

Using Technology to Enhance Teaching, Learning, and Students' Assessment

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Formative Evaluations as a Means of Improving Learning and Teaching

- A continuous and ongoing process
- Pace student learning
- Enhance scaffolding
- Help students monitor their own progress

Introductory Statistics at UCLA: 1997 - 2004

- Three hours of lecture per week (with the Professor)
- One hour of section per week (with the T.A.)
- Homework, midterm and exam schedules are typical

Moodle

- Open source course management system
- Piloted by the statistics department since 2004
- Adopted campus-wide in 2007
- Chosen from among 30 possible candidates
- Key features include
 - Password protection
 - Online discussion forums
 - A central venue for posting teaching materials, data, etc.
 - Timed quizzes which are automatically graded
 - A flexible question bank in which quiz materials can be developed, refined and stored

A Course Homepage

The screenshot shows a web browser window displaying a Moodle course homepage. The browser's address bar shows the URL <http://moodle.stat.ucla.edu/course/view.php?id=121>. The browser's address bar also shows several search engines: chrisbarr, google, google.news, google.scholar, asa.jobs, registrar, web.of.science, florida.jobs, australian.jobs, or.jobs, math.jobs, and industry.jobs. The browser's tabs show "Gmail - Inbox" and "Course: Statistics 10, Lecture 3 In...".

The Moodle course homepage features the following elements:

- UCLA Department of Statistics Collaborative Learning Portal** logo and navigation links.
- LearningPortal** and **Stat10Lec3-07S** course identifier.
- People** section: Participants.
- Activities** section: Forums, Quizzes, Resources.
- Search Forums** section: Search box, Go button, Advanced search link.
- Administration** section: Turn editing on, Settings, Assign roles, Groups, Backup, Restore, Import, Reset, Reports, Questions, Scales, Files, Grades, Unenrol me from Stat10Lec3-07S.
- My courses** section: Statistics 10, Lecture 3 Introduction to Statistical Reasoning, Statistics 110A, Lecture 1.
- Weekly outline** section: A list of course activities with checkboxes for each week.

The **Weekly outline** section contains the following activities:

- News forum**: FINAL EXAM GUIDELINES
- 1 April 7 April**: Practice quiz, Syllabus Fall 2006, Week 1-3 supplemental handouts Spring 2007, Homework 1 due Thursday April 12th
- 8 April 14 April**: Supplemental handouts for weeks 1-3, Quiz 1 Attempt 1 Spring 07, Quiz 1 Attempt 2 Spring 2007, Syllabus S 07
- 15 April 21 April**: Quiz 2 attempt 1 Spring 07, Quiz 2 attempt 2 Spring 07
- 22 April 28 April**: Review midterm Spring 07, Supplemental handouts weeks 4-7, Quiz 3 attempt 1, Quiz 3 Attempt 1 - open ended question
- 29 April 5 May**: Check your score for Quiz 3 Attempt 1, Quiz 3 Attempt 2, Q3A2 essay question, Midterm review answers
- 6 May 12 May**: Midterm review answers F06, Rubric for Q1A1 free response, Rubric for Q1A2 free response, Week 6-7 handouts
- 13 May 19 May**: Midterm answers, Quiz 4 Attempt 1, Practice quiz on probabilityTh, probability practice quiz answers

An Online Quiz

Navigation icons: back, forward, refresh, home, search. Address bar: <http://moodle.stat.ucla.edu/mod/quiz/attempt.php?q=589>

Search bar: chrisbarr, google, google.news, google.scholar, asa.jobs, registrar, web.of.science, florida.jobs, australian.jobs, or.jobs, math.jobs, industry.jobs

Navigation: Gmail - Inbox, Stat10Lec3-07S: Quiz 4 Attempt 1

UCLA Department of Statistics Collaborative Learning Portal

You are logged in as Christoph

LearningPortal ▶ Stat10Lec3-07S ▶ Quizzes ▶ Quiz 4 Attempt 1 ▶ Attempt 1 Update

Time Remaining: 0:59:25

Info Results Preview Edit

Note: This quiz is not currently available to your students

Preview Quiz 4 Attempt 1 Start again

1 Marks: 1

In a company with 10,000 employees, there are 3000 engineers, 2000 scientists, 2000 technicians, and the rest are staff. If you pick a person at random, what is the probability that s(he) will be an engineer or staff?

