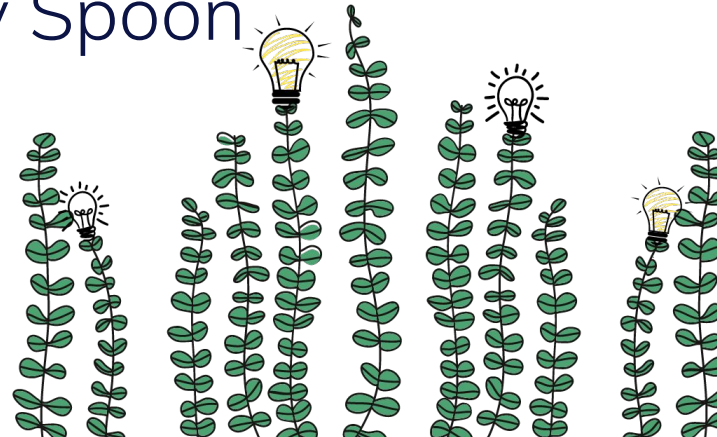


Authentic & Alternative Assessment in Intro Stats

Kathleen Almy & Kelly Spoon



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?

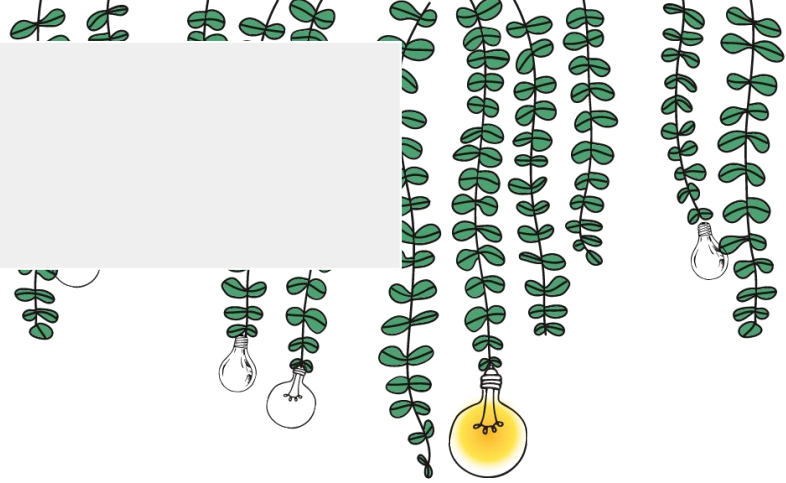
Rethinking Traditional Assessments

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!

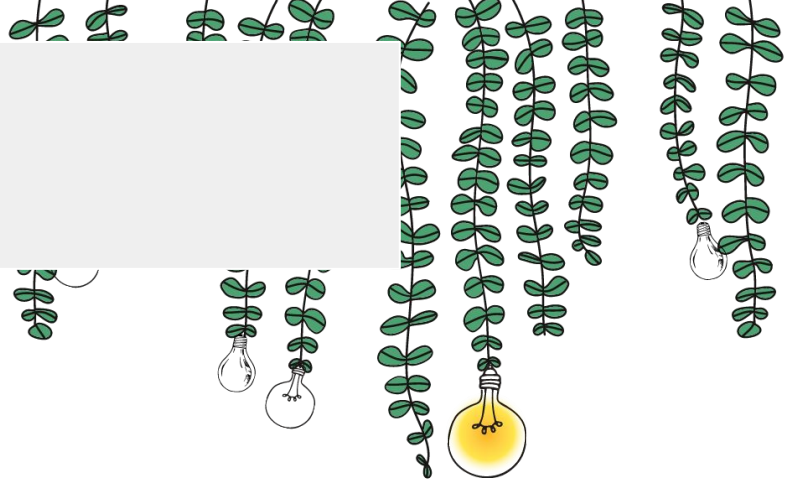
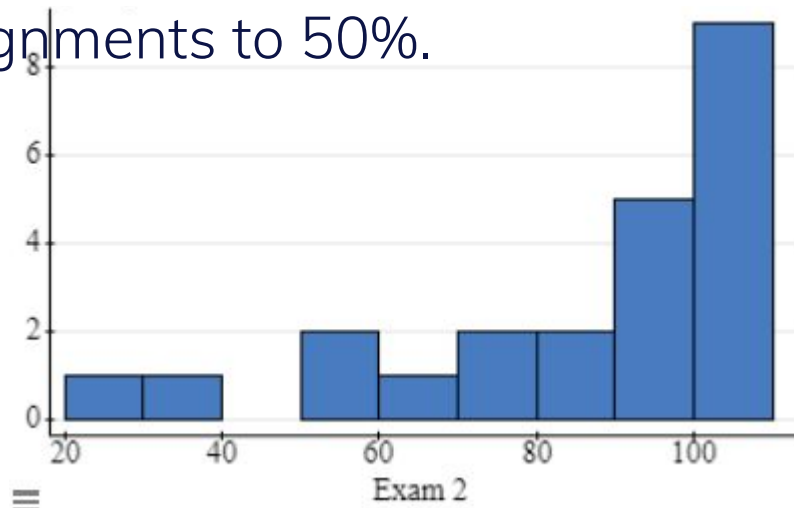


