The Problem

• Students require regular practice problems to apply concepts in a course.
  On certain STAT courses, students were requesting more regular homework assignments.
• Research suggests that only about 20% of students seriously attempt homework questions that are without credit.
• Traditional paper-based assignments require much time to grade, and feedback to students is not timely.
• All students received the same assignment, with the potential for plagiarism going undetected.
• Thousands of sheets of paper are expended on written assignments …

Integrating R

• The R statistical software is a powerful open-source environment for statistical computing. R has been used extensively in undergraduate teaching at UBC.
• We have enhanced WeBWorK to enable it to communicate with R.
• This integration allows WeBWorK access to R's rich facilities for statistical data manipulation, analysis, and visualization, and hence permits the creation of probing and diverse problems in statistical science.
• Hundreds of questions have been coded in WeBWorK that use R functionality.

WeBWorKiR in Action

Questions have been created for use in STAT 200, 241/251, 300, 302, 305, 404, and SPPH 400. The screenshots that follow give an example of a question from STAT 300. As with most questions on the course, it features a case study that provides the basis for the simulated data.

WeBWorK

• Developed by the Mathematical Association of America, WeBWorK is an open-source on-line homework system, incorporating thousands of questions in mathematics.
• WeBWorK permits randomization in questions, allowing homework sets to be customized for each student.
• Grading is automated, students receive instance feedback on their answers and can be allowed multiple attempts at questions.
• Prior to our project, WeBWorK contained very few questions in statistical science.
• Coded in the Perl language, WeBWorK was not well suited for creating questions in probability and statistics.

Outcomes

• So far around 5500 students have used WeBWorK on UBC STAT courses.
• Student feedback via mid-term surveys has been very positive:
  - on 200/241/251 around 90% either agreed or strongly agreed with the statement “The online WeBWorK assignments were useful to your learning.”
  - Comments include: “Good amount of questions - not too many but still reinforces learning”, “Forces me to keep up with class”, “I like it when I get immediate feedback on questions that require more than one part. This at least allows me to know where I went wrong in the question.”
• Teaching assistants have been freed from tedious grading to work on other tasks, such as classroom support.
• Instructors report an increase in student engagement and performance.
• Other institutions are using the resources created, including Camosun College and University of Calgary.

Special Thanks

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