Modular Probability and Statistics Tasks to Promote Inferential Reasoning

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Motivation for Task

Learners struggle with inferential reasoning across grades

- Sampling distributions
- Confidence intervals
- Hypothesis testing

Problem Statement

- At the end of Introduction to Statistics/Statistical Methods course, **students can perform calculations** about inference problems but **can not** or may not see the big picture between **the concepts of sampling distributions and inferential reasoning.** (Chance, delMas, & Garfield, 2004)
- There exists **various misunderstandings** about **the concepts and interpretation** of the results in statistical inference. (Falk & Greenbaum, 1995; Sotos, Vanhoof, Van den Noortgate, & Onghena, 2007).

Background: Research Literature

- Foster understanding in statistics through **integration of physical activities with computer simulations** (Chance & Rossman, 2006; delMas, 1997)
- Utilize discourse to promote **meaning of visual representations** (Wild et al., 2009)
- Data-context provides **connection** between the abstract structure, the visual, and how that can be interpreted into a story (Pfannkuch, 2011).

Background of Task

- Initial task adapted for a graduate statistical thinking class
- Implemented in an introductory statistics course at community college
- Revised task to implement a second time in same type of course

*This task was adapted from an activity found in the Georgia Department of Education Mathematics IV Unit 1 document (found at http://bit.ly/2CfiJDk)

The Task

- Purpose: Serve as an introduction to sampling distributions
- 3 Components
  - Modifiable to meet instructional goals

To access the task we will use today:
https://go.ncsu.edu/nctm2019

Research Study

Community College Introductory Statistics Course

Research Questions

- At the end of an introductory statistics course, what are the students' reasoning and conceptual understandings of Central Limit Theorem in sampling distribution activities?
- How do students make connections between the sampling distributions and statistical inference at the end of an introductory statistics course?

Methods

- Community college introductory statistics course
- All students were given a **three part task** during class time as part of their final exam review.
  - Each task was about 45 minutes.
  - Students completed one task each day.
- 9 students' data were analyzed - completed all three parts of the task.

Preliminary Findings

- Students who can converse about various distribution types (population, sample, and sampling) **meaningfully** and also **reason** about distribution features have strong understandings of the CLT theorem.
- For two of the students, English was NOT their native language. **Both students developed robust conceptual understanding, but were challenged with daily language.**

Implications

- Questions from the concepts of descriptive statistics provide rich opportunities to discuss and develop understanding of CLT:
  - Hands-on task and technology integration.
  - Data visuals, particularly distribution.
  - Impact of sample size.
  - Variability of data and variability of samples.
  - Comparing samples.
  - Inference about population.

Thoughts and Questions?

Contact Information & Task

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Link to Task:
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