Rethinking Traditional Assessments

Possible improvement:

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

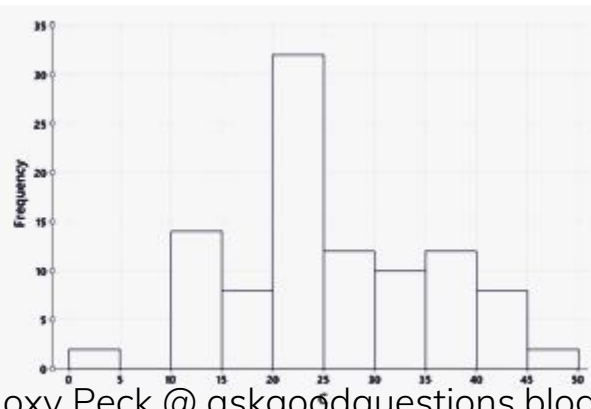
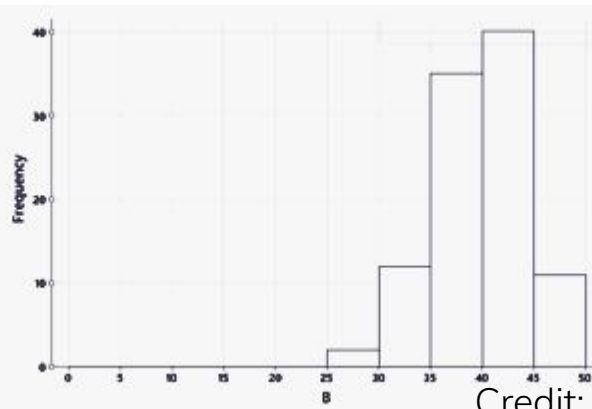
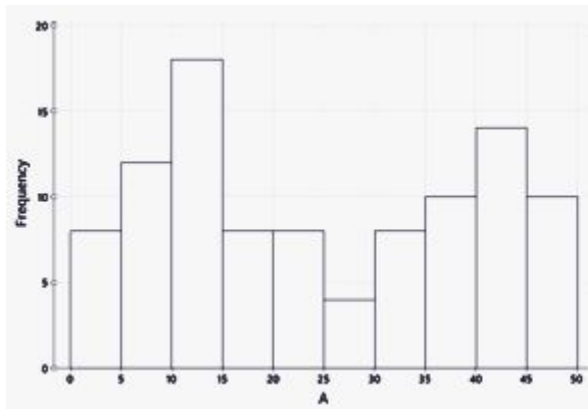
How would making the change proposed above impact the standard deviation for the dataset displayed to the right?