Choose one answer.

- a. 0.30
- b. 0.60
- c. 0.06
- d. 0.50

2 Marks: 1

In a certain country, 30% of the people have blonde hair, 20% of the people have blue eyes, and 5% have both. If you pick a person at random, what is the probability that they will have blonde hair or blue eyes?

Choose one answer.

- a. 0.50
- b. 0.40
- c. 0.45
- d. 0.60

3 Marks: 1

You are the TA for Statistics 10 and a student comes to you with the following question,

I have made a contingency table for gender and smoking. Based on this table, of the 500 females, 250 smoke and of the 400 males 200 smoke. Would it be correct to conclude that gender and smoking are independent?

What would be the best answer?

Choose one answer.

- a. It is correct to conclude that gender and smoking are independent because the probability of being a smoker given that you are a male is equal to the probability of being a smoker.

Real Time Quiz Results

Q#	Question text	Answer's text	partial credit	R. Counts	R.%
(2217)	<p>Q4A1 addition rule for disjoint events :</p> <p>In a company with 10,000 employees, there are 3000 engineers, 2000 scientists, 2000 technicians, and the rest are staff. If you pick a person at random, what is the probability that s(he) will be an engineer or staff?</p>	0.30	(0.00)	2/141	(1%)
		0.60	(1.00)	129/141	(91%)
		0.50	(0.00)	3/141	(2%)
		0.06	(0.00)	3/141	(2%)
(2218)	<p>Q4A1 addition rule for overlapping events :</p> <p>In a certain country, 30% of the people have blonde hair, 20% of the people have blue eyes, and 5% have both. If you pick a person at random, what is the probability that they will have blonde hair or blue eyes?</p>	0.50	(0.00)	24/141	(17%)
		0.45	(1.00)	80/141	(57%)
		0.40	(0.00)	29/141	(21%)
		0.60	(0.00)	4/141	(3%)

Question Bank

Info Results Preview Edit

Quiz Questions Categories Import Export

Category: Default Edit categories

Display
 Also show

Action	Type
<input type="checkbox"/>	Simple Linear Regression (QuestionBank)
<input type="checkbox"/>	correlation and regression (QuestionBank)
<input type="checkbox"/>	dependent and independent variables (QuestionBank)
<input type="checkbox"/>	effects of outliers (QuestionBank)
<input type="checkbox"/>	general (QuestionBank)
<input type="checkbox"/>	interpretation (QuestionBank)
<input type="checkbox"/>	least squares (QuestionBank)
<input type="checkbox"/>	non-linear relations and regression (QuestionBank)
<input type="checkbox"/>	r-squared (QuestionBank)
<input type="checkbox"/>	regression and causality (QuestionBank)
<input type="checkbox"/>	regression to the mean (QuestionBank)
<input type="checkbox"/>	residual (QuestionBank)
<input type="checkbox"/>	slope and intercept (QuestionBank)
<input type="checkbox"/>	Test of Significance (QuestionBank)
<input type="checkbox"/>	general (QuestionBank)
<input type="checkbox"/>	interpretations and conclusion (QuestionBank)
<input type="checkbox"/>	null and alternative hypothesis (QuestionBank)
<input type="checkbox"/>	p-value (QuestionBank)
<input type="checkbox"/>	p-value and significance level (QuestionBank)
<input type="checkbox"/>	parameter and statistic (QuestionBank)
<input type="checkbox"/>	box plots
<input type="checkbox"/>	Q4A1 F06 probability deck of cards

Select all / Deselect all With selected:

Delete Move to >> Default

Introductory Statistics at UCLA: 2005 -

- Two hours of lecture per week (with the Professor)
- Two hours of section per week (with the T.A.)
- Homework, midterm and exams are typical
- Five or six quizzes are proctored via Moodle
- Students are allowed two attempts, with one lecture and one section meeting in between the attempts

Sat	Sun	Mon	Tues	Wed	Thurs	Fri
		Lecture	Section		Section	Lecture
First Attempt of the Quiz			Second Attempt of the Quiz			

