DISTANCE DELIVERY: IMPACT ON LEARNING

Michael K. Swan, Washington State University

Abstract

Among the various differences between asynchronous interactions and face-to-face classroom communication, one vital difference involves those that possibly affect the student's ability to learn. The effectiveness of courses in facilitating instruction and learning is a key concern of all educators involved in or contemplating conducting distance courses. This manuscript explores the impact on learning in asynchronous internet/web based courses compared to learning in a face-to-face classroom. Specifically, the study examines student perceptions of the effectiveness of an active-learning, asynchronous web based course relative to that of a face-to-face classroom-based course. Students were asked to compare effectiveness on a variety of dimensions. These research results are consistent with earlier research related to learner outcomes along several measures, mainly with regard to students' positive attitudes about their learning in an asynchronous web based course. Additionally, the findings here offer new evidence that learning can also be enhanced with an active learning format in a distance delivered course.

Introduction

Currently refined and affordable technology has provoked numerous universities to offer a variety of alternatives to face-to-face classroom instruction. These alternatives include distance delivery of courses using interactive television, video conferencing, two-way video and audio, and satellite to remote classrooms or learning center sites and both synchronous and asynchronous web based courses. The least traditional of these alternatives utilizes asynchronous communication by which communication is mediated by technology and is not dependent on instructors and students being present in the same location at the same time. By using asynchronous communication, students can work at their own pace and at various locations they are able to control (Berge, 1999 and Swan, 1997). Many of the face-to-face course activities can be recreated technologically through electronic conferencing, email, discussion boards, and the web. In fact, the use of the internet or web sites to deliver distance education has grown faster than any other instructional technology (Stringer & Thompson, 1998).

Another element of involvement through technology is the balance of active versus passive participation. This is the extent to which the student is expected to actively participate in the learning process and is a design preference of both face-to-face courses and web based courses. One can imagine a true lecture/notes/test environment as being on the passive end of the continuum and, say, an independent study course requiring entirely self-directed research culminating in a term project as being on the opposite end of the continuum. Of course, some combination of passive/active is most common. Ideally, the design alternative is motivated by the nature of the course and its identified learner outcomes.

There are several differences between asynchronous interactions and face-to-face course communication, but the most critical differences involve those that can affect a student's ability to learn (Winiecki & Chyung, 1998). In a face-to-face college course there is agreement of space, time, and sequential events. A distance education course lacks all of these (Edelson, 1998). Many educators worry that without face-to-face course discussions and student interactions, instructors cannot provide real guidance and feedback (Swan & Jackman, 1999; Jaffe, 1997). Questions related to the effectiveness of distance delivered technology-based courses in facilitating instructional tasks pose significant concerns for all educators involved in or contemplating conducting such courses.

Purpose / Objectives

Answers to these questions ought to depend on the extent to which technology is used to mediate course or laboratory instruction. In a web based course students must be an active participant in the learning process. In contrast to the passive learner who sits in the course and receives information from a lecture or discussion group, the active learner must aggressively seek and understand packets of knowledge to attain the core outcomes or skills identified in the course. Thus the purpose of this research study was to investigate the impact on learning of asynchronous web based courses as compared to face-to-face course learning. The specific objective of the research was: to examine student perceptions of the effectiveness of an active-learning, distance delivered asynchronous web based course compared to that of a face-to-face lecture based course. Students are asked to compare effectiveness on a variety of dimensions.

Some disciplines and courses lend themselves well to a passive learning environment. Others, like Soil fertility or GPS, offer an excellent opportunity for active learning, particularly learning through the web based interactions. Soil Fertility exists to provide information that can be used to make crop management decisions. In a real sense, soil fertility is synonymous with information access and utilization. A major player in global information access and dissemination is the World Wide Web (WWW), making the WWW an ideal medium around which to construct a soil fertility course. What's more, unlike the "facts" in history, soil fertility operates in an ever-changing environment. In fact, the information that soil fertility specialists utilizes is itself changing at a dizzying rate. In the next 10 years, it is estimated that the information on the WWW will double every two weeks. As a result, agriculturists —and agricultural students—must lower their tendency to rely on learning existing information and move toward learning how and where to locate and incorporate new information. As described below, the courses on which this research study is based were upper level agricultural courses with multiple sections that utilize an active learning model, designed to encourage and teach students to actively seek out information needed to meet specific course outcomes.

Theoretical Framework - Distance Delivery

Relevant research involving distance delivery of courses has shifted from a focus on the technology itself to the effects on student learners and learning. Specifically, this research can be classified generally into four categories: interaction, active learning, student perceptions, and learning outcomes.