Rethinking Traditional Assessments

Possible improvement:

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

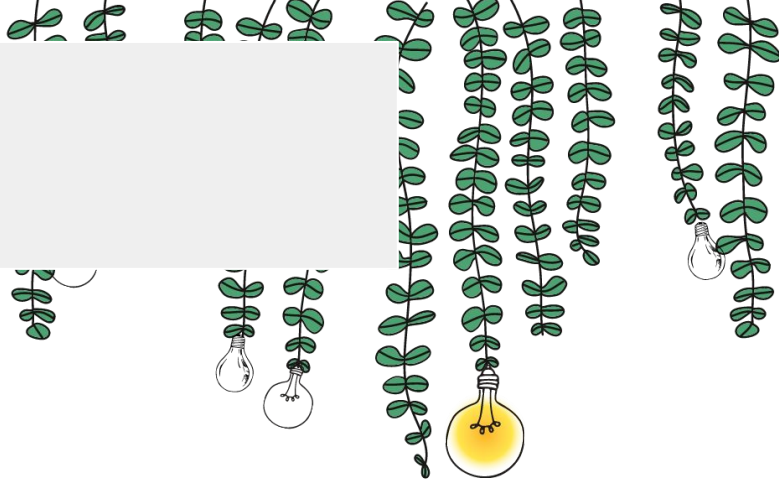


Credit: Roxy Peck @ askgoodquestions.blog

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.



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

What are some questions YOU ask?

Share your answer in the chat!

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.

- Birthplace
- First gen
- Shoe size
- Height
- Mom Height
- Dad Height
- Hrs worked per week
- Hrs exercise per week
- Hrs social media per week
- Random number
- Haircut spending



Weekly Data Analysis Activities

Share your favorite data analysis activity!

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



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.



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



Authentic Assessments

How can we leverage the assets students bring to class and empower them to use data to solve problems?

Discussion Boards – Connecting to Interests

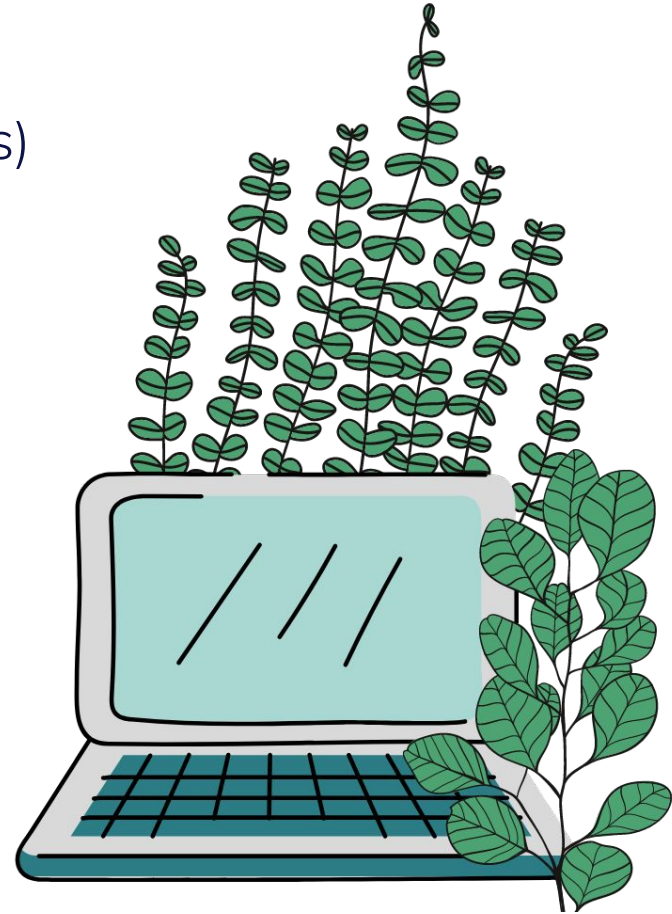
Our task this week is to see how Statistics is used in your field of study