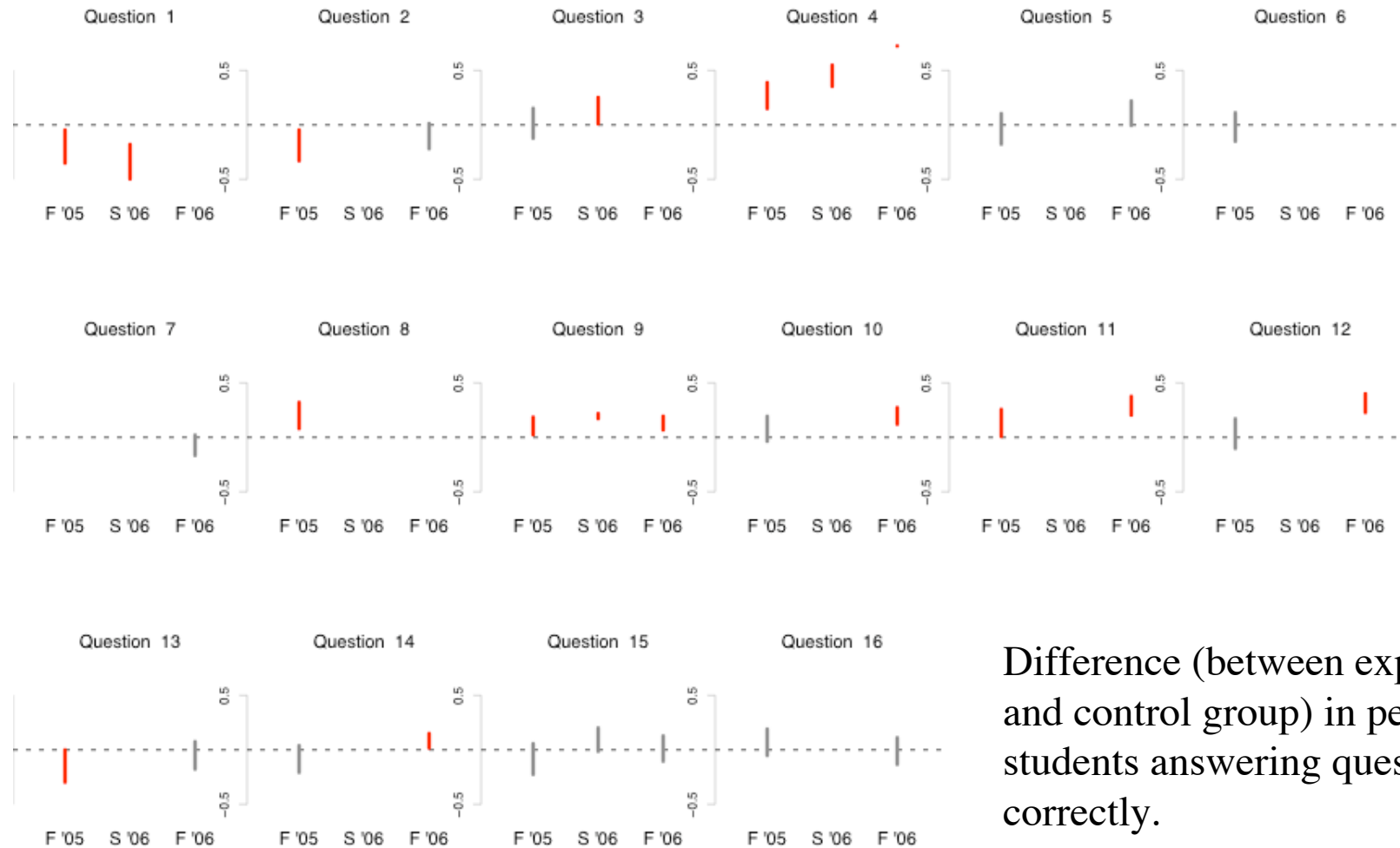
Evaluating the New Approach

- Multiple quiz attempts and group discussion help students link new concepts to old, and help students generate their own knowledge
- Moodle's resources allow the instructor and teaching assistants' to operate more effectively as facilitators
- Immediate feedback allows students to identify the concepts which they find most challenging, review them and enhance scaffolding

Data Collection

- Control group (Without Moodle): Spring 2004
- Experimental groups (With Moodle): Fall 2005, Summer 2006, Fall 2006
- Class demographics and time of day were similar
- All four groups had the same instructor (Esfandiari), textbook, lecture notes, grading and assignment structure
- The control group received mock quizzes
- Teaching assistants varied across classes
(Results gathered the day of the final)