Interaction

A set of research has centered on the value of interaction to learning. Most educators feel that interaction is a necessary component of learning. According to Jaffe (1997), "Learning is an essentially social process that requires interaction for the purpose of expression, validation, and the development of the self as a knowledgeable learner". Following this reasoning, a compelling question is whether or not interaction can be effectively achieved in a distance education course. A second group of research into distance education courses suggests that faculty awareness is one of the most important elements of a successful achievement of meaningful interaction in a distance education course (Larison, 1997, Swan, 1997). For that reason, students must be connected to some medium that allows for feedback, discussion, and encouragement so that interest, attentiveness, and commitment are maintained (Swan & Jackman, 1999).

Research also recommends that courses should be designed so that regular interaction occurs between instructor and students, students and students, and students and their learning environment (Berge, 1999). This often involves concentrated time and preparation by the instructor to provide a learning environment that allows for adequate opportunity for appropriate interactions. Soo and Bonk (1998) revealed that, even though distance delivery instructors rated real-time interaction lowest, learner-centered learning rated highest. This indicates that the instructor has an important role in distance delivered learning. Technology utilizing discussion or chat rooms, e-mail, video conferencing, and listservs enables interaction to occur. Many feel this technology must be enhanced and used to its capacity to compensate for the lack of human interaction and face-to-face discussions.

Active Learning

A further group of research is focused on the "active learning" aspect of many distance delivered courses. One main rationale of teaching in postsecondary education is to aid students in moving from a point of reliance on the instructor to one of self-reliance and experiential learning. Rowntree (1986) believed that students must do more than simply receive information: "They also must engage and participate in activities and tasks that enhance understanding." One method of assisting students in this transition is by asking them to demonstrate an understanding of the concepts involved through writing (Swan, 1997). Asynchronous courses usually require more conceptual writing and literacy skills than the face-to-face course (Larison, 1997). Additionally Larison reported that 95% of students surveyed felt that the asynchronous course required a greater amount of work than the face-to-face lecture based course, and 83% of the students felt the asynchronous course required an equal or higher quantity of writing.

In a face-to-face classroom, low levels of class participation are sometimes unavoidable and accepted as the norm. This occurs because a few self-selected students carry the participation burden of the entire class. Often, the same group of students fields the questions while the remaining students rely on those students to respond. On the other hand, in the asynchronous course, a single student does not alleviate other students from the responsibility to participate (Swan & Jackman, 1999). Students who are not sufficiently self-disciplined and motivated, or who are not prepared for the heavy workload, may have more difficulty with this type of course.

Student Perceptions

A third group of research suggests that student reactions to distance delivered learning is influenced by several student participant characteristics such as attitudes toward technology, maturity, and other demographic characteristics. For instance, it has been suggested that students with a thorough understanding of electronic communication have a more positive attitude toward the distance-learning course (Irani, 1998). Swan (1997) explained that students who perceive that the distance delivered course is information-rich and sufficient to the instructional tasks made greater use of the learning environment. In Swan's study, 80% of the survey items relating to instructional delivery and learning opportunities receive higher ratings by students taking an distance delivered course than students taking the same course in a face-to-face setting. Lack of contact with the instructor is the main concern mentioned by 50% of the distance students.

Edelson (1998) found that the most difficult hurdles to overcome in an distance delivered course involved the anxiety caused by "the disunities of time, space and action, and the numerical superiority of student comments to those of the instructor." Students who are more mature and somewhat confident in their ability to express themselves have the least anxiety concerning the online course (Larison, 1997). Distance students also perceive that interaction and student performance in a video conferencing course are superior to the face-to-face classroom (Larison, 1997). Student success in a web based course requires vigilant attention to the student audience as well as careful selection of instructional design (Swan, 1997).

Learning Outcomes

A fourth group of research focuses more exclusively on the relative attainment of learner outcomes. Media evaluation studies indicate there is no significant difference in the educational effectiveness of media type (Irani, 1998). Several studies compared performance of students enrolled in face-to-face and interactive video conferencing classrooms. Results generally indicated that no significant differences in overall student performance or attitudes were revealed. Wegner and others (1999), reported no significant difference in test scores between the students enrolled in face-to-face courses and those enrolled in distance delivered courses despite the fact that the distance students did not attend a single on-campus lecture.

Several research studies comparing student achievement tend to show no significant difference, some studies indicate students have a more positive attitude about the course and their learning in a distance delivered course (Soo & Bonk, 1998; Wegner et al, 1999). In Swan's study (1997) two-thirds of the students surveyed about their distance delivered course liked the convenience and wealth of information available through the Web. Students particularly like the flexibility a distance delivered course offers as well as their ability to control the pace of instruction (Berg, 1999, Edelson, 1998).

