Authentic & Alternative Assessment in Intro Stats

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Chat Blast

What is the **purpose** of assessment?

Put your answer in the chat...

but wait to press send until it’s time!
Rethinking Traditional Exams

Can we keep traditional assessment, but make it better?
Rethinking Traditional Assessments

Traditional question:

Calculate the standard deviation for the given data set.

What is the goal of a question like this?

Share your answer in the chat!
Rethinking Traditional Assessments

If the goal is understanding standard deviation and what it measures, what is a better question?

Share your examples and ideas in the chat!
Rethinking Traditional Assessments

Possible improvement:

A suggestion from Joe Feldman’s *Grading for Equity* is to change the minimum grade on assignments to 50%.

How would making the change proposed above impact the standard deviation for the dataset displayed to the right?
Possible improvement:

Which of the three histograms summarizes the dataset with the smallest standard deviation?
Rethinking Traditional Assessments

Possible improvement:

Which would be larger – the standard deviation of the weights of 1000 randomly selected people, or the standard deviation of the weights of 10 randomly selected cats (ordinary domestic housecats)? Explain.

Credit: Allan Rossman @ askgoodquestions.blog
Tips and Tricks

- Reflect on **what** is being assessed
- Break questions up whenever possible
- Consider the trade off between multiple choice and free response

Quick ways to rewrite multiple choice:
  - Create a question where B would be the correct answer.
  - Explain what misconception or error leads to answer C.
Alternative Assessments

What can we do other than exams?
How do you get data for students to use?

- Class survey
- Class activity - measuring arm spans
- Physical simulation - flipping coins
- Student-created survey
- Textbook data sets
- Other online sources of existing data
Beginning of Class Survey

3. What is your major? (Optional)

4. I identify as... Note: If you prefer to self-describe, you can use the other option to do so. (Optional)
   - A. Male
   - B. Female
   - C. Non-binary / third gender
   - D. Prefer not to disclose
   - E. Other

5. What year were you born? (Optional)
Enter a numeric response between 1920 and 2020 inclusive.

What are some questions YOU ask?
Share your answer in the chat!
Weekly Data Analysis Activities

Introducing a topic
- Flipping coins - probability and law of large numbers
- “Fake” 3 question quiz - binomial probabilities

Developing understanding of a topic
- Drawing samples of M&Ms to produce confidence intervals
- Measuring heights and armspans for regression

Share your favorite data analysis activity!
Tips and Tricks

- Assessment: formative, summative, or some of both?
- Start physical -> move to online
- Keep data over time and add each semester’s to it
  - Another example of law of large numbers with real data
As teachers we may have been taught that whether an assessment is summative and formative defines where the student is in the learning progression, but in equitable grading the opposite is true:

where the student is in her learning progression defines whether an assessment is formative or summative.

- Grading for Equity
Discussion Boards – Data Analysis

- Create a display for a categorical variable. Comment.
- Create and post summary statistics for a quantitative variable. Hypothesize if you think the data will be skewed to the left, skewed to the right, or fairly symmetric based on looking at the numerics ONLY.
- Post a histogram for that same quantitative variable. Describe the shape in context.
Renewable Assignments

Students compile and openly publish so that the assignment outcome is inherently **valuable to the community after the class is over**.

- Study materials: Concept maps, study guides, quizlet, multiple choice creation
- Content delivery materials: Videos, additional examples, Desmos activities, rubrics
How can we leverage the assets students bring to class and empower them to use data to solve problems?
Our task this week is to see how Statistics is used in your field of study

- Explain what your field of study is (or one that you may be interested in).
- State why this field is of interest to you.
- Describe what type of data might be collected in this field. Try to come up with at least four variables and label whether they are numeric or categorical.
- Determine whether the data collected would more likely be from an observational study or experiment and explain how you determined that.
Tips and Tricks

- Allow revisions based on feedback (rubrics)
- Ideas from Small Teaching Online
  - Ditch the two responses!
  - Allow students to select discussion groups based on datasets / interests
  - Post highlights after each assignment
- Consider the verbs in your prompt
  - Use Bloom’s Taxonomy to level up questions
Student-Led Project

Students choose a research topic to find or collect data on to then analyze a bivariate relationship.

What are some reasons professors may not do projects in their classes?
Create several mini-assignments that become the cumulative assessment in the class. Set deadlines for each. Provide feedback on each. Help students pace themselves. Build self-efficacy as you reinforce student learning...

- Small Teaching Online
# Semester-Long Project: Overview

<table>
<thead>
<tr>
<th>Step</th>
<th>Details</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Creation</td>
<td>Create a survey with your project team!</td>
<td>0</td>
</tr>
<tr>
<td>Survey Completion</td>
<td>Fill out the other surveys from the class and send out your group’s survey to friends / family / relevant people from your population of interest.</td>
<td>20</td>
</tr>
<tr>
<td>Data Cleaning + Univariate Analysis</td>
<td>Post a display and summary for all variables in your data set. If you are in a group, each member must post at least one variable from the data set. If you are working individually, you’ll produce summary stats for all variables.</td>
<td>10</td>
</tr>
<tr>
<td>Bivariate Display</td>
<td>Post a display of your two variables and discuss what you expected to see and what about the display confirms or refutes that initial belief.</td>
<td>10</td>
</tr>
<tr>
<td>Bivariate Analysis</td>
<td>Post your analysis of the relationship between two variables to our discussion board, including hypotheses, conditions, StatCrunch output and conclusion.</td>
<td>30</td>
</tr>
<tr>
<td>Future Work</td>
<td>Finish up the Research Cycle by thinking about ways to improve what was done.</td>
<td>10</td>
</tr>
</tbody>
</table>
Semester-Long Project: Survey Creation

