

TEACHING STATISTICS ON-LINE: OUR EXPERIENCES AND THOUGHTS

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“IT” or “Internet Technology” is a rising star in distance education. With the rapid development of new technologies, educators around the world have more tools and greater out-reaching power than ever before. What are IT education and its associated technology? How can statistics education benefit from it? How do you teach a statistics course on-line and what are the unique advantages and disadvantages of teaching statistics through the net? This paper summarizes my experiences designing and teaching an elementary statistics web course and gives my answers to some of the previous questions. I will in this paper present the way the course was taught and how specifically some of the course content was delivered using the “WebCT”(WebCT) software. Additionally some pedagogical recommendations will be made.

INTRODUCTION

Recent advances in technology have promoted changes in industry and government as well as many other aspects of people’s daily lives. These advances have provided new ways to implement distance education. Many educators have tried to teach different courses using the net to reach those students unable to take them using traditional means. The IT boom of the late nineties provided both funding and motivation for the development of different software for distance education using the net. Different ideas and teaching models emerged.

One approach is to simulate the traditional teaching method using technology. This approach usually involves videotaping lectures that cover the different topics of a course. Students access these lectures on the net. The advantages of this approach are: 1. Students can “attend” classes from anywhere in the world through the net; 2. Lectures can be repeated as many times as a student wishes to view it.

Another approach is to use text-based content delivering software such as WebCT. This kind of software manages individual student’s progress records, course content, communication tools such as emails, BBS and chat-rooms, as well as other traditionally teacher managed tasks. Institutions often use this kind of software in many credit-granting courses.

I have been using WebCT as the portal for *my* elementary statistics Web course and have not provided digital video lectures to students. I use the “workshop” teaching material developed by Rossman and Chance (2000). In this approach, students explore and discover statistical concepts and procedures by working on different activities using the MINITAB statistical software. An instructor in this approach answers questions and motivates the students to learn. Lectures are only appropriate when most of the students have difficulty understanding a particular concept through the designed “workshop” activities. The workshop philosophy ordinarily allows the elimination of lectures. My web-course was first offered in the second summer session of 2001 and I am currently teaching another one. This paper shares *my* experiences teaching this web-course.

THE WAY THE COURSE WAS TAUGHT

Model: At the university where I teach, an office in the school of continuing education coordinates distance education courses. Its function is to advertise the available web-courses, send out course material to registered students and direct student questions to the right parties. The university has a WebCT site license. WebCT is a text-based content portal designed for web courses. It has a wide array of functionalities to accommodate the different needs of courses from a wide spectrum of disciplines. Because of the complexities of these functionalities, learning to use WebCT could be a challenge for those who are not particularly technologically savvy. To provide technical support, the university created an “Instructional Design Center” (IDC). IDC maintains several powerful servers that house the WebCT software and the web-courses. It is also a resource center and provides both training courses and technical consulting services to instructors.

Teaching effectively through the web requires a support system. Our model's interrelationships are summarized in Figure 1.

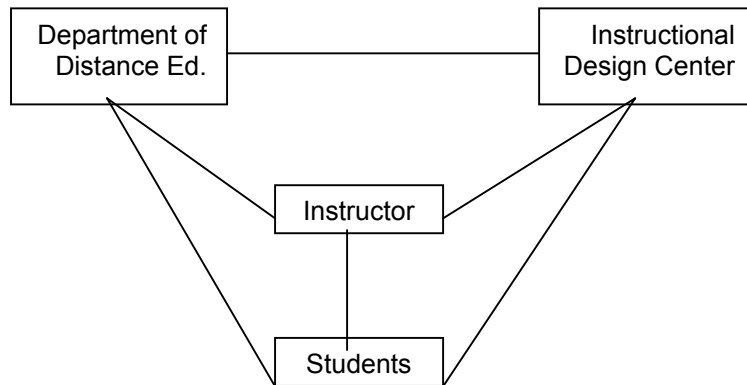


Figure 1. Interrelationships.

