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Online Delivery as a Course Adjunct Promotes Active Learning and Student Success

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Abstract

Chickering and Gamson's notable summary of the best practices of undergraduate teaching include promoting active learning, cooperation, and student–faculty contact. The present study hypothesized that online delivery of lecture prior to course meetings allows more in-class time to achieve these goals. Students in a control group received a traditional, oral, lecture-style class with supplementing PowerPoint presentation, whereas students in a treatment group received online presentation of the same lecture script and PowerPoint presentation prior to coming to class; the treatment group's in-class time was devoted to group activities and discussion of material. Learning and retention were assessed by student performance on a series of multiple-choice tests and quizzes given throughout the semester. Results indicate that students in the treatment condition scored significantly higher on most measures than did students in the control condition. Through strong control of experimental conditions, this study departs from many previous investigations of the benefits of online delivery as an adjunct to seated class time in an introductory social science course, highlighting its advantages such as freeing class time for those activities and strategies deemed to be best practices. The implications of these results and limitations to the study are discussed.

Keywords

on-line delivery, active learning, PowerPoint, computer assisted technology

Frederick (1986) argued that one of the most important aspects of teaching is deciding among the numerous ways to present class material. Choosing from various available methods requires a clear articulation of the primary and secondary goals of a class: a thorough understanding of the tools available at the institutional and individual levels and an understanding of the needs and abilities of the students. To this end, researchers continue to debate the efficacy of online content delivery and seek to document empirically its educational merits.

With respect to educational technology, Swan (2004) asserted that students must interact with various interfaces, and that "learners must make use of specific technologies, platforms, applications, and course templates to interact with course content, instructors and classmates" (p. 64). The question remains, as Swan (2004) pondered, whether or not the advances seen today in online education enhance or detract from a student's ability to successfully interact with peers, instructor, and course content. Furthermore, Rungtusanatham, Ellram, Siferd, and Salik (2004) reminded educators that we must ask how much knowledge can actually be imparted via an online forum. Indeed, in attempting to gauge the answers to these questions, it seems that one can find any number of anecdotal accounts or empirical studies that substantiate the many advantages and disadvantages of online teaching and learning (see Grandzol & Grandzol, 2006, for review), and this, of course, does extend to the social sciences such as psychology (Aberson, Berger, Healy, & Romero, 2003) and sociology (Wright & Lawson, 2005).

More than a generation ago, Goldsmid and Wilson (1980) reported that active learning techniques—also known as student-centered instruction—are generally superior to other forms of academic instruction. After many decades of educational research, Chickering and Gamson (1987) outlined Seven Principles of Good Practice in Undergraduate Education, stating that the most effective teaching strategies are indeed those that (a) "encourage active learning" as well as those that (b) "encourage cooperation," (c) "encourage student–faculty contact," (d) emphasize "using one's time well," (e) generate "prompt feedback," (f) respect "diverse talents and ways of learning," and (g) convey "high expectations" (p. 3). These approaches certainly promote successful learning. However, can online education allow these techniques to be practiced?

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More and more, web-based teaching is being used in various forms to enhance or replace traditional teaching methods (Brown, 2003; Burge & Imel, 2000; Meyer & Augustine, 2002; Persell, 2004; Twigg, 2003; Wright & Lawson, 2005). Many believe that computer-aided teaching methods are transforming the ways in which professors teach (Wright & Lawson, 2005). However, it is of concern if the methods that promote best practices such as cooperation and faculty–student contact are lost via this modality. Of concern, also, and at worst-case scenario is whether or not online offerings constitute "digital diploma mills" (Noble, 1998). Can we indeed ensure that web-based instructional methods are doing our students and therefore society a service?

As stated above, there are documented advantages and disadvantages to offering courses with their complete content delivered online (see Grandzol & Grandzol, 2006). However, the literature on blended learning techniques—or approaches to delivery that combine online with in-person delivery of course material—is limited and somewhat dated. Although some older studies have shown little or no benefit to blended learning models (Bass & Enyon, 1998; Benston, 2000; Noble, 1998; Wright & Lawson, 2005) or benefits only to specific populations such as visual learners (Gilroy, 1998; Kulik, 1994), those in need of remediation (Turney, Robinson, Lee, & Soutar, 2009), and less educated, less mature, and low-achieving students (Lavin, 1980), others have demonstrated some positive outcomes to blended approaches and "hybrid" courses (those that employ online material and reduced seat time) as facilitating active learning (Novak, Gavrin, Christian, & Patterson, 1999), receiving student praise (Yudko, Hirokawa, & Cho, 2008), and leading to better course performance than passive-learning delivery (Riffell & Sibley, 2005). These studies, however, focus on the efficacy of the online mode of delivery and do not address the loss or gain of Chickering and Gamson's (1987) best practices in undergraduate education.

