Seven Trimesters of an Online Introductory Statistics Course

K. Laurence Weldon
Simon Fraser University, Dept. of Mathematics and Statistics
Burnaby, Canada V5A 1S6
weldon@sfu.ca

1. Introduction

This paper reports the delivery of a completely online version of an introductory statistics course. STAT 101 has been offered at SFU in seven successive trimesters during Sept '97 - Dec '99. The course has minimal mathematics prerequisites and yet is a serious introduction to the concepts of statistics. Verbalization, visualization, conceptual understanding and problem solving are emphasized, with some efficiencies gained by relying on computer software for graphs and calculations. In the descriptive part of the course, topics include: bivariate data, time series, categorical data, and data presentation; while in the inferential part: sampling, study design, and inference (including the simplest anova and regression) are covered.

The motivation for an online version of the course is to improve on the educational quality of the correspondence version of the course, within a similar cost envelope. To achieve this the use of online two-way communication over the internet has been added to the original features of the correspondence course -- the latter used self-study, assignments, and telephone and postal communication, as the only pedagogic tools. Unlike many other initiatives in online instruction, the internet has not been used in this course for the supply of data or information. The use of the internet as a communication tool substituting for face-to-face contact has been exploited.

The main obstacles to overcome in the design of an online course are: compatible and adequate software and hardware for communication; lack of two-way communication with others associated with the course; avoidance of viruses; and identification of the person submitting the material. The design described here has overcome these impediments, as we will elaborated below.

2. Course Components

Students are allocated to study groups of 4 or 5 students at the beginning of the course - these groups usually do not change. Within a study group, students can communicate with each other without their online conversation being accessible by other study groups. These study groups are responsible for answering fairly open questions from each week's material. (For example: "Which technique is best for graphing a univariate data distribution?) The study group appoints a moderator who is responsible for submitting the group consensus, and this moderator job rotates through the study group. These group assignments count 15% of the course grade. Participation in these study group assignments and in other course conferences counts for another 10%. These percentages have been high enough to coerce a high degree of compliance in study group activity; for example, a recent class averaged a grade of over 80% on this portion of the course grade.

There are also assignments submitted by individuals - these count another 15% of the grade. Students submit assignments electronically and responses are returned electronically. This submission process is handled using a conferencing system called FirstClass published by SoftArc (1998). Each message has the capability of including graphs. Attachments were not used, in order to avoid virus problems. The problem of communicating equations is not a big one in this course. Most communication is a record of verbalizations or graphs, which FirstClass handles easily.

"The FirstClass system allows the students access to several online conferences connected with the course. Here is a list of the ones I use in this course:

1. Student café (informal chat, students and instructor)

2. Study Group Conference (visible to the particular study group of students, and also to the instructor for the purpose of evaluating participation.)
3. Instructor Q&A (visible to all)
4. Technical Help Q&A (concerns FirstClass and Browser)
5. Notices from Instructor (a student-read-only conference)
6. Assignment Submission (content visible only to Instructor)

The dialogue in these conferences ranges from the very informal back-and-forth chat (1. and 2. above) to the more formal one-way presentations (5. and 6. above). The Study Group conference has a formal goal, the submission of the answers to group assignments, but the process is quite informal. Feedback on assignments is sent to students individually via e-mail, with their electronic submission annotated with comments from the instructor. The more informal conferences allow students' personalities to emerge, reassuring students that they are being educated by people rather than machines. This is a huge improvement on the correspondence course, where the only communication was via handwritten note, at intervals of a few weeks.

A mid-term test and final exam are given in person, and these components count 60 percent of the course grade. Students are required to pass these in-person tests. Remote writers arrange envigilation by a qualified individual, usually a high school teacher.

The FirstClass system manages the study conferences, and the questions and answers between students and the instructor. Most questions and answers are accessible by the whole class, just as they would be in a classroom. Private conversations are possible by ordinary e-mail, but students are told they do not get participation credit for this, to encourage them to use the shared conferences for questions.

There is a read-only conference in which the instructor can alert the entire class to certain important ideas, administrative changes, old examinations, or assignment solutions. A useful feature of FirstClass is that, for any particular posted message, the instructor can easily get a list of who has accessed the message and when. It is possible to tell who will have missed an important message.

FirstClass is available for Macintosh or Windows PCs. Students download the software at no cost while the institution pays a one-time fee per student account. The accounts are reusable in subsequent semesters. The course text is Griffiths, Stirling and Weldon (1998).

3. Enrolment and Instructor Workload

Because all the course communication is recorded either in FirstClass conferences or e-mail, it is possible to estimate the total workload involved in delivering the course. The method for estimating workload is as follows: The instructor submits bi-weekly hours in order to receive remuneration. This includes time for marking including response to students, online questions and answers, preparation of notices, e-mails for private interaction, and evaluation of participation by students. The total hours charged at the end of the course is divided by the number of students completing the course, to obtain the hours per student. Over the seven trimesters 97-3 to 99-3, the numbers of completing students were 41, 21, 23, 30, 37, 39, 41 and the per-student hours spent by the instructor were 13.8, 14.3, 11.3, 9.1, 8.2, 8.0 and 5.2, in chronological order. The reduction in instructor time was due to the elimination of unforeseen problems due to this new mode of instruction, the switch to FirstClass for the most recent four semesters, and the provision of more efficient management guidelines to the instructor. Completion rates for the course were approximately 70 percent initially but have increased to over 80 percent in recent semesters.

Knowing the hours per student in the online course allows a rough cost comparison with the lecture version. Using rough figures, I computed the operating costs in both modes as a function of the enrolment. Assuming that the variable cost per student (mostly marking and tutorial assistance) is about twice what it is for students in a lecture course, but that the cost of a lecturer is about 6 times the cost of providing the supervision of the online course, it works out that for courses with enrolment of about 70 or less, the costs of the online course are less than the costs of the lecture

version. With a huge class, if they are all listening to a single lecturer, the lecture version is clearly less expensive. Of course, the infrastructure costs of both modes have not been included in this comparison, and may be important for a comprehensive analysis.

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4. Conclusion

The basic idea of using the internet to add socialization to an otherwise lonely correspondence course seems to have worked well - students seem to enjoy the easily arranged non-simultaneous online communication. Achievement on the examinations is comparable to the lecture versions of the course. When students have a choice of the online course and the conventional lecture version, only about 20 percent opt for the online mode. But for those with scheduling problems, or who live far from the university, it does fill a need. Moreover, from the perspective of the university, the course model described here is less expensive to deliver than the lecture version, once the start-up problems are solved, for courses of less than about 70 students.

REFERENCES

SoftArc Inc (1998). FirstClass Version 5.506 is software published by SoftArc Inc. and detailed information can be obtained from info@softarc.com.

Griffiths, Stirling and Weldon (1998). Understanding Data: Principles and Practices of Statistics. John Wiley & Sons. Brisbane.