Multiple Choice Questions

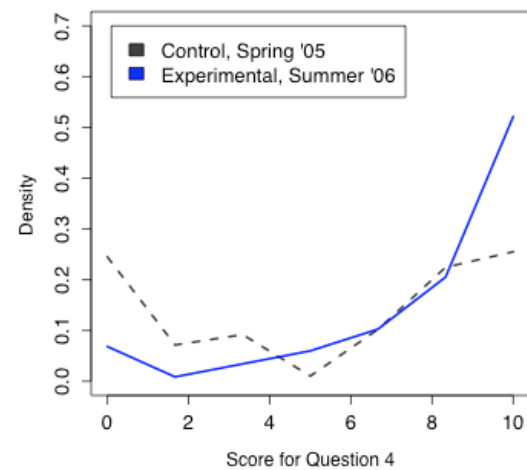
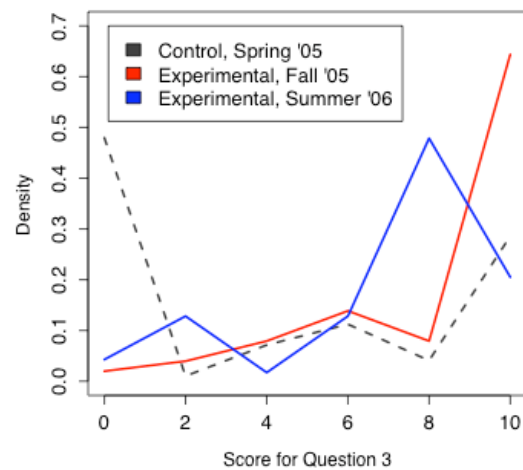
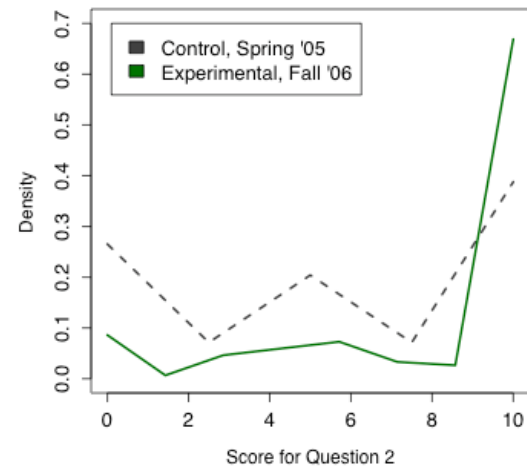
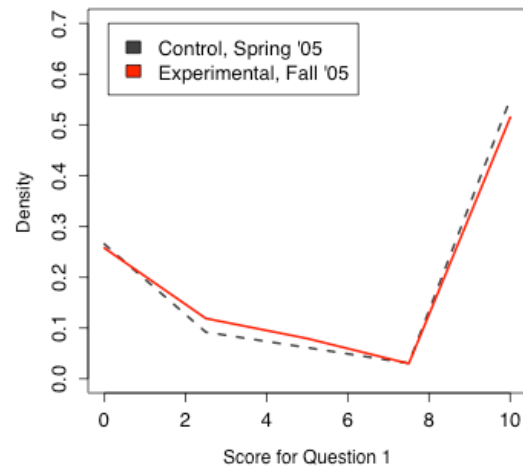


Difference (between experimental and control group) in percent of students answering question correctly.

