EDUCATION AND PRODUCTION

Evaluating the Performance and Acceptance of Teleconference Instruction Versus Traditional Teaching Methods for Undergraduate and Graduate Students

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ABSTRACT Institutions are currently seeking alternative ways to deliver a full-line of course materials without acquiring additional staffing. Hence, faculty is charged with creating alternative ways to deliver or offer course content to students. The purpose of this study was to evaluate undergraduate and graduate performance and perception of teleconferencing versus traditional blackboard lectures. In the undergraduate course, we discovered that students performed equally as well on exams and provided favorable reviews of the course; however, the acceptance of this new format is lacking given the enrollment and number of students dropping, e.g., 30 to 40% reduction in the course before semester’s end. On the other hand, students taking the graduate course appear to accept the technology well with consistent enrollments and achievement in course content. In summary, using teleconferencing as a way to teach students may be better suited for graduate students when compared to undergraduates.

(Key words: teleconference, undergraduate, graduate, learning)

INTRODUCTION

The term “information superhighway” was coined by Albert Gore (Bauer, 2000). The former vice-president uses the expression interchangeably with “electronic highway” and “National Information Infrastructure”. The primary charge of the National Information Infrastructure is to make the government work better, making the United States a world leader in science, engineering, and technology, and perhaps most importantly, deliver to all Americans the information they desire when they need it and when they want it—at an affordable price. The Internet is one of the earliest large network systems. The Internet was established in the early 1980s, when the National Science Foundation established a system of five national supercomputer centers to serve the research community and to link the centers to all the nation’s campuses via a long-distance network (Mitchell, 1994). Since its creation, the Internet has grown from less than 200,000 networked computers in 1989 to over 2.2 million in 1992 (Mitchell, 1994). According to the Internet Industry Almanac, there were nearly 579 million Internet users worldwide by the end of 2000; not surprisingly, the United States has nearly 164 million Internet users or 28% of the total worldwide (Computer Industry Almanac, 2000). It is very clear that Internet usage and technology has increased rapidly over a very short period. The usefulness of the Internet through advanced technologies has made distance learning (DL) very attractive to consumers and universities. Perhaps this technology came at a good time because of the need to maximize all available resources.

In general, budget constraints have increased throughout many college campuses; therefore, the luxury of offering a full curriculum of courses may be a thing of the past; faculty are charged with implementing creative measures to assure that course content can be disseminated or acquired by individuals or both. Through the use of DL technologies, the need to disseminate or acquire knowledge may be accomplished. And in many cases, DL technologies allow people with and without specific expertise to join forces for one common goal. In fact, the Committee on Institutional Cooperation (CIC) has encouraged collaboration among and beyond CIC institutions (CIC, 1999). There is a clear trend for multi-institutional collaboration among universities, i.e., instruction, extension, and research.

The objectives of this paper are to evaluate the performance and acceptance of undergraduate and graduate instruction using teleconference technology in the classroom.

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Abbreviation Key: CIC = Committee on Institutional Cooperation; DL = distance learning; IPFW = Indiana Purdue Fort Wayne; MSU = Michigan State University.
TABLE 1. Comparison of overall scores between the Purdue University (PU) main campus course (ANSC102) versus the Fort Wayne branch campus course (ANSC101) and ANSC555 at PU versus the ANSC555-like course received at Michigan State University1

<table>
<thead>
<tr>
<th>Course</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC101</td>
<td>81.0 ± 9.6</td>
</tr>
<tr>
<td>ANSC102</td>
<td>78.9 ± 7.9</td>
</tr>
<tr>
<td>ANSC555</td>
<td>83.6 ± 2.5</td>
</tr>
<tr>
<td>ANSC555 at Michigan State University</td>
<td>86.1 ± 4.5</td>
</tr>
</tbody>
</table>

1The overall means and standard deviation are shown for the four classes.

MATERIALS AND METHODS

Teaching an Undergraduate Course by Teleconferencing

“Introduction to Animal Sciences” (ANSC102) is a three-credit (2 hours of lecture and 1 hour of laboratory) level course and taught in both fall and spring semesters at the main campus of Purdue University. The lecture and laboratory are stand-alone in terms of testing. Like other universities, Purdue University delivers some courses to branch campuses, and this is the case for Introduction to Animal Science. The lecture only version of this course is entitled “Introduction to Animal Science 101” (ANSC101) and taught at the Indiana Purdue Fort Wayne (IPFW) campus.

