-Ground with an Online Supplement,* and *Partially Online*, as formats which provide better learning than the Completely Online format. The only exception to the above findings involved the *Office/Productivity* Software

subject area. Regarding *Office/Productivity Software*, the respondents felt that Completely Online provided the best learning. This inconsistency may be explained by the fact that many of today's students enter college with prior working knowledge of spreadsheet, word-processing and presentation software.

Finally, the inherent content of CIS courses must be considered in light of the current research findings. The current study surveyed students who were specifically enrolled in CIS programs. Since CIS programs involve content that is quantitative and technically-oriented, some students may have difficulty comprehending such content in an online format. The technical nature of such course content may explain why CIS students in the current study did not prefer an online method of course delivery.

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APPENDIX A

Table 1: Chi-Square Test Results

Cross tabulation of Prior Online Course and Course Delivery Method

Preference of Course Delivery Method	Have Taken Online Course in the Past?		χ^2	Φ
	Yes	No		
Prefer Online Delivery Method	120 (1.7)	40 (-2.3)	13.74**	.19
Do Not Prefer Online Delivery Method	122 (-1.4)	94 (1.9)		

*Note: ** = p ≤ .05.   Adjusted standardized residuals appear in parentheses below group frequencies.*

APPENDIX B

Table 2: Demographic Profile of Students Who Prefer/Do Not Prefer Online Format

Demographic Profiles of Respondents

Demographic	Prefer Online Format		Do NOT Prefer Online Format		Row Total	
	Count	Percentage	Count	Percentage	Count	Percentage
Student Level						
Undergraduate	82	42.5%	111	57.5%	193	51.3%
Graduate	35	43.2%	46	56.8%	81	21.6%
Doctorate	14	24.1%	44	75.9%	58	15.5%
ACE	25	65.8%	13	34.2%	38	10.1%
Integrated	4	66.7%	2	33.3%	6	1.6%
Sex						
Male	112	42.4%	152	57.6%	264	70.2%
Female	47	42.3%	64	57.7%	111	29.6%
Age range						
18-21	43	39.8%	65	60.2%	108	28.7%
22-30	56	45.5%	67	54.5%	123	32.8%
31-40	39	47.6%	43	52.4%	82	21.9%
41-50	18	40.9%	26	59.1%	44	11.7%
51-60	4	26.7%	11	73.3%	15	4.0%
61 or older	0	0.0%	4	100.0%	4	1.1%
Employment Status						
Part-Time Job	49	40.5%	72	59.5%	121	32.3%
Full-Time Job	89	45.4%	107	54.6%	196	52.1%
Not Employed	22	37.3%	37	62.7%	59	15.7%
Enrollment Status						
Full-Time	120	40.1%	179	59.9%	299	79.5%
Part-Time	40	51.9%	37	48.1%	77	20.5%
Living Status						
Resident	18	34.0%	35	66.0%	53	14.1%
Commuter	142	44.0%	181	56.0%	323	86.1%
Previous Online Course						
Yes	120	49.6%	122	50.4%	242	64.4%
No	40	30.3%	94	69.7%	134	35.7%
Distance from Campus						
0 - 5 Miles	31	37.8%	51	62.2%	82	21.8%
6 - 10 Miles	35	54.7%	29	45.3%	64	17.0%
10 – 15 Miles	22	36.1%	39	63.9%	61	16.2%
15+ Miles	72	42.6%	97	57.4%	169	44.9%

APPENDIX C

Table 3: Best Learning by Delivery Method and Subject Area

Delivery Method Providing Best Learning

Subject Area	On-ground		Completely Online		Hybrid/Partially Online		On-ground with Online Supplement	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Software Development/Programming	149	39.6%	39	10.4%	95	25.3%	93	24.7%
Network Administration/Security	140	37.2%	47	12.5%	92	24.5%	97	25.8%
Web Development/Web Programming	115	30.6%	66	17.6%	114	30.3%	81	21.5%
Multimedia/Graphics	120	31.9%	65	17.3%	108	28.7%	83	22.1%
Office/Productivity Software	100	26.6%	114	30.3%	88	23.4%	74	19.7%
Project Management	135	35.9%	61	16.2%	82	21.8%	98	26.1%
System Analysis & Design	144	38.3%	44	11.7%	89	23.7%	99	26.3%
Certification Courses (e.g., A+,N+)	142	37.8%	67	17.8%	91	24.2%	76	20.2%
Operating Systems	134	35.6%	64	17.0%	95	25.3%	83	22.1%
Database	158	42.0%	49	13.0%	81	21.5%	88	23.4%
Business Intelligence (e.g. Data Warehousing, Data Mining)	135	35.9%	51	13.6%	100	26.6%	90	23.9%