

Session 307: Flipping with A Twist – Promoting Inquiry While Flipping the Classroom

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Handout 1: Screencasting Software and Hosting

Handout 2: A Complete List of Activities from AP Stats

Handout 3: Hershey Kiss Confidence Intervals Activity

Screencasting Software and Hosting

- Creating Screencasts – Note: I am only including the ones I have personally used
 - Jing (Techsmith, www.techsmith.com/jing.html)
 - Benefits
 - FREE
 - Easy to set up
 - Easy to use
 - Online library at www.screencast.com (2GB)
 - Drawbacks
 - Flash files do not upload to all platforms (youtube)
 - Five-minute time limit
 - Must start over if you make a mistake
 - Screencast-o-Matic (www.screencast-o-matic.com)
 - Benefits
 - FREE
 - Fifteen-minute time limit is much more relaxed
 - Not an application – for those who need network administrators to add programs
 - Finished screencasts are downloadable as .mp4
 - Drawbacks
 - Java-based
 - Operates a little slowly
 - Online library not quite as streamlined as screencast.com
 - Camtasia (Techsmith)
 - Benefits
 - Editing (sound and video) ability
 - Can add questions for students to check for understanding
 - Drawbacks
 - It ain't cheap (~\$300)
- Hosting videos
 - Both screencast.com and screencast-o-matic.com have links to the videos that can be e-mailed or posted to a website
 - Your own site
 - Moodle (what I use)
 - Blackboard
 - Schoology
 - All the formats above can create an html embed code
 - Youtube
 - Easiest to use and link to, searchable
 - Sophia.org
 - Specifically designed for educational videos, easily searchable
 - My videos are also here
 - Others include Vimeo, Flickr, Metcafe
 - Social media: Facebook, Twitter

A Complete List of Activities from AP Statistics

Unit 1: Sampling and Experimentation

The Cola Challenge – gets them seeing the entire statistical process from Day 1

Random Rectangles – shows the importance of selecting a random sample

Pulling the Strings – shows how well-intentioned samples may have selection bias

Helicopter Rotors – students conduct an experiment and consider randomization and replication

Speed Sorting – shows the shortcomings of a Completely Randomized Design and the benefits of a Matched Pairs design for certain experiments

Dogs – shows, numerically, the benefits of blocking and how blocking helps us “see through the noise” that variables may introduce

Stroop Test – a student favorite that clearly shows a Matched Pairs situation

Unit 2: Displaying, Summarizing, and Comparing Quantitative Data

Getting to Know the Class – students answer a variety of questions in a Google Form, and boom – all the data you need for this unit

Bean Counters – shows the benefits and drawbacks of side-by-side plots, and reinforces some matched-pairs thinking from the previous chapter

Numb3rs Outliers – Students come up with the formula for an outlier

Capture/Recapture – shows the ability of boxplots to summarize multiple distributions

Unit 3: z-scores and Normal Calculations

Usain Bolt Stopwatch – students time a race by hand, their errors creating an approximately normal dotplot around the true finishing time.

Strength vs. Speed – a take on an AP Statistics problem, students select an NFL draft pick and find criteria to decide on one player over another.

Unit 4: Scatterplots, Correlation, and Regression

Height and Armspan – shows the relationship of z-scores to the correlation coefficient

Bungee Jumping Barbie – students explore the idea of extrapolation and the scenarios in which it is warranted

Stats Fun Run – shows a situation in which the least-squares line is not the line we desire to model our data

Unit 5: Probability Rules

Probability Stations – students use Stirling Charts to see probability as long-term relative frequency

The Monty Hall Problem – understanding conditional probability

Testing for a Rare Disease – students use technology to see why rare diseases create so many false positives. Uses Bayes Theorem to show probability as a rational function

Unit 6: Probability Distributions and Random Variables

***Several activities involving coins, dice, and cards**

Casino Gaming Lab – includes investigations of

- **Craps** – the probability of winning the Pass Line
- **Blackjack** – “Bust Probabilities” show what is a “safe bet”
- **Roulette** – comparing different types of bets on the wheel
- **Plinko** – Expected value and variance are explored

Are you a Mind-Reader? – uses binomial probability to show how frequently events occur

Unit 7: Sampling Distributions and Sampling Variability

German Tanks Problem – a classic problem that introduces the concept of sampling distributions

Penny Age, Baseball Salaries, and the Gettysburg Address – these activities all result in sampling distributions of means

Predicting the Election – students use beads to obtain a sampling distribution of proportions

Unit 8: Confidence Intervals and Hypothesis Testing for Proportions

Gimme a Kiss! – students create confidence intervals and show what a confidence level means

Testing for a Rare Disease, Part 2 – students investigate Type I Error, Type 2 Error, and Power

Hugs vs. Kisses – students use data to run confidence intervals and hypothesis tests for the difference of two proportions