In addition, many of the above-mentioned studies and others have been conducted simply by analyzing student reports of the benefits and outcomes of blended learning courses. Also, other studies discussing the utility of computer-assisted instruction rely primarily on anecdotal evidence and have not been empirically tested (Benson et al., 2002; Grandzol & Grandzol, 2006). Although all of these methods are useful approaches to help us understand the strengths and limitations of various teaching styles, it is difficult to put too much weight on their conclusions because of the limitations imposed by the methodologies employed. The present study attempts to rectify these methodological concerns by its objective examination of student performance and its inclusion of a valid control group in the analysis of whether or not online delivery assists in promoting best practices in education.

Method

A quasi-experimental field study was conducted to compare traditional lecture delivery with online delivery plus interactive learning in two, concurrent sections of an introductory social science course. The classes were taught by the same instructor at a small liberal arts college.

Participants

Demographics were ascertained as available from class rosters. Of the 28 students who were enrolled in the class used as a control, 15 (53.6%) were male and 13 (46.4%) were female, with no significant difference in the ratio, $\chi^2(1, N = 28) = 0.143$, $p > .705$. Similarly, of the 32 students who were enrolled in the class used as a treatment group, 14 (43.8%) were male and 18 (56.2%) were female, with no significant difference in the ratio, $\chi^2(1, N = 32) = 0.500$, $p > .480$. Both courses had a greater proportion of freshmen enrolled than sophomores, juniors, and seniors; control group: $\chi^2(1, N = 28) = 17.14$, $p < .001$; experimental group: $\chi^2(1, N = 32) = 22.25$, $p < .000$.

Procedure and Materials

Both classes met at 11:00 a.m. in the same room; however, the control class met 2 days a week for 1 hour 15 minutes (11:00 a.m. to 12:15 p.m.), and the experimental class met 3 times a week for 50 minutes (11:00 a.m. to 11:50 a.m.). Both groups, therefore, had the same number of contact hours during the semester.

In both classes, the same textbook was assigned, and an entire week of class time was dedicated to each chapter to maintain temporal consistency. In addition, both classes were asked to read the assigned chapter in the textbook prior to coming to the class in which it was to be discussed. Furthermore, for both classes, the same quizzes, practice exams, and interactive review sessions were posted on the school course management system.

Both classes received material using the same lecture script and the same PowerPoint slides emphasizing main lecture points. The control class received material via a passive learning format (traditional, oral lecture) supplemented with the PowerPoint slides. In contrast, the experimental class received the lecture prerecorded, embedded into PowerPoint slides by the instructor using Audacity software, a free downloadable program, and placed on the course management system. This class was instructed to listen to the online lecture before coming to class. For the control group, after the course material had been covered, the same PowerPoint slides with embedded lectures were placed on the course management system to ensure equitable access to class material.

Because the experimental class was exposed to the material via the above-described method before class, their seated time was devoted primarily to answering questions about the lecture, discussing difficult or unclear points, and participating in interactive or group work that synthesized the assigned material (see the appendix for a description of some of these activities). As mentioned, the control class spent class time listening to lectures and taking notes from the PowerPoint slides, and questions were encouraged. If their lecture was completed within the 1-week time frame allotted, interactive group work as

Table 1. Comparison Between Control and Experimental Classes of Student Performance on Assessments

	Control Class (n = 28)		Experimental Class (n = 32)				
Assessment	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Quiz 1	10.56	4.21	14.03	3.12	3.51	53	.001*
Quiz 2	14.92	3.66	17.11	2.94	2.41	51	.02*
Exam 1	72.00	13.50	76.63	19.17	1.05	57	.30
Exam 2	72.88	16.07	84.34	13.12	2.94	54	.005*
Exam 3	75.57	16.93	81.89	20.66	1.14	47	.26
Final exam	145.83	25.45	168.72	24.08	3.32	50	.002*
Total course points	405.89	60.45	459.18	61.87	2.78	39	.008*

*Significance remains when employing the Holm–Bonferroni correction to alpha for multiple comparisons.

described above was initiated to encourage expanded understanding of the course material.

