Experiences with International Web-based Introductory Long-Distance Statistics Courses

Jürgen Symanzik
Utah State University, Logan, UT
*e-mail: symanzik@math.usu.edu*
WWW: http://www.math.usu.edu/~symanzik

Natascha Vukasinovic, Monsanto Company
Alex Cheng Ki Wun, Hong Kong
Contents

- Introduction
- The US Setup
  - Course Structure
  - Electronic Exams & Grading
  - Problems and their Solutions
- The Hong Kong Setup
  - Weekly Meetings
  - Electronic Homework Submission & Grading
  - Problems and their Solutions
- Evaluation of Student Surveys
- Conclusions & Future Work
Introduction

- Stat 2000: Introduction to Statistical Methods
- Utah State long-distance course
- 3 sessions offered 2004 in Hong Kong
  - Spring (15 weeks, 01/12-04/19): 60 students
  - Summer 1 (12 weeks, 02/23-05/10): 30 students
  - Summer 2 (15 weeks, 04/26-08/02): 89 students
Use of electronic textbook CyberStats (first use outside North America)

~2 CyberStats subunits assigned per week

1 main instructor in US

1 local instructor in Hong Kong

Students have to work fully electronically:

- No printed textbook required (but optionally available)
- Web-based homework submission and grading
- Web-based exams and grading
- Communication via message board & e-mails
<table>
<thead>
<tr>
<th>Course Map</th>
<th>User Home</th>
<th>Course Map</th>
<th>E Notes</th>
<th>Message Board</th>
<th>Help/Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units A - Collecting and Visualizing Data</td>
<td></td>
<td>Units C - Inference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units B - Modeling Random Behavior</td>
<td></td>
<td>Units D - Regression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units E - Design of Experiments and ANOVA</td>
<td></td>
<td>Units F - Time Series</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Units G - Statistical Process Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-1 Overview of Data Collection</td>
<td>A-2 Overview of Sampling</td>
<td>A-3 Overview of Experiments and Observational Studies</td>
<td>A-4 Population vs. Sample</td>
<td>A-5 Describing Data Graphically</td>
<td>A-6 Describing Data Numerically</td>
</tr>
<tr>
<td>B-4 Random Variables</td>
<td>B-5 Binomial Random Variables</td>
<td>B-6 Expected Values and Variance</td>
<td>B-7 Binomial Random Variables</td>
<td>B-8 Poisson Distribution</td>
<td>B-9 Normal Distribution</td>
</tr>
<tr>
<td>B-10 Exponential Distribution</td>
<td>B-11 Sampling Distributions</td>
<td>B-12 Central Limit Theorem</td>
<td>B-13 Chi-Squared Distributions</td>
<td>B-14 F-Distribution</td>
<td>C-1 Confidence Intervals - The Concepts</td>
</tr>
<tr>
<td>C-9 Paired Data</td>
<td>C-10 Two-Way Tables for Count Data</td>
<td>C-11 Overview of Linear Modeling</td>
<td>C-12 Simple Linear Regression</td>
<td>C-13 Multiple Linear Regression</td>
<td>C-14 Residuals</td>
</tr>
<tr>
<td>D-1 Overview of Linear Modeling</td>
<td>D-2 Confidence Intervals for the Mean</td>
<td>D-3 The Concepts of Hypothesis Tests</td>
<td>D-4 Hypothesis Test for the Mean</td>
<td>D-5 Power and Sample Size</td>
<td>C-6 t-Tests and Intervals</td>
</tr>
<tr>
<td>D-3 Residuals</td>
<td>C-7 Tests and Intervals for Proportions</td>
<td>C-8 Two Independent Samples</td>
<td>C-9 One-Way ANOVA</td>
<td>C-10 Data Over Time</td>
<td>C-11 Overview of Statistical Process Control</td>
</tr>
</tbody>
</table>
US Setup: Electronic Exams