This model provides very good support to instructors. However, it is not student centered. The instructor of the course is the resource person to students for both content and technical issues. Perhaps the existence of a student-centered support system would have made the teaching of a web-course less overwhelming.

Description of the web-course: It is important to inform a student of the characteristics of a web-course so that the student can make an informed decision on whether this style of teaching is suitable for his or her particular learning style. For a student to have a successful learning experience in any mathematics course, self-motivation is required. This is much more apparent in a web-course because there is no student-teacher face-to-face contact in a web-course. It is therefore all the more important to communicate to students in some detail what this course is about.

Initial Welcome letter: The school of continuing education helps web-course instructors to send a welcome letter to students before the start of the course. I give course information and some initial instructions to students in this letter.

It is a good idea to compose a letter with detailed information and instructions concerning the course. For many of the students, it will be their first web course. These students will have very little idea on what the course is about and how to use the software. They need detailed instructions on how to log on to WebCT and where to look for the course syllabus.

Course Content: WebCT provides a nice content management model. You can organize your course content the way you see fit. I organized *my* course content into eight different sections: 1) ABCs Of The Course; 2) Study Instructions; 3) Course Dataset Files; 4) Class Dataset Files; 5) MINITAB Command Files; 6) Solutions For Selected Activities; 7) Answer Keys For Exams; 8) Corrections.

In ABCs Of The Course, I give study instructions, instructions on how to submit assignments via WebCT and download files. This section is designed to provide step-by-step instructions on technical issues related to WebCT. Some tasks such as file transfer and assignment submission are different in a web-course but just as fundamental as in a traditionally taught course. It is important not to let these issues become obstacles and curtail students' learning enthusiasm. It is very easy for a student to be discouraged by non-content related technical problems. Many students react to these simple "know how" problems by either dropping the course or giving up. We need to consciously minimize the side effects of technology and give detailed instruction at the very beginning in order to solve this type of problem.

The workshop approach philosophy is that students learn by exploring and discovering. The teaching material is organized into topics, with each topic consisting of a sequence of activities. An activity usually has a list of questions designed to lead a student to the discovery of related concepts and procedures. For each activity, I give study instructions explaining objectives and giving hints as to how to answer certain questions in the Study Instructions.

The workshop approach uses a rich collection of genuine and interesting datasets. Datasets in two formats are available for student download. One group of datasets is bundled in a zipped file while the other datasets are listed as individual files. Data is also collected from students and analyzed. I use the course bulletin board in WebCT to collect class datasets from *my* classes. I have backup datasets that are collected from other classes in the event that too few students post their information. Both course datasets and class datasets are listed under “Class Data Files”.

Because MINITAB doesn't perform some simulations and can't create certain graphs by regular menu function or simple commands, there are macro command files that were created to perform these as well as a variety of other tasks. I organize these files in both zipped file and listing format for student download. They are listed under “MINITAB Command Files”.

Because it is difficult for an instructor to discover particular areas of difficulty that students are experiencing, I post detailed solutions to homework problems and exams after students finish their work. In a web course, it is important to provide answer keys to all problems because face-to-face communication between instructor and student is lacking.

SOME “WEB-ADVANTAGES”

Using new technology, web courses have some unique advantages: 1) “Instructions” can be repeated as many times as students are willing to view them. 2) There are no distance or time boundaries. Web courses truly overcome the distance boundary. A student anywhere in the world can take the course I offer here at Indiana University of Pennsylvania. 3) Instructors can utilize computer technology to perform complicated computations and construct sophisticated graphical illustrations. 4) Instructors can utilize computer technology to perform complicated computations and construct sophisticated graphical illustrations. 5) They are more “convenient” for the students. 6) They are more “convenient” for the instructors. Instructors can communicate with his or her students from anywhere and at any time. 7) Instructors can utilize computer technology to exercise greater flexibility in administering exams and collecting homework. WebCT has a powerful exam delivery utility. An exam can be put together from a database and delivered to students at a specific time. The utility keeps a check on the activity and time once a student starts to work on an exam. The instructor can set different parameters for different students. For instance, an instructor can elect to release an exam to a specific student at a specific time or elect to allow a student multiple tries to pass the same exam.