To control for experimenter expectancy, success in the courses was measured by student performance on identical, objective assessments: two 20-item multiple-choice, in-class quizzes; three cumulative 100-item multiple-choice, in-class exams; and a 200-item cumulative multiple-choice final exam given during the same weeks throughout the semester (same-day administration of the assessments was impossible because of the alternate-days scheduling of the classes).

Results

Some students missed exams or quizzes that were to be used as data for this study, and therefore measurements were made with available scores.

A 50-question pretest was given to both classes on the first day of class to test for equality of potential. As expected, there was no significant difference between scores of the control (M = 24.46, SD = 5.32) and experimental classes (M = 27.03, SD = 6.30), $t(58) = 1.69$, $p > .096$. It is surprising that a posttest embedded within the final exam revealed no significant difference between scores of the control ($M = 40.82$, SD = 6.97) and experimental classes ($M = 43.72$, $SD = 8.6$), $t(50) = 1.31$, $p > .196$, although, as expected, both classes did show a significant increase in scores from pretest to posttest; control: $t(22) = 10.14$, $p < .001$; experimental: $t(28) = 9.77$, $p < .001$. The pretest and posttest scores were not calculated into students' final grades for the course.

Table 1 shows the results of the comparison between the groups' performances on graded course assessments.

Discussion

Although pretest–posttest comparison showed an increase in the mastery of course material, there was no significant difference between class performances for posttest measures. It does seem odd that the posttest measure did not demonstrate a significant difference whereas most other assessments including the final exam into which the questions were embedded did, as did the aggregate measure. However, as the mean score was superior in the predicted direction, this result could be a product of a limited sample size.

Although the experimental course performed better on most measures, there was no significant difference in performance between the experimental and control courses on the first or third exam. It is possible that the nonsignificant difference between groups for the first exam is the result of both classes engaging in an adjustment period to the course presentation method, which differed between the two. However, this explanation is illogical with respect to performance on the third exam. Again, as the mean scores were higher in the predicted direction for both nonsignificantly different exams, these results could also be a product of the limited sample size.

Although the experimental course received all in-class time devoted to active learning, the control course was not completely deprived of this experience. One limitation to this study is that we could not measure with certainty exactly how much active learning versus traditional lecture was employed in the control group, but we can say that the time spent therein was probably less than 30 minutes per week versus the full 150 minutes per week devoted to active learning in the experimental group. Although it would be scientifically more rigorous to expose one course completely to the treatment and withhold it completely from the other, we knew that the prime directive of teaching the classes was promoting student learning and research concerns, which were kept as rigorous as possible, were nonetheless given secondary consideration in this case.

The treatment course listened to lectures outside of the class in their own time prior to class meetings. Students were permitted unlimited access to each lecture so that they were able to review the material as much as they felt necessary. It has been shown that online lecture delivery—where the students are able to access the lecture information at any time and as often as they like—seems to offer students a measure of control over the learning process, which facilitates student success (Hove & Corcoran, 2008; Novak et al., 1999). Students from the control group were also granted unlimited access to the online lectures, but only after the material was covered in class. Thus, students from the experimental group came to class with questions from the lectures and were therefore much more prepared to engage in discussion of the material and in cooperative activities relevant to the topic. Such active learning activities also seemed to

have the latent effect of making the class more fun for the students, thereby increasing their commitment to the class and their subsequent motivation for attending—factors shown to be associated with positive learning outcomes (Albaili, 1997; Wright & Lawson, 2005).

One major problem with the approach to online plus in-class delivery, as articulated by Benson et al. (2002), is that the use of computer technology in teaching may change not only how information is taught but also what is taught. The instructor of the experimental and control courses in this study made every effort to maintain consistency of material between groups. However, as mentioned above, each class has its own personality so to speak, and discussion and various interactions do take on different themes and depth. Obviously, to interfere with these for the purpose of maintaining rigor in the present study would not be ethical of educators who are trying to decipher what promotes best practices in teaching and learning.

This study departs from many prior endeavors by its use of a valid control group in its design; that is, the same institution, semester, instructor, start time, room, textbook, PowerPoint slides, lecture script, and objective assessments were used for both conditions. There are limitations to our findings, however. First, the lack of random assignment to classes (which was impossible) leaves open the door for plausible alternative explanations for differential performance between the groups. The experimental class, which performed better, met 3 days per week instead of 2. It could be that the more motivated students sign up for courses that meet more frequently. Along these lines, it may also be true that courses meeting 3 days per week with a shorter course period can sustain students' attention better than courses that meet twice per week for a longer course period.