- 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

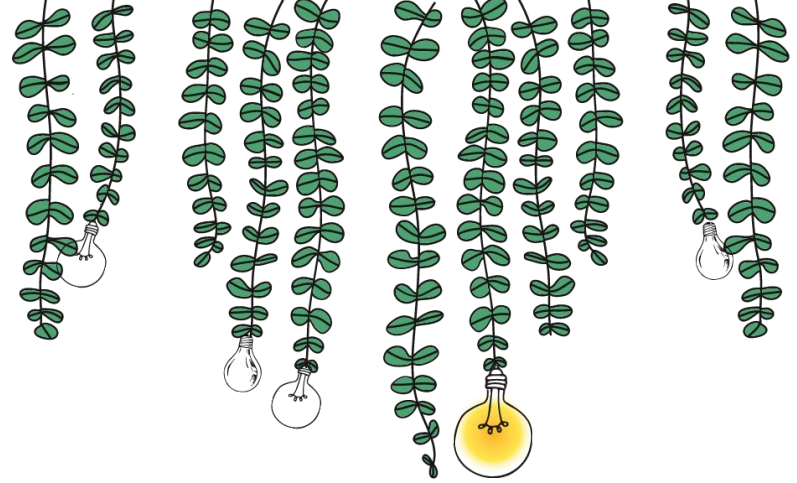
Students choose a research topic to find or collect data on to then analyze a bivariate relationship.

What are some reasons professors may not do projects in their classes?



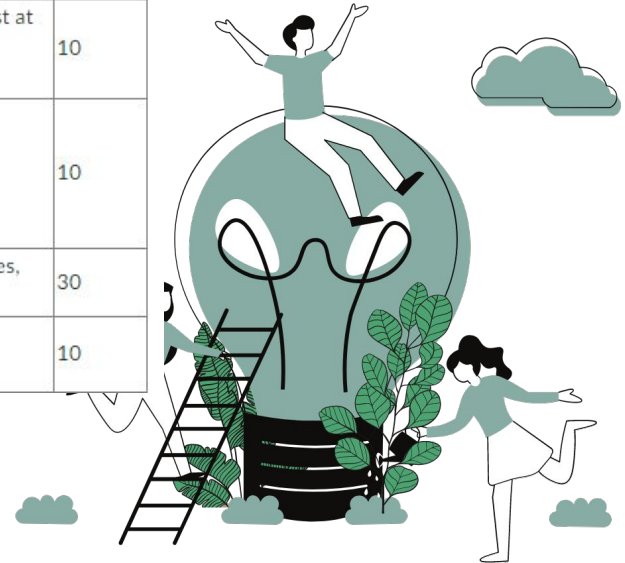
“ Create several mini-assignments that become the cumulative assessment in the class.

Set deadlines for each. Provide feedback on each. Help students pace themselves. Build self-efficacy as you reinforce student learning...



Semester-Long Project: Overview

Step	Details	Points
<input checked="" type="checkbox"/> Survey Creation	Create a survey with your project team!	0
<input checked="" type="checkbox"/> Survey Completion	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.	20
<input checked="" type="checkbox"/> Data Cleaning + Univariate Analysis	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.	10
<input checked="" type="checkbox"/> Bivariate Display	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.	10
<input checked="" type="checkbox"/> Bivariate Analysis	Post your analysis of the relationship between two variables to our discussion board, including hypotheses, conditions, StatCrunch output and conclusion.	30
<input checked="" type="checkbox"/> Future Work	Finish up the Research Cycle by thinking about ways to improve what was done.	10



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/Qevz6GVB3jzAbwzF9> ↗

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?

Semester-Long Project: Data Cleaning and Exploration

Exploring Our Data Instructions

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

Were there 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?

Survey Questions

- Would you have adjusted your existing questions in any way? Why?
- Would you have added another question to investigate? 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!**

