# GAISE for Large Enrollment Roundtable

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## 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)
  - Instrucor 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

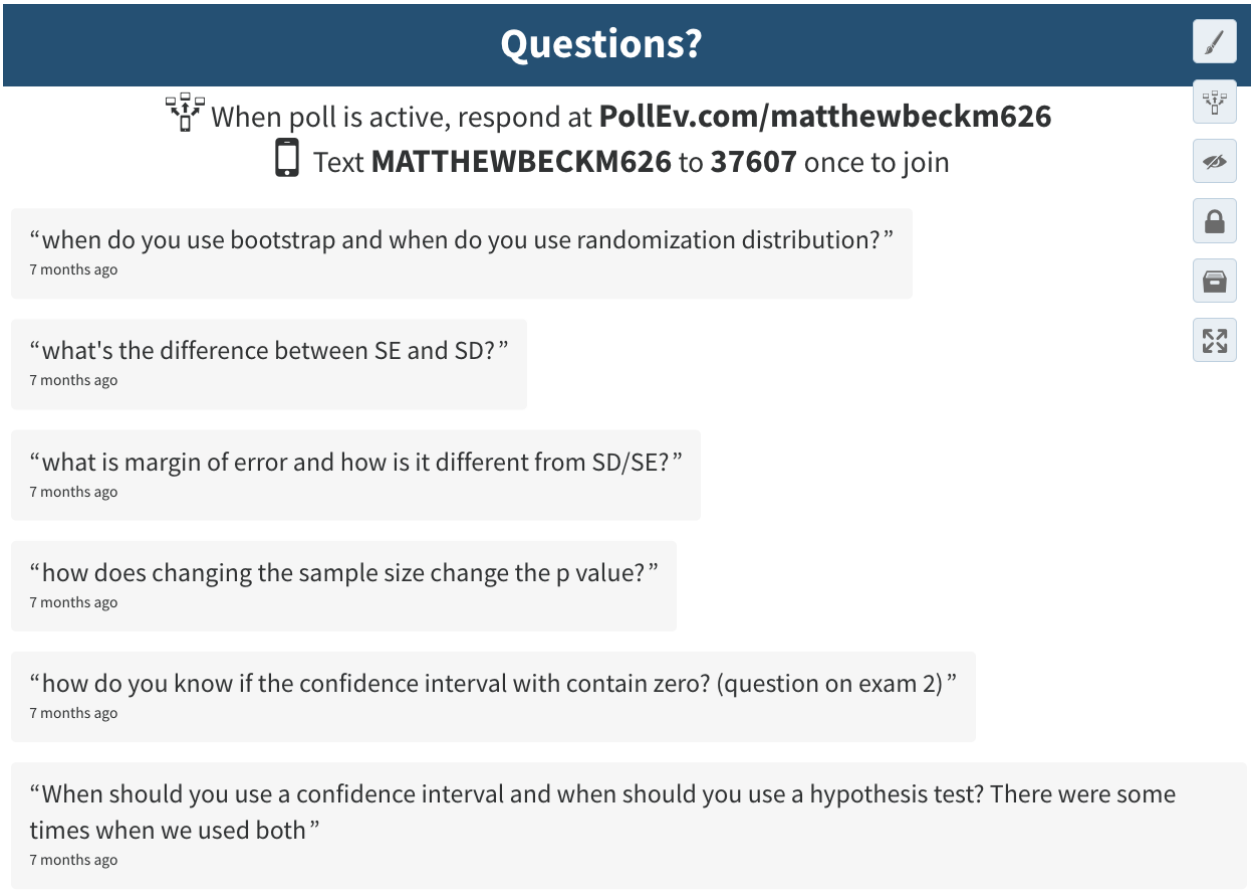


Figure 3: Excerpt from fall 2016 final exam review.

### 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


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Blumberg, P. (2015). Student Participation/Active Learning. *University of the Sciences' Teaching and Learning Center.* Available at http://www.usciences.edu/teaching/tips/spal.shtml#within

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Davidson, N. (1990). Small-group Cooperative Learning in Mathematics, *Teaching and Learning Mathematics in the 1990s. The NCTM Yearbook.* p. 52-61.

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