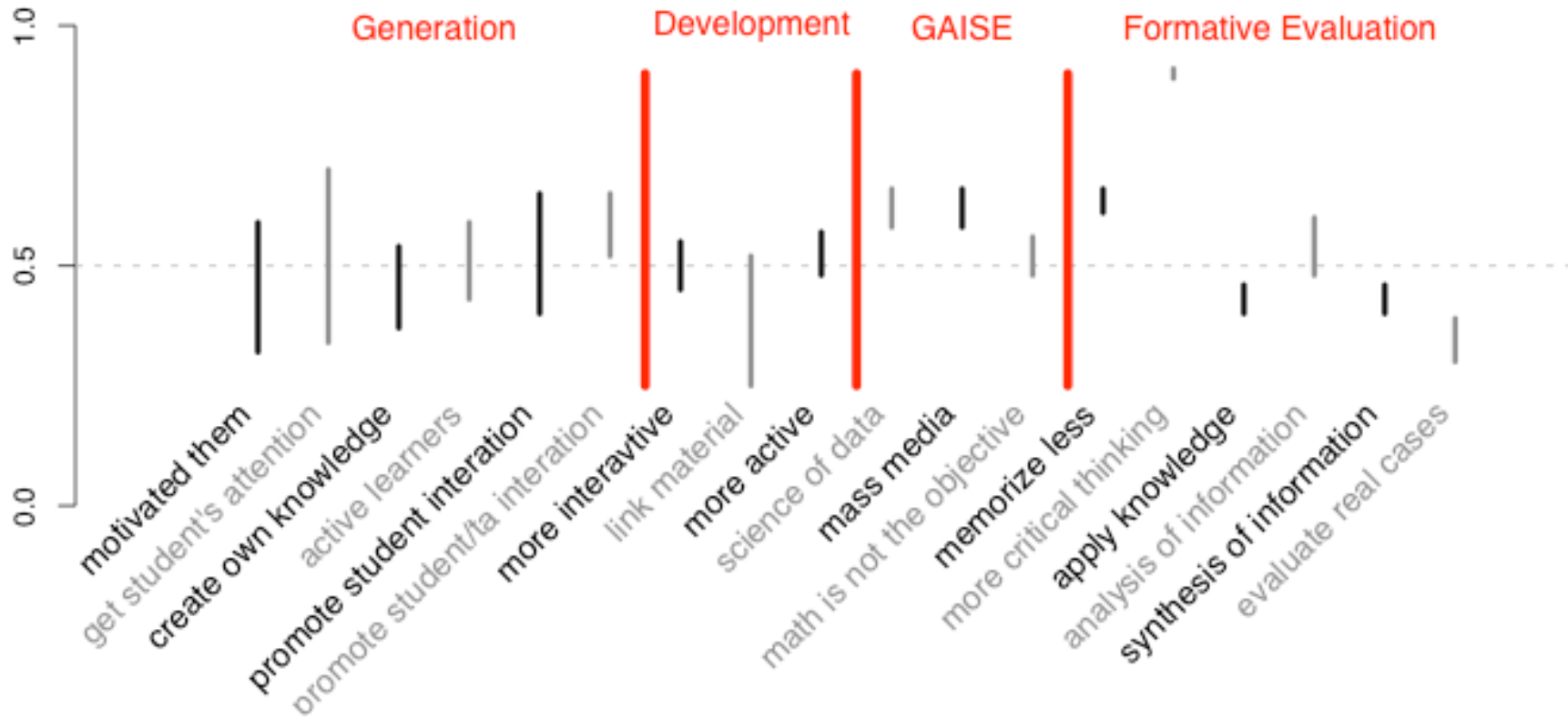
For complete results please visit

<http://www.stat.ucla.edu/~chrisbarr/research1/EBS.pdf>

Free Response Questions



Summary of Survey Results



The Application of Moodle at UCLA

Department of Statistics

- Funding of “blended instruction case study” by the College of Letters and Science and Office of Instructional Development in 2004
- Research on possible course management systems and choosing the Moodle
- Why Moodle was chosen (free as opposed to Blackboard, customizable, based on testing and measurement theory)
- Moodle was used to start developing a test bank of multiple-choice questions and on line testing of students in Winter 2005 and Spring 2006 to pilot the BICS case study or restructured Statistics 10 on small groups of students,
- Fall 2006 Moodle was implemented in teaching large groups of Statistics 10
- Winter 2007 Moodle was implemented as a course management system for upper division and graduate classes (a total of 22 courses)