3

Authentic assessments

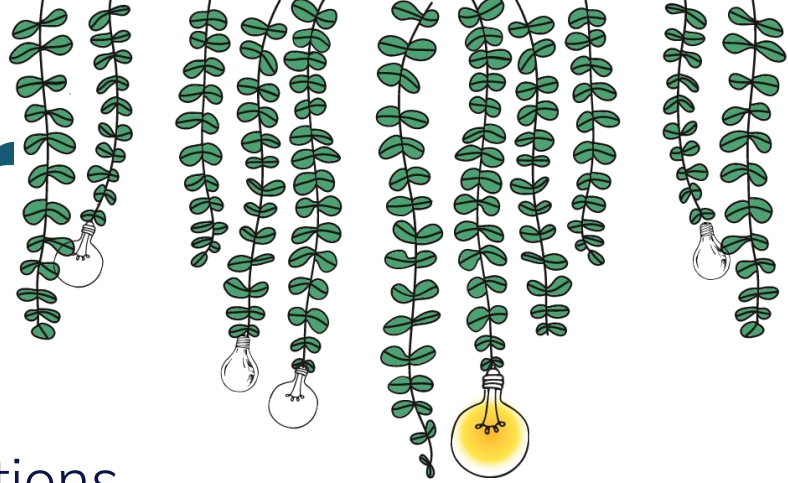
2

Alternative assessments

1

Better exam questions

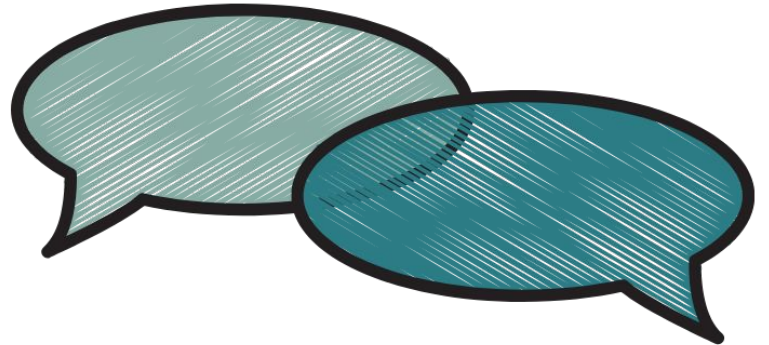
Why reconsider assessment?



- 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

The background features several hanging green vines with small leaves. Interspersed among the vines are several lightbulbs. One lightbulb is illuminated with a yellow glow, while the others are unlit. The vines and lightbulbs are positioned on the right side of the slide, partially overlapping the title bar and the main content area.

Kathleen Almy

- kalmy@almyeducation.com

Kelly Spoon (@kellymspoon)

- kspoon@sdccd.edu

[https://tinyurl.com/
AMATYCstatstalk](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/> - Allan Rossman's blog of thought provoking questions for statistics
- [7 Exam Questions for a Pandemic](#) - 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://teaching.pitt.edu/wp-content/uploads/2020/07/FLEX-Designing-Discussion-Questions-Using-Blooms-Taxonomy-Examples.pdf>
- <https://www.mandela.ac.za/cyberhunts/bloom.htm>
- <http://faculty.academyart.edu/faculty/teaching-topics/teaching-curriculum/enhancing-teacher-student-interaction/different-types-questions-blooms-taxonomy.html>

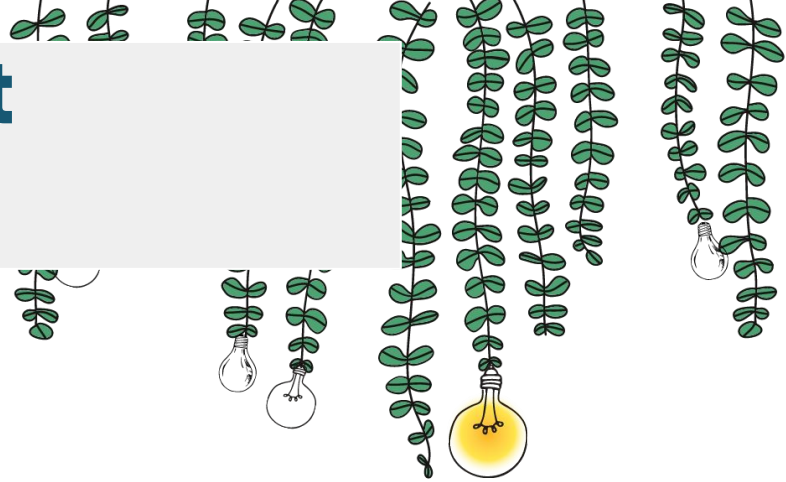
Renewable Assignment Resources / Examples

What are renewable assessments?

- [Blog post](#) by David Wiley
- [Webinar](#) with Suzanne Wakim (Biology, Butte)

Examples:

- <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!

