

Assessing Student Learning Using a Digital Grading Platform

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Context

- **Foundations of Data Science** – new undergraduate course
 - Fall 2015: pilot (CS 94/STAT 94)
 - Spring 2016: scale-up (CS/STAT/INFO C8)
- Assessment questions
 1. What do the instructors *want* students to learn in this course?
 2. What are students *actually* learning in this course?
 3. How does this course and its content relate to other curricula on campus?
- Step 1 – between Fall 2015 and Spring 2016, compile a list of student learning objectives: *Upon completion of CS/STAT/INFO C8, students should be able to:*
 1. *Write correct small programs that manipulate and combine data sets and carry out iterative procedures.*
 2. *Extend a program with multiple functions so that it runs correctly with additional functionality.*
 3. *Calculate specified statistics of a given dataset.*
 4. *Identify the sources of randomness in an experiment.*
 5. *Formulate a null hypothesis that relates to a given question, which can be assessed using a statistical test.*
 6. *Carry out statistical analyses including computing confidence intervals and performing hypothesis tests in a variety of data settings.*
 7. *Given the result of a statistical analysis from the course, form correct conclusions about a question based on its meaning.*
 8. *Given a question and an analysis, explain whether the analysis addresses the question and how the analysis could change and still address the question.*
 9. *Articulate the benefits and limits of computing technology for analyzing data and answering questions.*
 10. *Correctly generate and interpret histograms, bar charts, and box plots.*
 11. *Correctly make predictions using regression and classification techniques.*
 12. *Assess the accuracy and variability of a prediction.*

Methodology

CS/STAT/INFO C8 uses the service gradescope.com to grade assignments quickly in a digital format. Gradescope has a statistics feature (currently still in beta) that allows instructors to “tag” individual questions with meta-concepts. Instructors can then view how students performed by *concept* as well as by question. Example:

2: Investigating Poverty	9 points
..... 2.1: Histogram of incomes for households	1 point
<input type="button" value="CODE"/> <input type="button" value="GRAPHS"/> 	
..... 2.2: Histogram of number of people per household	2 points
<input type="button" value="CODE"/> <input type="button" value="GRAPHS"/> 	
..... 2.3: The ahs_poverty table	2 points
<input type="button" value="CODE"/> 	
..... 2.4: The poverty_counts table	1 point
<input type="button" value="CODE"/> 	
..... 2.5: Bar chart of poverty rates	1 point
<input type="button" value="CODE"/> <input type="button" value="CALCULATE"/> <input type="button" value="GRAPHS"/> 	
..... 2.6: Evidence that poverty is related to / caused by location	2 points
<input type="button" value="INFERENCE"/> <input type="button" value="APPROPRIATE"/> 	

Preliminary Findings

Table: Assignments 1-4 (First Half of Semester)

Learning Objective	Assignment 1		Assignment 2		Assignment 3		Assignment 4	
	Points	% Correct	Points	% Correct	Points	% Correct	Points	% Correct
1. Write programs	8	87	15	89	13	94	14	91
2. Extend a program	8	87	7	92	1	95	–	–
3. Calculate statistics	2	96	14	89	3	91	5	79
4. Identify sources of randomness	6	87	–	–	–	–	–	–
5. Form a null hypothesis	–	–	–	–	–	–	–	–
6. Statistically test a hypothesis	–	–	–	–	–	–	–	–
7. Form correct conclusions	11	84	–	–	2	84	2	88
8. Identify appropriate analyses	9	84	–	–	–	–	2	88
9. Note benefits/limits of computing	–	–	–	–	–	–	1	80
10. Generate graphs	2	83	–	–	–	–	11	82
11. Make predictions	–	–	2	78	–	–	–	–
12. Assess prediction accuracy	–	–	–	–	–	–	–	–