Methods / Procedures

Collection of data was accomplished using a 12-item survey instrument prepared to determine students' perceptions of the effectiveness of an active-learning, asynchronous web based course with that of a face-to-face on-campus course. The population selected for this study was all students in a asynchronous distance delivered course being taught at Washington State University. The specific courses used in the investigation were both sections of two agricultural technology and management courses taught in Spring and Summer semesters of 2001 and Spring semester of 2002. The two courses followed virtually an identical asynchronous format. For purposes of comparison used in the study, the courses were thought to represent an appropriate contrast to a face-to-face lecture-based course for several reasons. One is the asynchronous format: Students had considerable flexibility as to when and where they completed the course assignments. Two, the courses had no lectures and no textbook. Three, the courses embodied the active learning notion, being designed around a series of electronic case studies which students were expected to vigorously seek out information needed to solve each case. In fact, the process of learning how and where to locate information is a vital outcome of both courses. The presumption of operational similarity between the courses and sections was confirmed by a comparison of responses. A chi-square analysis indicates no differences between the courses and sections in any of the responses at the .05 level of significance.

A five-point Likert type scale was provided for each question in the survey instrument, with 5 representing a high level of agreement and 1 representing a high level of disagreement. The midpoint of the scale, 3, was considered to represent no preference and was deemed the comparative standard for the study. Demographic information (age, educational level, gender, academic major, and student status) was also requested. Distance delivery faculty in the College of Agriculture & Home Economics and one additional course, not involved with the survey, was selected to review the draft questionnaire. Suggestions for improvement were incorporated into

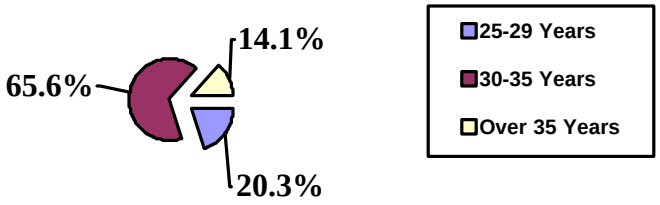
the final questionnaire, a total of 72 students were enrolled, with 64 useable questionnaires being returned.

Mean responses for each of the statements regarding student perceptions were calculated. A t-Test for independent samples was administered to the mean responses of each to determine whether the responses were statistically different from 3, the neutral midpoint of possible responses. Frequencies and percentages for each demographic factor were also calculated.

Findings

Respondents were asked to indicate their age, classification, gender, academic major, and student status. Of the 64 students indicating their gender, 33(51.6%) were female; 31 (48.4%) were male. As shown in Chart 1, the highest percentage (65.6%) of the 64 students indicated their age was in the range of 30 to 35 years, (20.3%) were 25 to 29 years. Only 14.1 percent were over the age of 35.

Chart 1: Age of Respondents



As shown in Table 2, most respondents were either agricultural education or agricultural technology & management certified majors and were United States citizens.

Table 2 Academic Major and Status of Respondents

Academic Major	Frequency	Percent
Agricultural Education	31	48.4
Agricultural Technology & Management	24	37.5
Agriculture - General	5	7.8
Other Agriculture	4	6.3
Student Status	**Frequency**	**Percent**
U.S. Resident Student	56	87.5
International Student	8	12.5

Respondents were asked to rate each of the elements on a five-point scale with five representing fully agree and one representing fully disagree. For analysis, the responses were separated into two categories. The responses that relate to learner outcomes are reported in Table 3. Since all t-values are greater than 1.997 (the comparison value for a population of 64 and an alpha of .05), each response is considered significant. The element of learner outcome with the highest mean response concerned an overall feeling of the use of the web as an effective learning tool. The next highest mean response concerned whether the student would take another distance delivered

course. However, the element of learner outcome with the lowest mean response concerned the ability to better learn the material as compared to learning in the face-to-face course setting.

Table 3 Identified Learning Outcomes

Learning Outcomes	Mean*	T – Value**
Learn the material	3.34	2.93
Meet course objectives	3.49	5.19
Develop writing skills	3.58	5.42
Motivated to complete the assignments	3.62	4.71
Gain new skills	3.78	7.52
Used the web regularly	4.13	9.62
Would take another distance delivered course	4.18	11.39
Feel use of the web is effective learning tool	4.31	15.49

*5 = fully agree; 1 = fully disagree
** = the response is significant at p=.05

Four survey questions related to communication effectiveness. Communication in the course was conducted between the instructor and individual students only, achieved through almost daily two-way email correspondence and one-way message posting from the instructor on the course "discussion or chat room." Responses to these questions are shown in Table 4. As was the case for learner outcomes, the responses to each communication effectiveness question are significant. The element of communication effectiveness with the highest mean response concerns e-mail as an effective means of communicating to the instructor about class issues. On the other hand, the element of communication effectiveness with the lowest mean response concerns the ability to discern the course objectives when communication effectiveness is compared to discerning course objectives in the face-to-face classroom setting.