In fall semester of 2001, the ANSC101 course was offered to students at IPFW by two-way video conferencing from Purdue University. The course started with (n = 24) students at IPFW campus, while (n = 145) students were taking the similar course (ANSC102) on the main campus at Purdue University. Even though ANSC 101 and 102 were offered during the same semester, the two were not offered simultaneously. The ANSC102 course was carried out in a very traditional format, i.e., use of overheads, PowerPoint slides, blackboard, and handouts. The students taking ANSC101 were provided lecture only from the same instructor teaching the ANSC102 course. Both classes met twice a week. The ANSC102 lectures were 50 min per class period (Tuesday and Thursday from 0830 to 0920) with a two-h laboratory on Friday. For the ANSC101, each session was taught on Tuesday and Thursday from 1200 to 1315.

Grades for both ANSC 102 and ANSC 101 were based on the student’s performance on three exams. The exams were written by the instructor and faxed to the facilitator at MSU along with the answer key. Grading at MSU was done by the facilitator.

Teaching a Graduate Course by Teleconferencing

“Animal Growth and Development” (ANSC 555) is a two-credit dual level course that has been taught for the past 5 yr during spring semester at Purdue University. The course covers the fundamentals of mammalian and avian development and then applies these concepts to discussions of the molecular mechanisms regulating animal growth and body composition. Since much of the course content is based on current research, the reading material for each topic includes review articles, book chapters, and primary research reports. Textbooks are used as reference materials. During the spring semester 2000, the course was also offered at Michigan State University (MSU) by two-way video conferencing from Purdue University. There were 17 students enrolled at Purdue University (11 graduate, six undergraduate) and five at MSU (four graduate, one undergraduate). One of the Purdue University undergraduates was from the School of Science, and one was an exchange student from Poland; all of the remaining students were majoring in Animal Sciences. At MSU, the four graduate students were majoring in Animal Sciences, and the undergraduate student was enrolled in the premed program. A faculty member served as a facilitator for the class at MSU.

The class met twice weekly for 50 min in a videoconferencing studio on the Purdue University campus. This studio seats a maximum of 40 students. Students at MSU met in a similarly equipped studio on their campus. The video and audio broadcast was controlled by technicians located at each studio and link-up before each class was initiated by the MSU studio. The reading material for each topic was copied by the instructor and distributed to students at Purdue University and faxed to the facilitator at MSU. The primary reading list for the semester as well as additional reading material and information was made available on a website.

Grades for the semester were based on the student’s performance on three exams. The exams were written by the instructor and faxed to the facilitator at MSU along with the answer key. Grading at MSU was done by the facilitator.

Teleconferencing Technology Used

Students taking the ANSC101 or ANSC555 at MSU received the video signal from a distance education studio on the Purdue University campus. For the ANSC101 course, the only individuals were the instructor and computer technician for all the students taking the class were at the IPFW campus plus one facilitator. As for the ANSC555, (n = 17) students were in the studio along with the instructor and computer technician, while the signal was sent to five students at MSU plus the facilitator. For both courses, the studios would be linked-up before each class which was initiated from the Purdue University. The Purdue University studio was equipped for PowerPoint presentation as well as for slides, overheads, and video. At the main campus, the visuals were shown on two 78.74-×78.74-cm screens (one showing the remote class and the other the instructor’s lecture materials) located on each side in the front of the room. Video image for the students at IPFW were made available on a 78.74-×
78.74-cm television screen. Microphones were located in front of each student at both sites, so questions could be heard in both settings. Each class was tape-recorded, and all of the videotapes were made available to the students throughout the semester. The primary course notes as well as additional reading material were made available on a web page, which was identical for both courses.

**Statistical Analysis**

Comparisons between locations were based on the student's performance on exams. Since these exams offer discrete findings, a nonparametric test was used, the Kruskal-Wallis test of scores. Also reported are the consensus statements used in a perception test for the ANSC101 course, in which students voted on their top issues of acceptance and concern for the class.

**RESULTS AND DISCUSSION**

There were no differences in student performance on exams for ANSC101 or ANSC555, when comparing grades from the main campus with those obtained at the remote site (Table 1), although the overall mean for both remote sites (IPFW and MSU students) were numerically higher than the average mean on campus. Despite the similarities, the ANSC101 course experienced a number of issues.

For the first lecture in ANSC101, the instructor visited the class to give the lecture in person and communicate that future lectures would be delivered via videoconferencing and not by “traditional” classroom lecture. This news disturbed students, which was consistent with previous findings (Latour, 2002); more specifically, four students immediately dropped the course, so the class was down to 20 by the end of the first lecture. The remaining 20 students welcomed the companion information provided through a WebCT webpage and the transfer of information via email.

Despite favorable evaluations, the commitment to complete the ANSC101 course was lacking and most likely resulted from the teleconference format (Table 2); more specifically, there were virtually no differences in instructor evaluations as shown in Table 2, when comparing student responses on campus, ANSC102, versus students taking ANSC101. However, the students strongly stated their dislike for the DL format as evidenced in responses in Table 2. Some of this dislike may have resulted from an inquiry of how to make the course better, in particular students at the IPFW campus stated that they would like to get some of the “hands-on” experience that students obtained in ANSC102.

