

Student Perceptions and Learning Outcomes in Asynchronous and Synchronous Online Learning Environments in a Biology Course

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Abstract

This paper presents data from a two-semester study of the effects of distance learning on student achievements as well as their perceptions and attitudes towards online education. Students' course grades and satisfaction survey results from two internet-based instructional groups were compared. The results showed no significant difference in course grades and student satisfaction between the two online groups.

Keywords: Asynchronous, Synchronous, Distant Education, Learning Outcomes, Internet-based Environments.

Introduction

Over the last decade or so, the Internet has made an indelible impact on higher education by enabling the phenomenal growth of online education. Most colleges across the country now offer fully online (asynchronous) courses and more recently blended (synchronous) courses (Gomory 2001, Otte et al. 2006). Asynchronous interactivity is where participants are separated geographically and are not engaged at the same time, as they would in a face-to-face or telephone conversation. Rather, exchanges are mainly by e-mail and there is some elapsed time between message exchanges. In a synchronous format there is a blending of face-to-face and online learning (Mayadas 2006). These modified learning environments created by web-based technologies, not only eliminate barriers of time, space and learning styles, providing increased access to higher education, they challenge our traditional styles of teaching and learning (Swan 2006).

Providing quality learning experiences is the goal and responsibility of all educational programs, assuring student, faculty, and program success. As online education is evolving, new questions are being raised concerning ways to develop effective teaching and learning methods. Recent studies on distant education have shifted from the focus on technology itself to its effects on learners (Hiltz 1997, Sherman 1998, Wegner et al. 1999, Loomis 2000, Shapley 2000, Bangert 2006, Dziuban et al. 2006, Otte et al. 2006). There are four categories of this recent research: interaction, active learning, student perceptions, and learning outcomes. One of the most important aspects of online education is how the student themselves perceive the online learning experience. This study was designed to compare how student perceive their online learning experiences on internet-based environments in a biology course.

Statistical analysis

Standard descriptive statistics were used in all analysis. Calculations and data analysis were carried out using JMP 5 (MAC OSX version). A one-way analysis of variance (ANOVA) was used to test for differences between the 2 groups at 95 % confidence limit.

Methods

Three formats of a Medical Terminology course (non-laboratory course) in the Biology Department were selected for this study: an asynchronous course, a synchronous course and a traditional course (control group). Course content was the same for all three sections and a different instructor taught each course. The control group (N=40) received instruction in a traditional lecture, question-answer, small group activity format. Instruction was delivered during fourteen two-hour periods for each semester. Both online formats used a Blackboard platform. The asynchronous course was designed using a course cartridge by Marjorie Willis and the synchronous course was designed by the instructor that taught the course. The asynchronous group (N=38) attended no classes except for a one-hour orientation at the beginning of the semester and for a comprehensive final exam at the end of the semester. They were also required to take a timed weekly quiz for the chapter covered. Additionally, topics were posted weekly on a discussion board by the instructor for each student to respond; students can also respond to each other. The synchronous group (N=39) attended classes for one-hour a week for group discussions and the second hour was online. They were also required to take a timed weekly quiz and a comprehensive final exam. Grading in both online formats weighed the same, quizzes 67% and final exam 33%. Students in the two internet based sections were surveyed at the beginning and at the end of each semester.

Results

Students surveys administered at the beginning of the semester (N=117) showed: males 24%, females 76%, average age was 29 years ranging from 18-41 years of age, students majors were Nursing 34%, Nuclear Medicine 33%, Medical Assistant 20%, Radiologic Technology 8%, Biology 5%, International students on visa 10%, students taking their first online course 93%, students with a computer at home 95%, students that use e-mail regularly 99%, working students 76%, students with a previous biology course 67%, students living in the Bronx and neighboring boroughs 93% with 7% living in Westchester county.

To assess student perceptions of the course a survey of ten questions (see Table 1) was administered at the end of each semester for the two online courses (N=77). 5=Fully agree 1=Fully disagree.

Table 1. Survey used to assess student perceptions

Survey Questions	Means Synchronous	Means Asynchronous
1. Feel you gain new skills	4.9	4.4
2. Feel you develop your writing skills	4.0	3.8
3. Feel course objectives were met	4.9	4.5
4. Feel you learned the material	4.8	4.1
5. Feel the use of the internet is an effective learning tool	4.8	4.1
6. Feel you were motivated to complete assignments	4.8	4.3
7. E-mail is an effective communication means	4.4	4.7
8. Prefer e-mail for communicating with instructor	3.9	4.1
9. Communication with instructor was effective	4.9	4.5
10. Will take another internet course	4.4	4.0

To assess student achievement of the course, the final grade points (GP) for each student was used. These results are shown in Table 2.

Table 2. Assessment of student achievement.

Group	N	Mean (GP)	Range	Std. Dev.
Control	40	2.5	0.0 - 4.0	1.3
Synchronous	39	3.3	2.5 - 4.0	1.2
Asynchronous	38	2.8	1.5 - 4.0	0.8

Discussion

Online learning environments are a new frontier for educational programs, students, and faculty. Understanding how to use this powerful learning technique has created new challenges for educators. A key concern of all educators involved in online instruction is learning outcomes. The major focus of this study was to compare a synchronous and an asynchronous online learning environment to determine student perceptions of their learning experience and course performance. The present data show that there are no significant differences in student perceptions of their learning experiences (p-value 0.04) when comparing the two online learning environments. Additionally, the data show no significant differences in student course grades (p-value 0.04) when comparing the two online courses as well as compared to the control group.

Although not statistically significant, the synchronous group showed a slightly higher student satisfaction of their learning experience. This group also showed a slightly higher grade average. Both online groups have a slightly higher grade average compare to the control group. The withdrawal rate in both online groups was much higher than the control group, and we believed this is due to students not knowing that they have registered for an online course. While neither online group had any failures, the control group had three failures.

Conclusions

Despite the small sample size, the study revealed several interesting conclusions. First, there was no significant difference in student satisfaction of their online learning experience in both online groups. Although 93% of the students were first time online users, overall students showed a very positive feeling about their experience in both online groups. Second, there was no significant difference in course grades when comparing the two online groups and to the control group. Although the online groups show a slightly higher grade average, most studies done on distant learning environments showed similar results (Loomis 2000). We believe that these results are compelling and they support the evidence that distant education is achieving the goal of providing quality learning experiences. Together, these results provide further insightful information for both online learning environments.

The Medical Terminology Course was chosen for this study because it has no laboratory component and the course relies heavily on note memorization. Therefore, it may lend itself well to an online format. Future studies will look at other biology courses with a laboratory component and more complex theoretical content and see how they compare.

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