Survey Questions Help

NUMERICAL / QUANTITATIVE VARIABLES
- Be sure to specify units or timeframe in your question.
  - How many hours do you work?
    - How many hours do you work in a typical week?
- Leave your question open-ended, if possible. We can always group into ranges later!
  - How many hours do you work in a typical week? 0-10, 11-20, 21-30...
  - How many hours do you work in a typical week? _____

CATEGORICAL VARIABLES
- Do not leave your question open-ended, if possible. It will be hard to clean otherwise!
  - What is your favorite sport? _____
  - Which of the following sports do you enjoy watching most? Basketball, soccer...
- Try to limit possible options to 4-5, including ‘other’ if that’s reasonable.
- Avoid multiple selection questions
  - Which of the following pets do you own? Select all that apply.
    - Do you own? A dog, cat, both, neither.
Semester-Long Project: Survey Completion

Please **TAKE THIS** survey: [https://forms.gle/Qezz6GVB3jzAbwzF9](https://forms.gle/Qezz6GVB3jzAbwzF9)

When you finish, please answer the following question: What is an interesting **bivariate** relationship this group could explore using their data (those question posted)?

*Remember, a bivariate relationship is one that involves TWO variables. For example, I would explore whether gender identity was related to which social media sites a person used.*

Answer one of the following:

1. Why do you think it is interesting and what do you think that relationship will be?
2. What’s another question that might have been interesting to add to this survey? Why?
Exploring Our Data Instructions

Create a summary and a display of your variable. Add a sentence or two about your findings.

Were they any errors or unusual values?

Does this seem like what you expected for the population? Why or why not?
Semester-Long Project: Exploring Relationships

Exploring Relationships Instructions

Create a display showing your two variables at the same time. Remember, your display depends on your variables types!

What did you expect to see in terms of a relationship?
What did you see in terms of a relationship?
What aspects of the graph are leading you to that conclusion?
Semester-Long Project: Analyzing Relationships

Analyzing Relationships
Instructions

Run an analysis on your two variables. Remember, your analysis depends on your variables types!

- State which test you are running.
- State the hypotheses for your test in context.
- Check whether or not the conditions were met for your test, showing your reasoning for your choice.
- Include computer output.
- Make your decision and give your conclusion in context of the test and problem.
Semester-Long Project: Future Work

We will now go back to the planning stage - what would you do differently if you did this again?

Thinking Forward Student

What would you change moving forward with regards to:

Data Collection Method

- Would you have adjusted your population or sample in any way? Why?
- Would you have added another question to investigate? Why?

Survey Questions

- Would you have adjusted your existing questions in any way? Why?
Semester-Long Project: Final Submission

Final Submission

- Video presentation
- Written report
- Infographic
Tips and Tricks

● Scaffold the pieces of the project - can insert them at appropriate times in curriculum
● Groups created based on survey OR sign up sheet for identified topics
● Allow revisions to components based on peer or instructor feedback
● Grades based on *statistical understanding* and individual contributions
Choose your level of comfort!

1. Better exam questions
2. Alternative assessments
3. Authentic assessments
Why reconsider assessment?

- Engages students in relevant questions
- Reduces opportunities (and desire) to cheat
- Increases equity
Reassessing our Assessments

What is something you want your students to remember after your class?
Continue the Conversation

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Kelly Spoon (@kellymspoon)
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https://tinyurl.com/AMATYCstatstalk
Better Assessment Question Resources

- **AP Statistics Past Free Response Questions** - the AP exam has excellent questions that extend beyond procedural (with rubrics) here they are organized by topic courtesy of StatsMedic
- [https://askgoodquestions.blog/](https://askgoodquestions.blog/) - Allan Rossman’s blog of thought provoking questions for statistics
- [7 Exam Questions for a Pandemic](https://askgoodquestions.blog/) - Francis Su’s blog post with questions for a math final that are reflective in nature
Discussion Board Resources

Logistical resources from Small Teaching Online

- “An Online Instructor’s Guide to Better Discussion Boards” - Blake
- “What Research Tells Us about Online Discussion” - Orlando
- “Five Tips for Improving Online Discussion Boards” - Gernsbacher

Resources for better prompts based on Bloom’s Taxonomy

- https://www.mandela.ac.za/cyberhunts/bloom.htm
Renewable Assignment Resources / Examples

What are renewable assessments?
- [Blog post](https://openedgroup.org/doer-fellows-renewable-assignments) by David Wiley
- [Webinar](https://openedgroup.org/doer-fellows-renewable-assignments) with Suzanne Wakim (Biology, Butte)

Examples:
- [https://openedgroup.org/doer-fellows-renewable-assignments](https://openedgroup.org/doer-fellows-renewable-assignments) - unfortunately, none from math / stats...
Project Resources

- “An Online Instructor’s Guide to Better Discussion Boards” - Blake
- “What Research Tells Us about Online Discussion” - Orlando
- “Five Tips for Improving Online Discussion Boards” - Gernsbacher
Other Resources

- **Teaching and Learning for Social Impact - Focus on Backward Design** - aligning your course with your outcomes
- **Grading for Equity - Feldman** - how our assessments are linked to our grading practices
- **Grading for Growth STEM University Conference 2021** - more on completing redesigning your assessments + grading using standards-based or specification grading
- **An Older Version of Kelly's Online Course** - needs edits, I know!