**Bottleneck Lesson Plan- Central limit theorem and sampling**

**PSYCH 200 Elementary Statistics in Psychology, 200, primarily psychology majors but some other humanities majors require it as well.**

Briefly outline your answers to the following:

1. **The bottleneck—What are students unable to do?**

* this is a threshold concept- a paradigm shifting concept that once students understand, the light bulb goes off on everything else.
* students often cannot see the difference between a sample and a population
* students have trouble understanding proper sampling procedures, how to represent the range of values and variance within a sample so that it properly represents the population.

1. **Mental Action—What mental actions does the expert perform to get past the bottleneck?**

* the expert would define the population (all grocery stores in Erie that sell Lettuce)
* then they would define the best places to get a representative sample (go to diverse stores where lots of different people shop- get a wide sampling of the variability)
* then, they would do this and sample the prices at the small bodega on Parade street and the large chain grocery store in mill creek as well as wegmann's

1. **Model the thinking—What analogy will you use to model these mental actions?**

* all the different types of apples. if you were confined to just one apple, you wouldn't know how wonderful apples can taste and what a variety there is in apples. some are good for pies, some are good for eating. apple butter
* come up with analogies for me

1. **Practice and Feedback—How will the students practice these mental actions? How will they receive feedback to make improvements?**

* walk across campus and choose a category of things (shirts that people wear, cell phones, pencil types)
  + how would you define the clusters within these categories
  + how would you get a representative sample
  + what is the most extreme example in the population
* do one as a team- grade in class
* then one as homework

1. **Motivation—What will I do to hold students accountable and disrupt ritual ways of learning?**
2. **Assessment—How will I assess student mastery of the mental actions?**

* CAT- give them three populations. If you were a sociologist; how would you break up this population into samples to study X? If you were a geologist; how would you break up the population; if you were a religious studies prof; if you were an educator; if you were a psychologist; if you were a geographer?
* give them a multiple choice quiz

Prepare a brief summary of the results of the pre- and post CATs—including, if possible, some quantities. What inferences can you draw from the data? For example, “On the pre-test, 33% were able to do XXX, while on the post-test, 57% did XXX and 22% still could not. These results show a 24 improvement, though about one-fifth of the class are still struggling with XXX.” Or “The majority of students correctly answered 5 of the 8 test questions on the bottleneck concept.”

1. **How will you share what you learned?**

In a paper with Joan.