SOME “WEB-BARRIERS” FOR INSTRUCTORS

Repeatability and outreaching power are two distinct advantages of web courses. However, this form of education has its own unique shortcomings. From *my* experience in teaching the elementary statistics course, I summarize some of these in what follows. 1) Lack of face-to-face communication lends an air of impersonality to the pedagogical experience. Communication between instructors and students is mostly through emails, chat rooms, and bulletin boards. It is hard to know students on a personal level under these constraints. 2) The “distance” may make it harder to motivate student learning. 3) The necessity to teach simple computer “know-how” can get in the way of teaching the mathematical concepts. 4) The instructor may run into problems trying to detect specific weaknesses of a particular group of students. 5) Students may “resent” the absence of formal lectures. 6) The instructor may have difficulty emphasizing certain important points.

SOME “WEB-BARRIERS” TO STUDENT LEARNING

Students who take web courses face unique challenges. The following are examples of difficulties my students had. 1) Learning to use a computer for a particular purpose may involve technical difficulties. 2) Statistics software used in a course can at times present a challenge to the student. 3) It is difficult motivating students you do not see on an individual basis and on a regular schedule. Compared to a traditional course, it is much easier for a student to get behind in a web course because there is not a set period of meeting. A web course relies heavily on self-discipline and self-motivation. 4) Communications between teacher and student can be difficult. 5) There may be a lack of “a sense of over-all class community.” Unlike a traditional class in

which students get to know each other and make friends on a personal level, students may never meet their fellow students face to face in a web course. They often just communicate through emails and bulletin board discussions. A “virtual community” might not be sufficient for some students’ academic tastes.

WAYS TO IMPROVE STUDENTS’ LEARNING EXPERIENCE

Realizing the unique difficulties both instructors and students have with a web type course, I can share some of the methods I have used or will use to address these difficulties. 1) I give detailed instructions on computer techniques used in the course. 2) I send a welcome letter to students before the semester starts. Detail information on how to logon to WebCT is given in the letter. 3) I have organized course information on a “CD” which I will give to the students. Currently students in my courses need to download course datasets, Macro files and other class datasets via the web. We can eliminate this burden by preparing a CD that contains this information. Indeed, I am in the process of preparing a CD for my students for next semester. 4) I plan on providing videotaped lectures of various lessons from the course. 5) I use other communication methods. I give students my telephone numbers and encourage students to contact me when encountering problems. When they register for the class I ask students to send me their telephone numbers. As a last resort, if it appears that email and chat room have failed to convey my message. I call them. 6) I make myself available to the students. Many students get stuck on things that are simple. It is usually easy for me to answer most of the questions. Since students are easily discouraged by these small problems, it helps to answer their questions as soon as possible. So, I often schedule myself four to five times weekly in the chat room. 7) I try to be flexible. Unexpected problems, frequently having to do with connection to the Internet, may arise in a web course. Instructors need to be somewhat sympathetic and less rigid in their interpretation of the rules should a student encounter such problems.

CONCLUDING REMARKS

Teaching through the net has its advantages and disadvantages. Many of the disadvantages can be overcome by vigilance, perseverance and hard work. With the advance of technology, I foresee that distance education via the web will be more wide spread and more accepted by future students.

There are many well developed tools available to enable statistics education via the web. We have workshop textbooks that are designed for students to discover statistical concepts that can be easily adopted for web courses. Lectures can be digitally video-typed and made available to students in a CD. To explain how to use software on step-by-step basis incorporating pictures and vocal instructions, one can use “Camtasia”. Technology is overcoming the distance barrier in education. Now is a time of change. If we work together to study and develop the pedagogical methodologies in this brand new way of teaching and learning, we can foster and cultivate a rewarding learning environment for our students.

REFERENCES

- Rossman, A., & Chance, B. (2001). *Workshop statistics: Discovery with data* (2nd edn). Emeryville, California: Key College Publishing.