

GAISE for Large Enrollment Roundtable

Matthew Beckman (Penn State University)

Joint Statistical Meetings / Baltimore, MD / August 1, 2017

GAISE Remarks specific to large classes

1992 Cobb Report (pre-GAISE)

- Little or no strategic guidance specific to large class environment

2005 GAISE College Report

- **Recommendation 4: Foster active learning (p. 18-19)**
 - “...large classes provid[e] opportunities for large sample sizes for student-generated data.”
 - “...have students work in pairs, rather than larger groups.”
 - “separate lab/discussion section for activities, if possible.”
- **Recommendation 6: Use assessments to improve and evaluate student learning (p. 21-22)**
 - “Use small group projects instead of individual projects.”
 - “Use peer review of projects to provide feedback and improve projects before grading.”
 - “Use discussion sections for student presentations.”
 - “focus on choosing good interpretations of graphs or selecting appropriate statistical procedures.”

2016 GAISE College Report

- **Recommendation 4: Foster active learning (p. 18-19)**
 - Acknowledged and deferred to Appendix F.
- **Recommendation 6: Use assessments to improve and evaluate student learning (p. 21-23)**
 - “Use small group projects instead of individual projects.”
 - “Use peer review of projects to provide feedback and improve projects before grading.”
 - “Use discussion sections for student presentations.”
 - “Incorporate real-time response systems (e.g., clickers)...”
- **Appendix D: Examples of Using Technology**
 - Discussion of real-time response (i.e. clicker) utilization
- **Appendix E: Examples of Assessment Items**
 - “[W]e want students to interpret results more than we want them to produce results... However sometimes the practicalities of teaching a large class mean that an appropriate exam question might be a multiple choice item that does not as for explanation.”
- **Appendix F: Learning Environments**
 - Face-to-Face Courses >> Large Classes: (p. 132-134)
 - * active/cooperative learning can work in large classes (Carbone, 1998)
 - * just choose activities judiciously (Gelman & Nolan, 2002)
 - * embed TA’s or advanced students for group supervision (Davidson, 1990)
 - * “Example #1” >> modified think-pair-share (Blumberg, 2015)
 - * “Example #2” >> think-pair-share then randomly call on a student to report
 - * “Example #3: Data Collection Using Class Polling” >> see Appendix D for more
 - * “Example #4: Using Online Surveys to Maximize Class Time” >> see Appendix D for more

Some Additional Ideas

Clickers

- Incentive to participate
 - full credit for 50% participation (2% of class grade)
 - pro-rated extra credit for additional participation (up to 2% of class grade; planning 1% next time)
 - this was enough incentive for strong attendance & participation
- No incentive for accuracy except to show results
- Show/tell students when it's a close race; encourage them to reconcile with others
- Consider not publishing answers to clicker Q's (Students have to be there and pay attention)

Large sample size for class data collections

- In class investigations (e.g. M&M activity)
 - Google Sheet for instant data collection
 - Instructor can quickly clean the data (filter out spaces & obvious typos)
 - Instructor or students copy/paste data into software for analysis
 - Large sample size is reliable for representing key features (e.g. CLT)
 - Even anomalies are useful (e.g. outliers from wrong units & typos vs. legitimate extreme obs.)
- Polling with randomized response surveys (https://en.wikipedia.org/wiki/Randomized_response)
 - Ask gutsy questions, get anonymous answers (haven't tried this personally)

Crowd-source Q&A

- Student incentive to both ask and answer questions regularly (2 contributions/wk)
 - Some “training” is needed early in semester to set the habit
 - Students generally do a nice job with content questions
 - Questions are answered **much** more quickly
 - Most syllabus and logistical questions are easily resolved
- Instructor & TAs mainly just step in for
 - Unresolved issues
 - Exam review time

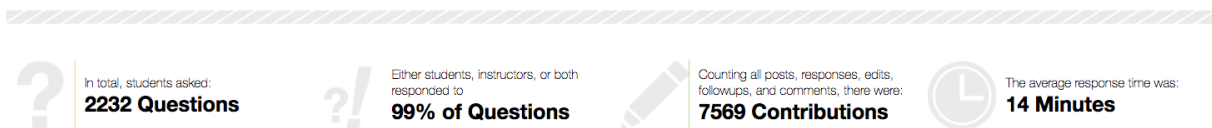


Figure 1: Fall 2016 Q&A volume metrics

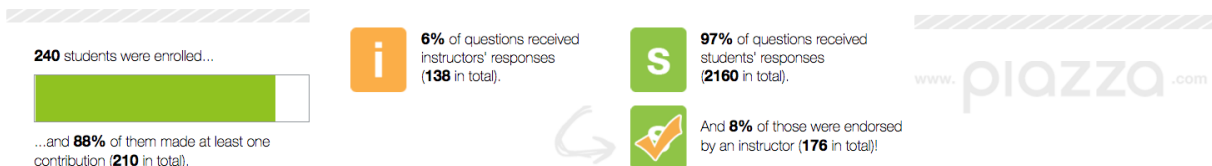




Figure 2: Fall 2016 contribution metrics.

Live SMS inbox

- Students can write in anonymously using a website or text message
- Students are still encouraged to ask questions in class since many SMS questions go unanswered
- Monitored periodically during “think-pair-share” or clicker questions
- There will be nonsense mixed in, so not good for the big screen
- Alternatively, a TA could monitor the feed & ask common questions
- Bonus: any errors or typos spark a flurry of activity so you catch them quickly

Questions?

 When poll is active, respond at **PollEv.com/matthewbeckm626**

 Text **MATTHEWBECKM626** to **37607** once to join

“when do you use bootstrap and when do you use randomization distribution?”
7 months ago

“what's the difference between SE and SD?”
7 months ago

“what is margin of error and how is it different from SD/SE?”
7 months ago

“how does changing the sample size change the p value?”
7 months ago

“how do you know if the confidence interval with contain zero? (question on exam 2)”
7 months ago

“When should you use a confidence interval and when should you use a hypothesis test? There were some times when we used both”
7 months ago









Figure 3: Excerpt from fall 2016 final exam review.

Exams & Projects

- Exams
 - 2 x 50min in-class midterms; 1 x 110min final
 - 15%, 20%, & 25% of final grade, respectively
 - Mostly short answer & select-response; a few fill-in-blank; occasional marking a plot/figure
 - Questions walk through (usually 2) statistical investigations of real data
 - Several tool selection questions based on provided research question (no analysis)
- Project (credit to Michael Bulmer for most of the guidance here)
 - 15% of final grade
 - Uses *The Islands* by Michael Bulmer (U.S. mirror: <http://theislands.umn.edu/login.php>)
 - Students design a study, collect data, analyze data, write report
 - Provided guidance (per Michael Bulmer):
 - * Lab activity with example of an experiment and an observational study using the Islands
 - * Catalogue of the variable types & combinations we have studied
 - * Complete scoring rubric
 - Groups of 1-4 permitted
 - Report Structure (word limits)
 - * Introduction (100 words)
 - * Methods (250 words)
 - * Results (250 words; 1-2 Figures)
 - * Conclusions (100 words)
 - Word limits are intentionally tight
 - * Students still have to do all the necessary statistical thinking to complete the project
 - * Students have to write in concise technical language
 - * Manageable for grading

References