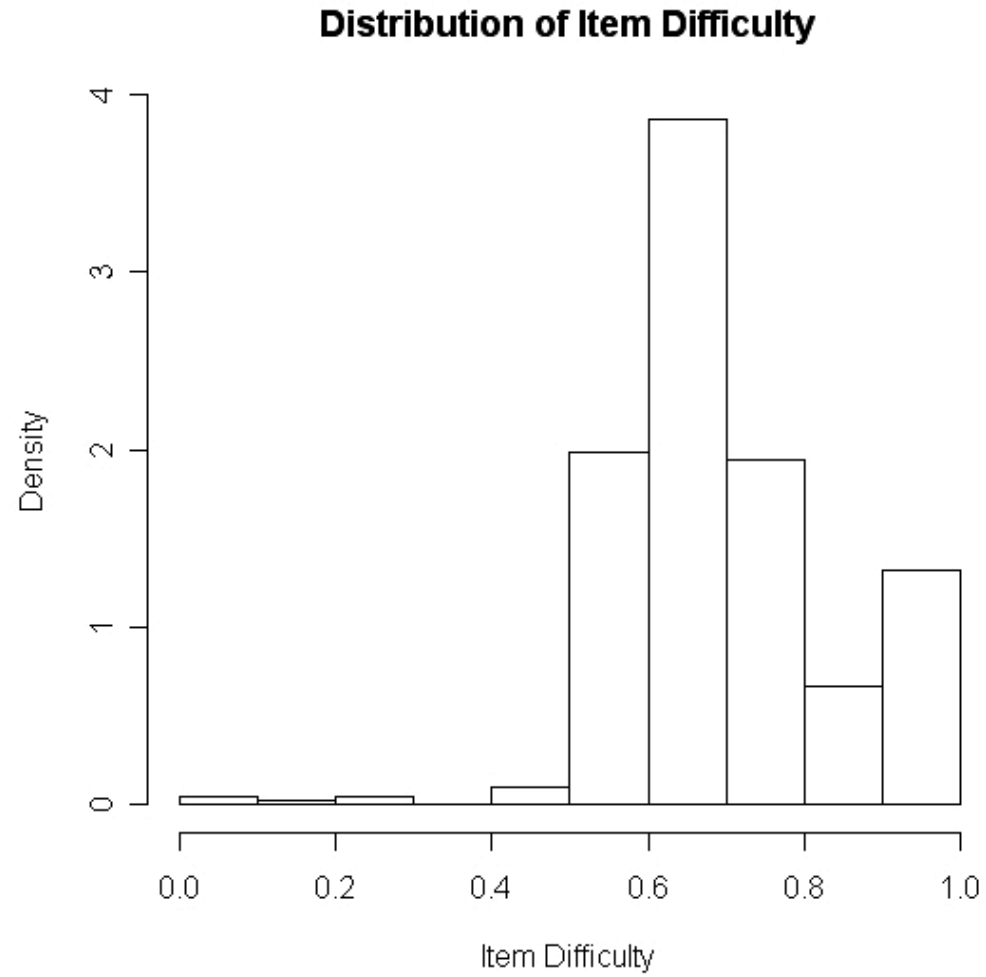
Using Moodle to develop the test bank: Part 1

- One of the major features of the restructured Statistics 10 is an automated test bank. We have taken the following steps toward developing this bank since Winter 2005
- Used Moodle to develop a series of multiple-choice questions based on the major concepts and strategies covered in the restructured Statistics 10 so that by now we have close to 1000 multiple-choice questions most of which are written at the higher thinking level including application, analysis, synthesis, and evaluation,
- Developing a system that was effective for categorization and identification of the questions by content,