Unit 9: Confidence Intervals and Hypothesis Testing for Means

What is Student's t? – students find the need for the t-distribution

Unit 10: Chi-Square Hypothesis Testing

Beads in the Tin – students create a measure for “discrepancy” in categorical data

M&M's Colors – a classic activity in which students compare the frequency of M&M's from a bag to the claimed colors

Tootie Fruities – similar to M&M's, but with an assumption that each color occurs with equal frequency (Tootie Fruities are generic Froot Loops)

Tootie Fruities vs. Froot Loops – this activity requires students to run a Chi-Square Test of Homogeneity

Unit 11: Inference for Linear Regression

***Many of the activities from Unit 4, combined with the sampling distribution feature in Fathom, can be used to show sampling distributions of slopes**

Gimme a Kiss! Hershey's Kisses and Confidence Intervals

In this activity, we will estimate a confidence interval for the proportion of times a Hershey's kiss lands on its base as opposed to its side. To do this, we will drop Hershey's kisses, count how many land on their base, and calculate the confidence interval.

To take your sample, gather five Hershey's kisses in your cup, shake them up, and drop them from about six inches above your desk. Count the number that land on their base. Repeat ten times to get a sample of size 50, recording your results in the table below.

Toss Number	Number that land on base	Toss Number	Number that land on base
1		6	
2		7	
3		8	
4		9	
5		10	

Total _____

What is the population of interest? _____

What is the sample? _____

Your result (50 tosses combined): $\hat{p} =$ _____

The results of the others in your group: _____

Compare your \hat{p} with the others in your group. Did you all get the same answer? _____

Follow these steps to make a 95% confidence interval based on your result.

- Calculate the standard deviation of your sample proportion (standard error):

$$\sigma_{\hat{p}} = \sqrt{\frac{\hat{p}(1 - \hat{p})}{50}}$$

- Look up the critical value, z^* , that corresponds to 95% confidence. Note, this is the z-score that corresponds to the middle 95% of the normal distribution. (Hint: what percentage would be left in each tail of the distribution?). The positive z-score is the critical value.

$z^*_{95\%} =$ _____

- The confidence interval is $\hat{p} \pm (z^*_{95\%} \times \sigma_{\hat{p}})$ where **the critical value multiplied by the standard error is the margin of error** for the interval. Adding and subtracting the margin of error from the sample statistic creates the lower and upper bounds for the confidence interval.

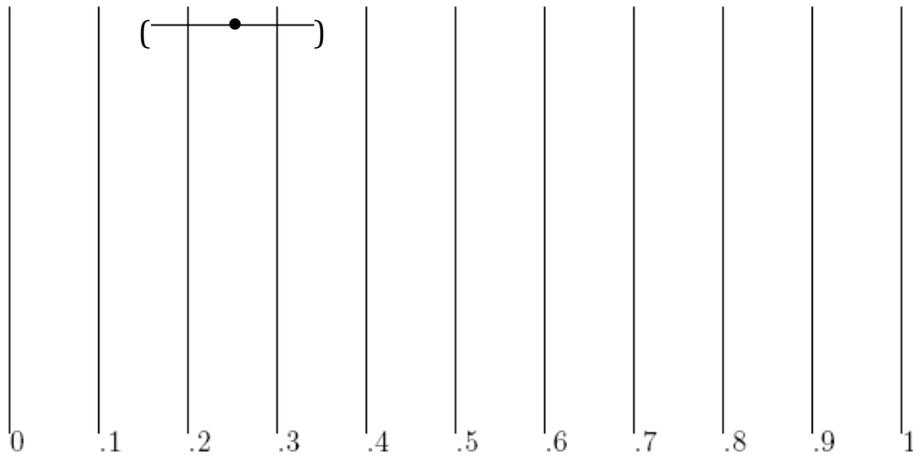
your lower bound = _____

your upper bound = _____



" I got the instructions from my Statistics Professor. He was 80% confident that the true location of the restaurant was in this neighborhood."

Use the lines below to roughly draw the confidence intervals of each person in your group. Indicate the location of \hat{p} as a dot. (An example of a CI from 0.13 to 0.37 with $\hat{p} = .25$ is given.)



After comparing with your group, plot your dot sticker on your \hat{p} -value on the chart at the front of the room. Using a marker extend a line from your dot to your lower bound and upper bound (in similar fashion as the diagram above)

Interpret the 95% confidence interval in your own words. Write your interpretation below.

Compare your interpretation with your group members' interpretations and come to an agreement on an appropriate interpretation. Write it below.

If you've completed these tasks and questions, eat a Hershey's Kiss while you ponder the following: Which of the following do you think is true (more than one may be true)?

- A. There is a 95% probability that the true proportion will fall in your interval.
- B. There is a 95% probability that your interval will include the true proportion.
- C. BEFORE we take the sample, there is a 95% probability that the confidence interval we will create WILL include the true proportion.
- D. AFTER we take the sample, there is a 95% probability that the confidence interval we created DOES include the true proportion.