Furthermore, although every effort was made to be consistent with the content and approach to the material, every class is different in terms of its dynamics, and unique questions posed by students required some unscripted discussion, interaction, or approach. Given that the first priority was teaching each class so that the students learned as much as possible, these deviations from rigorous methodology were necessary. This may have had an effect on the results presented herein.

We contend that a more likely variable driving the distinctions we reported here is the difference in the way in which the material was presented. In the control class, where the material was presented during class time using PowerPoint and in lecture format, the students were necessarily a more passive recipient of the material. Although every effort was made to encourage discussion of the material, it was difficult to move students beyond a cursory understanding of the material. Furthermore, because class time was used primarily for the dissemination of the course material, little time was left to interactive teaching. To put it another way, the in-class lecture class was able to reach students who are primarily visual and auditory learners but generally excluded a kinesthetic, interactive component.

It is important to note that the treatment course used in this study was presented in a format in which the students met for every scheduled class. Therefore, it may not be deemed a hybrid course by some definitions. Thus, our results cannot be generalized to courses that are presented entirely online or true hybrid learning models where students have less face-to-face interaction with the instructor. Our results are meant to promote the efficacy of online instruction as an adjunct, freeing class time for interactive activities that promote best practices.

Another limitation of this study concerns the issue of whether or not similar approaches can increase student scores on papers or other written assignments. Because of the arguable subjective nature of grading papers, this measure was not included in the present analysis. More research is clearly needed here to assess the effects of computer-assisted teaching on writing assignments in social science classes.

Despite the limitations presented in this analysis, it does appear that computer-assisted teaching in the form of online delivery can be a very effective tool to facilitate student success. It also appears probable that such course models offer more comprehensive learning opportunities for students and can overcome some of the confines of traditional lecture formats. Clearly, more empirical work in both the quantitative and qualitative realms is needed to assess more effectively the merits and shortfalls of various methods of using online delivery as an adjunct at the college level.

Appendix

Two Examples of Interactive Teaching Strategies Employed for Social Psychological Concepts

1. Lego Building: Task Completion. One of the most successful and well liked in-class activities involved an illustration of the way in within-group and between-group constraints affect task completion in groups. For this exercise, students are divided into six groups. It is desirable that the groups be at least relatively heterogeneous in composition. Every group is then given a bag of random Lego building blocks. Each bag also contains a note instructing the group what they are to build and three rules that they must obey while they complete the task. Every group receives a different build request and different rules of interaction. The rules contain at least one within-group constraint, such as that only females in the group may speak; the rules also contain at least one between-group constraint, such as that the group may trade only with male members of other groups. The rules are designed specifically to create barriers to the accomplishment of the assigned task that affect both within-group interaction as well as interactions between groups.

Groups are instructed that they may begin their task and may trade with other groups as necessary to accomplish their goals. However, they must obey the stated rules for their groups. A nominal award is usually given to the group that has the best build or that finishes first. Interaction and trade often become lively as groups scramble to complete the project in the time frame of the class.

In a longer class, the groups typically finish with time to spare. In such cases, discussion follows all groups completing

the task. In shorter classes, the groups work until the end of class, and discussion occurs during the next scheduled class meeting. Discussion centers around issues of how within-group and between-group constraints might affect completion of a task and how groups overcame constraints that they identified as the most problematic.

2. Mock Jury Selection: Status Characteristics. Another popular activity involves an illustration of status characteristics theory. After the lecture on status characteristics has been completed, each student is given a sheet listing 12 members of a mock jury. Information about each of the members is limited to three lines and includes both salient and nonsalient characteristics as well as information about diffuse and specific status characteristics. Students are asked to use the theory to determine which of the 12 members of the jury has the highest status to make him or her foreman of the jury.

After each student has individually completed the assignment, students are put into groups of three or four to compare answers. As each group indicates that they not only have selected the correct individual but also can demonstrate the use of the theory, they are instructed to go to the board and demonstrate how the theory is used to compare individuals. The first group to correctly demonstrate the process and select the "correct" jury member is given a nominal award. A review of the process and of status characteristics theory follows the exercise.

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