Table 4 Communication Effectiveness

Communication	Mean*	T -Value**
Discern course objectives	3.41	5.33
Prefer e-mail to telephone for communicating with Instructor	3.96	6.54
Discussion or Chat Room is a good way to communicate	4.29	11.73
E-mail is effective communication means	4.49	14.96

*5 = fully agree; 1 = fully disagree
** = the response is significant at p=.05

Conclusions

The study yields results consistent with previous research related to learner outcomes cited above. Specifically, students indicated the use of the distance delivered course had helped them gain new skills as compared to the face-to-face course setting (mean of 3.78). Similarly, most students responded positively concerning whether they would take another distance delivered

course. This is consistent with several studies which indicate that students have more positive attitudes about their learning in an online course. Since the population of the study consists of students somewhat familiar with electronic technology, these results also are consistent with previous research in which students with a greater understanding of distance communication and more cognitively mature students were more comfortable with and performed better in distance delivered courses. Results, though, are somewhat inconsistent with previous research that indicated no significant difference in learning performance, as cited above. Students responded positively to the question concerning the use of the web as an effective learning tool.

Students had a somewhat less favorable response when comparing their ability to learn the material in the distance delivered course to their ability to learn the material in the face-to-face setting. Responses related to students' motivation to complete the assignments in the distance delivered course also are not as convincingly positive. In the distance delivered sections of the course, these two learning outcomes involve active learning as compared to a more common use of passive learning in the face-to-face course. Since active learning involves more time, energy, and self-reliance, the response could be the result of the difficulty adapting to this kind of learning involved rather than the technology used.

Concerning communication effectiveness, results indicated that students felt that e-mail is an effective means of communicating with the instructor. Students also had a positive response to the discussion or chat rooms for communicating. However, students were less favorable toward their ability to distinguish course objectives as compared to the face-to-face setting. This might be due to the fact that course objectives are relatively easy to relate in either learning format.

The findings of this study are in common agreement with earlier research indicating that students have a more positive attitude about the course and their learning in a distance delivered course. This study does offer new evidence that learning can be enhanced with an active learning format in a distance delivered course. It is possible that the favorable attitudes of students surveyed toward their distance learning experience were in part due to this being their limited exposure to courses of this type. Whether incremental benefit persists beyond a single course is not answered by this study. Additional research is necessary to determine whether most or all of the benefit is gained with one course or whether second and subsequent courses, similarly structured, would be viewed as favorably, or even more favorably, than the first such course.

References

Berge, A. L. (1999). Interaction in Post-Secondary Web-Based Learning. *Educational Technology, 18* (1), 5-11.

Edelson, P. J. (1998). *The Organization of Courses Via the Internet, Academic Aspects, Interaction, Evaluation, and Accreditation.* Educational Resources Information Center, 2-15. U.S. Department of Education, Office of Educational Research and Improvement. (ERIC No: ED421644)

Irani, T. (1998). Communication potential, information richness and attitude: A study of computer mediated communication in the ALN classroom. *ALN Magazine, 2* (1), 1-12.

Jaffe, D. (1997). Asynchronous Learning: Technology and Pedagogical Strategy in a Distance Learning Course. *Teaching Sociology, 25* (3), 262-277.

Larison, R. D. (1997). *The Lecture Really Is Dead: Using Electronic Media to Teach On-Campus Courses.* Educational Resources Information Center, 2-8. U.S. Department of Education, Office of Educational Research and Improvement. (ERIC No: ED430525)

Rowntree, D. (1986). *Teaching Through Self-Instruction.* New York: Nichols Publishing Company.

Soo, K. and Bonk, C. (1998). *Interaction: What Does It Mean In Online Distance Education?* Educational Resources Information Center, 2-8. U.S. Department of Education, Office of Educational Research and Improvement. (ERIC No: ED428724)

Stringer, S. B. and Thomson, J. S. (1998). *Evaluating for distance learning: Feedback from students and faculty.* Educational Resources Information Center, 2-7. U.S. Department of Education, Office of Educational Research and Improvement. (ERIC No: ED422879)

Swan, M. K. (1997). Research and Teaching from the WEB / Multimedia. *The Journal of Vocational Education Research, 22*(3), 149-152.

Swan, M. K. and Jackman, D. H. (1999). Student Achievement in Distance Education Courses. *Journal of Technical Education*.

Wegner, S., Holloway, K. C., and Garton, E. M. (1999). The Effects of Internet-Based Instruction on Student Learning. *Journal of Asynchronous Learning: JALN, 3* (2), 1-9.

Winiecki, D. J. and Chyung, Y. (1998). *Keeping the Thread: Helping Distance Students and Instructors Keep Track of Asynchronous Discussions.* Educational Resources Information Center, 2-9. U.S. Department of Education, Office of Educational Research and Improvement. (ERIC No: ED422886)