

## TEACHING MATHEMATICS ONLINE: THE GOOD, THE BAD, THE UGLY

Katherine G. McGivney  
Shippensburg University  
Mathematics Department  
Shippensburg, PA 17257  
[kgmcgi@ship.edu](mailto:kgmcgi@ship.edu)

**Introduction:** During the summer of 2004 I taught the general education course, Introduction to Statistics, online, at Shippensburg University. Although I have taught this course in a traditional (face-to-face) format several dozen times, this was my first experience teaching the course online. The course spanned four weeks and included topics such as numerical and graphical descriptions of data, linear regression, random sampling, experimental design, probability, sampling distributions, and confidence intervals and hypothesis tests for one and two population means and proportions. Each student was required to purchase the textbook, Moore's *Basic Practice of Statistics* [1] as well as a TI-83 graphing calculator.

**Background:** Online teaching is a relatively new option at Shippensburg University, but it has become increasingly more popular over the past two years. Except for certain programs, online courses are primarily offered in the summer. During the summer of 2004 more than fifty classes were offered online, each lasting three to six weeks. Three of the courses were hybrid; that is, the students and instructor met on campus between six and fifteen hours throughout the course. The mathematics department offered two online classes last summer, Introduction to Statistics and Math for Liberal Studies.

**Population:** Twenty-two students enrolled and fifteen students completed the course. The students came from a range of disciplines including elementary education, biology, psychology, English, sociology; in addition, one student was a rising high school senior. The majority of the students who dropped the course did so within the first day or two. Almost all of these students cited the reason for withdrawing was due to the fact that the course requirements and workload exceeded their expectations. Interestingly enough, more than 70% of the students were Shippensburg University students and all but one of the students lived within forty miles of campus.

**Course Set-up:** All of the course materials were available through *Blackboard*, a web-based server software system used (in part) for course management. Within our course shell, the students were able to communicate with each other and me via email, a chat room, and a discussion board. Twice a week I posted study guides, TI-83 calculator commands, reading assignments, homework problems, writing assignments, journal prompts, quizzes and student grades. We worked in three-day blocks. The pace was fast – we covered roughly four chapters per week. Typically the students would have three days to read two chapters, complete twenty homework problems (which were not turned

in for grading), submit a writing assignment, post questions to the discussion board, and take an online multiple-choice quiz.

The discussion board was used for the students (and me) to post questions for the group to answer. If the students needed further assistance on a particular topic they would post their question and I (or frequently another student) would post a response. Using the discussion board on a frequent basis earned each student 4% points towards their final grade.

Each week the students were given a journal prompt to respond to; the purpose of this activity was to assist me in gauging how the online learning experience was going. Since this was my first experience teaching online and, with the exception of two students, it was also the students first time learning in an online environment, it was important to the success of the course that there be a continuous dialog concerning the pace and learning structure of the course. The five journal prompt responses were each worth 1% of their final grade. Sample journal prompts are the following:

- 1) What is your previous experience with online learning? Have you used Blackboard before? Have you taken a statistics course previously? Have you used the TI-83 graphing calculator in a math class?
- 2) How did week two go? What was the most challenging aspect of the week? How are you adapting to online learning? What do you like best about online learning? What do you like least? Any suggestions?
- 3) Would you have preferred a few on-campus meetings? If so, should this be an optional or required component? How was the pace of the course? Would you have taken the course if it were longer, say five or six weeks?

Many of the weekly writing assignments asked the student to answer questions based on what they learned by interacting with an applet. (The textbook was bundled with a c.d. that contained several powerful applets that could be used to teach a range of statistical topics.) A few applets that the students experimented with involved studying the properties of the normal curve, looking at how outliers affect a regression line, and investigating the meaning of a confidence interval. The seven writing assignments were each worth 3% towards their final grade.