The students at the IPFW campus were also offered the opportunity to express their views on these two broad questions: a) what do you like about this course and b) what specific suggestions do you have for changing this course? These two questions were facilitated by a staff member from The Center of Instructional Excellence. In this process, the students had to discuss and rank their highest issue by voting within the class and concluded the following: a) the students enjoyed having Internet access to notes, b) the professor, c) broad base of knowledge about agriculture, and d) getting to participate in a few test questions. The students would like to see the following changes, and they are as follows: a) bring the professor to the classroom, b) talk to the professor in person and not over email, and c) do more hands-on laboratories. The dislikes are not surprising and to some degree could be anticipated; however, they may have a significant influence on the course; that is, after the second year of teaching this course via teleconference the drop out rates ranges from 30 to 45%, which is extremely high and very uncharacteristic of courses offered by this instructor or Purdue University.
TABLE 3. Questions proposed to students for the animal growth course. Responses are from students at Purdue University and Michigan State University and compared at midterm and following the course.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Score (midterm)</th>
<th>Score (following Completion of course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the course logically organized</td>
<td>6.8</td>
<td>6.6</td>
</tr>
<tr>
<td>Uses time appropriately</td>
<td>6.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Requires an appropriate amount of work</td>
<td>7.2</td>
<td>7.0</td>
</tr>
<tr>
<td>Is stimulating and thought provoking</td>
<td>7.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Is improving my understanding of concepts</td>
<td>7.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Communicates ideas and concepts clearly</td>
<td>7.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Encourages free exchange of ideas</td>
<td>7.0</td>
<td>6.9</td>
</tr>
<tr>
<td>Is available outside of class if needed (email)</td>
<td>7.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Demonstrates thorough and up-to-date knowledge</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Is sensitive to student backgrounds and needs</td>
<td>7.2</td>
<td>7.1</td>
</tr>
</tbody>
</table>

1Students could provide a score from 1 to 8 (1 is lowest and 8 is highest).

In evaluating the graduate course, a different set of questions were used. Also, the questions were given at both the midterm and final to test whether student perception had changed over the course period. Again, students were allowed to rank a question between 1 and 8 (8 being the highest) on 10 questions. For this course, there were no statistical differences noted between midterm vs. final scores of the course (Table 3), with the scores themselves being very high (lowest 6.7). However, there were some significant differences between the universities as measured by student response. Specifically, when comparing student responses for each question between the two universities, questions 7 and 8 in Table 3 were found to differ between universities. Students at MSU, scored question 7 (encourages free exchange of ideas) lower ($P < 0.0329$) when compared to student responses at Purdue University, 6.5 vs. 7.3, respectively. Moreover, students at MSU scored question 8 (is available outside of class if needed) lower ($P < 0.0333$) when compared to student responses at Purdue University, 7.0 vs. 7.7, respectively. These responses are not completely surprising, since the instructor and facilitator noted that students did not interact equally to previous experiences in teaching like courses in a traditional classroom. Apparently, the environment (DL) influenced this, because the facilitator felt students would not interact in front of the camera, but following class would frequently meet and discuss the topics discussed in class with classmates and the facilitator. Even though there was a difference noted in “exchange of ideas” and “assistance outside of class” students at MSU gave the instructor a score of 4.0 (0 to 5 scale, with 5 being the highest) for the core university question “this course is among the best I have ever taken.” Likewise, the MSU students gave the instructor a score of 4.5 for the university core question “this instructor is among the best teachers I have known.” Despite these differences, the graduate course has maintained a good enrollment and retention as compared to the undergraduate course.

The current paper demonstrates that DL has potential in a teaching environment as students did perform equally as well on exams. At present, however, the DL format seems inappropriate for the undergraduate course, and the acceptance of this technology may become easier as students further embrace DL and as the technology improves. The graduate course seems to be better accepted, and this may be a greater function of maturity, thus, students recognize the importance of the course and overlook “not having the instructor in the class.”

Perhaps one of the biggest weaknesses of DL is the lack of feedback that the instructor can receive from the student while teaching a course, that is, to visually see whether a student has picked up on a concept, talking or playing around with a classmate, or seems tentative.

The actual savings in terms of dollars were not calculated in this study, but this study validates that an additional faculty member was not needed at Michigan State University to teach a graduate course in Growth and Development but rather to have an existing faculty member sit in the class and assist in facilitating the class. Even though the acceptance of the technology was not as high for the undergraduate course, an additional faculty member is not “technically” needed at the Fort Wayne campus; however, the long-term success of the offering at Fort Wayne may require an “in class instructor.”

REFERENCES