- Web-based exams:
  - 3 in Spring
  - 2 in Summer 1 & 2

- Exams taken in Hong Kong classroom

- Multiple-choice questions and text-based questions to be answered via CyberStats password-protected html Web page

- Question order randomized for each student, but identical questions within each group
**US Setup: Electronic Grading**

- Grading via html Web page with forms for points and instructor comments
- **ALL** answers (including duplicated ones) for a questions for **ALL** students visible at the same time
- Future research question: in which way do students change their answers?
US Setup: Problems & Solutions (1)

- 7 students involved in cheating in final exam in Spring (awarded F), e.g., Question 39:
  - 1244x: [ServerTime Apr-21-2004 10:46:52 PM] there has three outliers, and the data is fairly symmetric
  - 1257x: [ServerTime Apr-21-2004 10:54:14 PM] there are no outliers. The boxplot shows that there is fairly symmetric.
  - 1257x: [ServerTime Apr-21-2004 11:18:37 PM] there has three outliers, and the data is fairly symmetric.

- Solution: Additional proctors in back of the classroom
Almost impossible to motivate students to participate in discussion via message board; too shy or language problems?

Solution: none so far
Hong Kong Setup: Weekly Meetings (1)

- Weekly meetings of 180 minutes, mostly in computer lab
  - 10 min computer setup
  - 75 min lecture period
  - 5 min break
  - 75 min lecture period
  - 15 min Q & A period

- In lecture period: discussion of course material & work with WebStat & other interactive tools

- In Q & A period: Homework questions and further work with interactive tools
Hong Kong Setup: Weekly Meetings (2)

- Attendance above 90% at start of the semester
- Attendance gradually decreased to about 70%
- Exception: Close to 100% before exams
  (discussion of sample exams)
**Hong Kong Setup: Electronic Homework Submission & Grading**

- Almost 100% of homeworks submitted electronically
- About 60% to 70% of homeworks submitted on time

**Grading of homeworks:**

- “In my opinion, it’s really convenient to grade the homework online in CyberStats.” (Alex, Local Hong Kong Instructor)
Hong Kong Setup: Problems & Solutions

- Some technical problems with CyberStats
- Sometimes slow to access CyberStats
- Sitemap would be helpful
- Solutions: Communication with CyberStats developers; possibly CyberStats mirror site?
After the final exam

No extra credit in Spring: 5 / 58 responses from students attending the final exam

20 points (towards 1000 points score) in Summer 1 & 2: 27 / 27 and 60 / 81 responses (59 / 69 from students eventually passing the course)

25 (Spring) and 23 (Summer 1 & 2) questions on:
- General
- Instruction
- CyberStats
- Exams
- Demographics/Panswers (including “NA”) was acceptable
Student Survey (2)

Results for Summer 2 session only (60 responses):

- Demographics: about 50% male & 50% female; mostly early 20ies; English as a secondary language
- For most students, this was their first statistics course
- Students generally satisfied with overall quality of the course and instruction
- 19 students found this course better than other distance learning courses they took before
- Some students complained about computer shortage and fast pace of local instructor
Results for Summer 2 session only (continued):

- 27 students found CyberStats terrible, or were not very happy about it; 17 students liked it.
- Favorite CyberStats feature: WebStat and possibility to analyze data directly; not so popular: message board and e-notes.
- Time and difficulty level of exams appropriate for most students.
- Favorite exam questions: multiple-choice; least-favorite: text-based questions, with or without interactive tools.
Conclusions

- Overall positive experience for US Instructor
- “Convenient, user-friendly, excellent aid from calculators and WebStat during the class.” (Alex, Local Hong Kong Instructor)
- We continue to use CyberStats for upcoming Intro Stats course in Hong Kong this Fall semester!
Future Work

- Do a full analysis of all surveys
- Link survey answers to overall student performance
- Further analysis of repeated / changed student exam answers
Questions ?