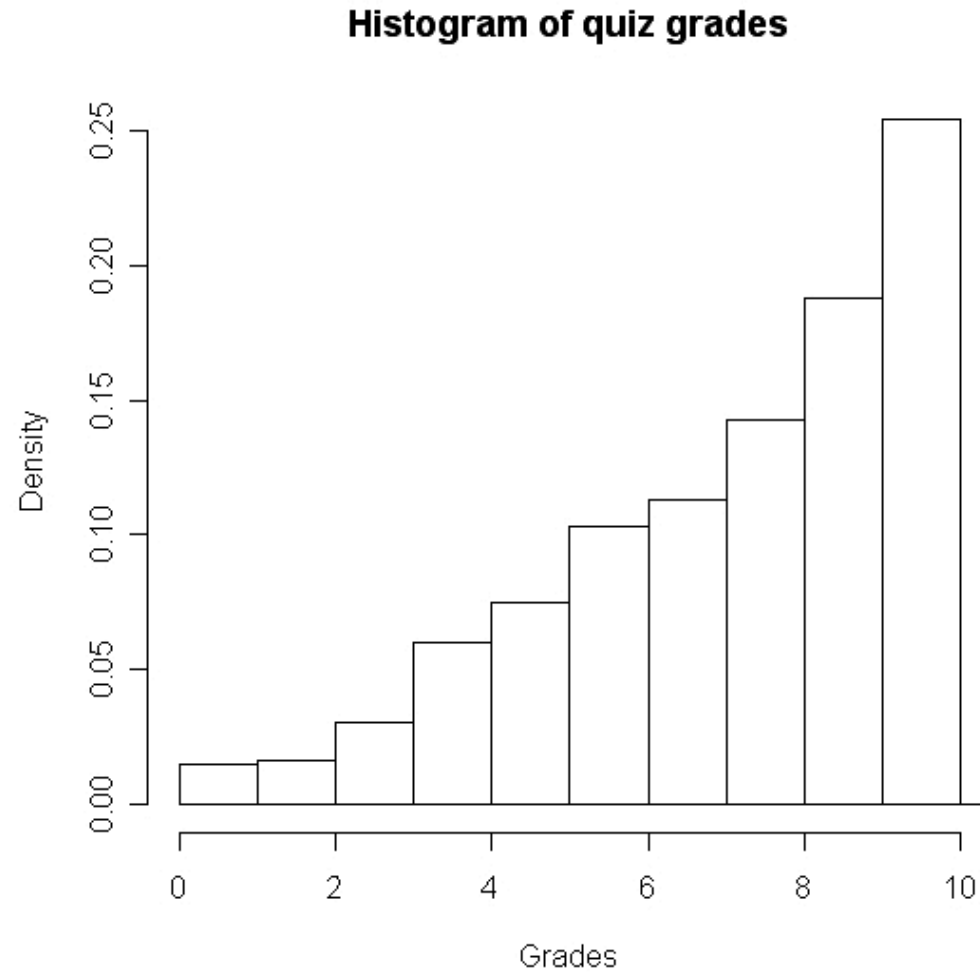
Using Moodle to develop the test bank: Part 2

- Checking the questions in the test bank for statistical soundness and accuracy,
- Editing the questions in the test bank,
- Classifying the questions in the test bank to a common bank to which all of the instructors can have access as well as banks that are specific to each instructor,
- Using Moodle to includes plots and graphics in the quizzes,
- Calculating the item difficulty (the percentage of students that got the correct answer) for each question since Winter 2005.

Item Difficulty



Distribution of Quiz Grades



Sample Essay Prompt

1 You are working with a researcher who has collected the following data on 500 people

Marks:

1

- gender (male and female)
- political affiliation (republican, democrat, and independent)
- annual income in dollars
- age in years

He wants you to plot two graphs that would display: 1) the relationship between gender and political affiliation, and 2) the relationship between political affiliation and income.

Q1) What plot would you draw for case 1 and why?

Q2) what plot would you draw for case 2 and why?

Sample Student Responses

- “I would draw three pie charts, one each for republican, democrat, and independent, with each chart having the percentage of males and females that are of that political affiliation, since it's easy to see how many males and females have a certain political affiliation with this plot”
- “I would draw three bar charts for this case since annual income has to be categorized by ranges of income and that's more fluently done using bar charts. For each chart, I would have the horizontal axis having annual income broken down by ranges (e.g. \$50K-\$100K being one range) and each of the horizontal axes of each chart being the political affiliation (republican, democrat, or independent)”

Why Open Ended Questions

- So far the instructors have used Moodle to pinpoint the percentage of correct answers and thus discuss what the students need to relearn or what they need to re-teach. The next step that we would like to take toward improvement of instruction and student learning is the identification of students' misconceptions and specially those misconceptions that are very common among students.
- Limitations
 - Not enough resources to read the answers
 - Turn-around time is slow. Students get feedback about a week afterwards

Leading Automatic Grading Softwares

Name	Cost
IntelliMetric	\$30/Student/Year
Criterion	\$12/Student/Year
IEA	More than the department's Budget
BETSY	Free

First Try with BETSY



Future Plans

- Build a database of essay prompts for the Automated Grading Softwares
- Gather training essay responses.
- Implement an online access site where students can submit responses and have immediate feedback

Thank You

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