GROUP WORK THAT WORKS
INDIVIDUAL COMPONENTS OF GROUP PROJECTS IN INTRODUCTORY STATISTICS CLASSES

Daryl Swartzentruber & Dalton Hopper

CENTRE COLLEGE

Relevant Literature

Bowe et al. (2016) provide a useful comparison of different ways to give individual grades from group projects, drawing from sources such as Gibbs (2009) and Lejk et al. (1996). These include:

1. Including an individual assessment component
2. Instructors moderating a group grade for individual students
3. Students moderating each other's group grade
4. Peer assessment
5. Student self-assessment

Our projects primarily implement the first approach.

MAT 130: Intro. to Statistics

An investigation into the mathematical techniques for analyzing and interpreting data with a goal of facilitating informed decision-making processes. The course involves descriptive and inferential methods. **R is used for statistical analyses.**

Selected topics:

- types of variables
- data visualization
- measures of center and spread
- simple linear regression
- Normal and t-distributions
- hypothesis tests (traditional & randomization)
- confidence intervals (traditional & bootstrapping)

Key Takeaways

- Students are more engaged and feel more accountable when individual components are embedded in group projects.
- Students appreciate having clear roles and expectations.
- Grading both individual and group components provides a more holistic assessment of student performance.

References

- Bowe, L., Delaney, M., Fitzgerald, B., MacCann, P. & Ryan, C. (2016) "Methods for deriving individual marks from group work." Dublin: Technological University Dublin.
- Gibbs, Graham. "The assessment of group work: Lessons from the literature." Assessment Standards Knowledge Exchange (2009): 1-17
- Lejk, Mark, Michael Wyvill, and Stephen Farrow. "A survey of methods of deriving individual grades from group assessments." Assessment & Evaluation in Higher Education 21.3 (1996): 267-280.

Daryl's Project - Overview

- I give students a survey asking who they do or do not want to be in a group with, as well as possible topics. From this I form groups of 3-4 students.
- Groups find their own data set after an in-class mini-lesson on data sources. Common data sources include Kaggle, the SCORE network, and the UCI machine learning repository. I work with students if there are any data cleaning/manipulation issues.
- Groups define the sample and population, and develop one statistical question per student. These questions must cover multiple types of analysis.
- Each student is responsible for presenting one analysis that includes both descriptive and inferential components.
- Group presentations are roughly 10-12 minutes long and include a description of the data set in addition to the individual presentation components.
- After the entire group presents, I ask each individual student a question based on class topics related to their analysis. Students choose the difficulty of their question ahead of time. See table below for scoring details.

Daryl's Project - Grade Components

Overall project worth **18 points (18% of final grade)**:

Group Components:

- **6 pts**: Data and project proposal (identification of sample, population, matching research questions to appropriate analyses)
- **2 pts**: Group part of presentation (explanation of the data set, average of individual components)
- **4 pts**: R Script with supporting work (implementation of correct procedures, numbers match presentation)

Individual Components:

- **4 pts**: Individual part of presentation (correct descriptions and interpretations, proper notation and terminology)
- **2 pts**: Individual response to question (demonstration of conceptual understanding)

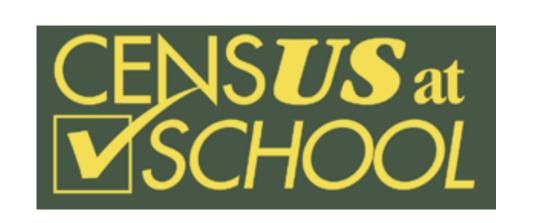|	0	1	2	3	4
Easy	0	.4	.6	.8	.8
Medium	0	.5	.7	.9	.9
Hard	0	.6	.8	1	1.1

Daryl's Project - Student Feedback

Strengths:

- Keeps individuals accountable
- Similar to real-world group tasks
- Provides clear expectations
- Gives groups flexibility to determine degree of collaboration
- Individual ownership over grades
- Tests individual knowledge
- Students can focus on area of strength, teach others their topic

Areas for Improvement:

- Fostering connection/collaboration among group members
- Ensuring that struggling students don't feel singled out
- Justifying the grade components (students don't like having a grade that is based on other students' work)
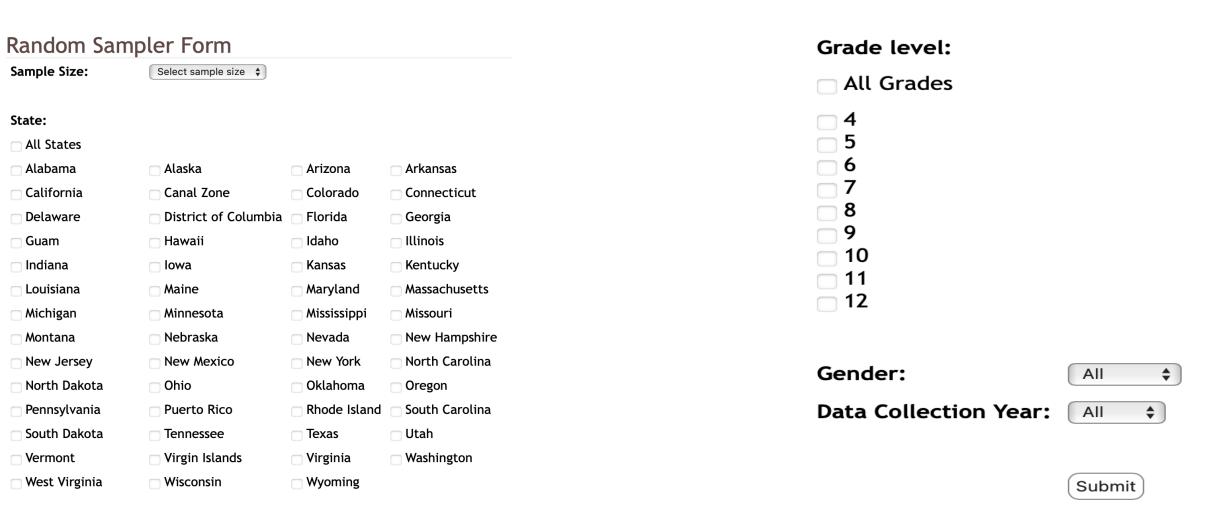- Developing a formal way for individuals to communicate with me if a group member is not doing their part

Dalton's Project - Overview

CENSUS at SCHOOL → International survey of students in grades 4–12 (U.S. data used)

- In **groups of 3**, students conduct a small-scale research project based on the large-scale *Census at School* project.
  - Students **choose their own groups**. Those unable to find a group are **randomly assigned**.
- Groups use the online **Random Sampler Form** to obtain a custom sample by specifying:
  - sample size, state(s), grade level(s), gender(s), year(s)

Random Sampler Form

- Each group conducts **6 statistical analyses (3 descriptive, 3 inferential)**:
  - At least **5 different analysis procedures** must be used.
- **Each group member leads** 1 descriptive and 1 inferential analysis, and presents both.
  - **Presentation length**: 12-15 minutes per group

Dalton's Project - Grade Components

The project is scaffolded and worth **100 points total (19% of final grade)**:

- **2 points**: Data Set(s) (1 submission per group — due 4 wks. before presentation)
- **5 points**: Project Proposal (1 per group — due 3 wks. before presentation)
- **88 points**: Presentation
  - **8 pts.**: Motivation (Group)
  - **8 pts.**: Cohesiveness (Group)
  - **8 pts.**: Slides (Group)
  - **25 pts.**: Statistical Content (Group)
  - **25 pts.**: Interpretations (Group)
  - **4 pts.**: Timing (Group)
  - **10 pts.**: Communication Skills (Individual)
- **5 points**: Letter of Learning (1 per individual — due after presentation)

Dalton's Project - Student Feedback

Strengths:

- engaging
- kept *everyone* accountable
- "one of the best formats I've tried"
- individual components . . .
  - alleviated pressure
  - were "*super*" helpful"
  - were great for that first push!

Areas for Improvement:

- more guidance on how to pick a focused, testable research question
- clearer and earlier acknowledgement that it is OK for project ideas to evolve over time