A typical quiz consisted of twenty questions. The textbook came equipped with a test bank that I used to generate the quiz questions. Consequently the quiz problems were very much in-line with what the students were asked to do on their homework problems. Each student had approximately thirty minutes within a twenty-four hour time period to complete a randomly generated quiz. They were each given only one attempt to take the quiz. In a rare instance where a student was logged out before finishing the quiz, I allowed them to take a new quiz. The seven quizzes were each worth 5% of their grade.

The last component used for assessment purposes was a proctored two-hour cumulative final exam. Since the students were all relatively close to the university, they all opted to

take the exam on campus (although they did have the option of taking a proctored exam off-campus). The exam consisted of a few multiple-choice questions but the far majority of the exam consisted of short-answer problems. The students knew the final exam structure at the beginning of the course and were encouraged to work homework problems out completely in preparation for the final exam. The final exam grade was 35% of their final grade. Having a cumulative exam that carried a lot of weight helped to keep the students honest and working hard throughout the course.

**Faculty/Student Blackboard Training:** This was my first experience with Blackboard. Prior to the course I enrolled in a four-week online Blackboard training course (as is required by my university for all first time Blackboard users). This experience gave me a very real picture of what it is like to learn online. Just like the students, we had weekly reading assignments, online timed quizzes, writing assignments, as well as a group project. Perhaps, more valuable than actually learning Blackboard, the online course provided me with an opportunity to be a student and really understand the challenges that are inherent to learning online.

A number of the students had used Blackboard in some capacity in a previous course. To ensure that every student was familiar with Blackboard's tools, I emailed the students a mandatory pre-course assignment. This activity asked the students to introduce themselves to their classmates using the email, discussion board, chat room features and to take an online quiz based on the syllabus. This assignment was due prior to the first day of the course. Due to the fast paced nature of the course and the sheer amount of material needed that to be covered in a month, I wanted to be sure that students were proficient with the basic utilities in Blackboard prior to the start of the course.

**Reflections:** From a professor's standpoint, a major plus to teaching an online course was the flexibility that it afforded. It was nice being able to teach from home, my office, or even a coffee shop. The textbook that I chose was well written and well suited for an online learning environment, due largely in part to the fact that there are plenty of ancillary materials to accompany the text. The University provided excellent technical support and instruction for both the students and the professors. Many of the students who either had a strong mathematics background or those who had taken a previous statistics course in high school were able to do very well in this type of learning environment. The students commented that they also appreciated the flexibility of online learning since it allowed them to hold a summer job and still take a course.

On the negative side, this course demanded much more preparation than is typically required in a traditionally taught statistics course. I also felt the need to be on Blackboard or checking email each day from early morning until late at night. Periodically, I felt a disconnect from my students at times and actually missed the give-and-take that occurs in a face-to-face situation. Many of the students, especially those with a less sophisticated mathematics background, found the pace to be too fast and had difficulty learning mathematics in this fashion. Since none of the students had experience with typing mathematical symbols I had to carefully choose the problems they would submit as part

of their writing assignment. Since the quizzes were multiple-choice, the students did not have to concern themselves with typing mathematical symbols in this situation.

The next time that I teach this course online I will offer an optional weekly on-campus tutorial session. Roughly 50% of the students said that they would take advantage of this option if it were available (and 50% said that they would not.) Teaching graphical and numerical descriptions of data and concepts of experimental design were fairly easy to do online but teaching topics such as sampling distributions, confidence intervals, and hypothesis testing, provided a much greater challenge. Next time I will also change the daily due-date times. Each assignment was due by midnight of the assigned date. I found that a number of students would work on the assignment in the late evening and consequently expect that I was online for help late at night. Next time I'll make the deadlines by five p.m.

Although it was challenging to teach statistics online, I enjoyed the learning experience. I plan to teach the course in the summer of 2006 but next time I'll use a more hybrid approach.

**References:**

- [1] Moore, David S., *The Basic Practice of Statistics*, third edition, Freeman Publishing, 2004.