GUIDED PRACTICE

Class: PSY 3020 (Inferential Statistics)
Date assigned:
Date due:
Time estimate to complete this assignment: 40 minutes

Overview/Introduction

In statistics, we use samples to make inferences about the parameters of a population. One of the most important and foundational principles that you will learn in this course is the concept of the sampling distribution. This distribution is a simulated distribution (often simulated by computers that do tens of thousands of calculations for us, but in our class lesson we will simulate one on a smaller scale, by hand) and it is used as a comparison distribution for our sample. The resulting sampling distribution is used to determine whether the result of our sample was likely due to random chance or not. This comparison helps us to make inferences about the greater population.

Learning Objectives

Basic objectives

1. Define Statistics
2. Define what a distribution is
3. Recognize the distinction between descriptive and inferential statistics
4. Recognize that inferential statistics uses samples to draw conclusions about populations

Advanced objectives

1. Construct a sampling distribution of means
2. Compare a sampling distribution of means to a sample distribution
3. Assess the statistical likelihood of a particular outcome

Preparatory Activities and Resources:

1. Watch the "Big Picture of Statistics" lecture video (also accessible on Canvas)
2. Complete the associated Guided Notes while watching the lecture video (Word Document accessible on Canvas)

Exercises: Please complete by the start of class on Monday.

- Be prepared to hand in your completed Guided Notes and take a short quiz on the lecture video at the start of class.

Questions?

If you are stuck, there are multiple ways of attaining assistance. Please feel free to contact me via e-mail (prof.cay.d@gmail.com), text/call (949-229-5677), or via Canvas messaging. You may also visit office hours (please see syllabus for times/location). We can also schedule a video chat, if needed.

Lesson Plan

Lesson: Simulating a Sampling Distribution

Timeframe (from pre-class to post-class activities): About 140 minutes

Materials needed: Lecture video ("Big Picture of Statistics" on YouTube https://youtu.be/yTrlO2tWDpY), guided notes to accompany lecture video*, quiz handout, classwork handout with Westvaco case study, pre-formulated spreadsheet for constructing sampling distribution*, concept check handout*, a sheet of paper. *Accessible on Canvas.

Objectives:

Basic:

1. *Define Statistics*
2. *Define what a distribution is*
3. *Recognize the distinction between descriptive and inferential statistics*
4. *Recognize that Inferential statistics uses samples to draw conclusions about populations*

Advanced:

1. *Construct a sampling distribution of means*
2. *Compare a sampling distribution of means to a sample distribution*
3. *Assess the statistical likelihood of a particular outcome*

Background to the Lesson: This is a required course in the psychology major, composed of a lecture and a lab component. It is a quantitative course (Statistics for Psychology) for non-math majors, and it typically has a high D/F/W rate. This particular lesson is the first major lesson in the course, and it is meant to introduce students to foundational concepts in the course that will regularly come up over and over again. They typically have difficulty linking all of the individual components (calculating means, creating a distribution, assessing likelihood to make a decision, etc.) in order to develop a larger, cohesive understanding of how all of the steps helped us reach a conclusion regarding the likelihood of an event (in this case, discrimination). Basic competence in arithmetic is required.

Introduction to Lesson: The purpose of this content area is to familiarize learner with overarching themes of the course (principles of probability, sampling distributions, making decisions using inferential statistics). To prepare for the lesson, students should watch the lecture video before class, and complete the associated guided notes for the video. These will be turned in at the start of class to check for completion (marked with a stamp if complete), and returned to the student to be used as a reference during the lesson (then returned back to the professor again at the end of the day in order to receive credit for completing them). A short quiz based on the video at the start of the class will also assess comprehension. While in class, students will take the foundations covered in the video lecture and expand upon them with a case study, whereby, they can apply their skills in a practical context. It will also provide them a chance to manually construct a sampling distribution, and become more familiar with the steps involved (later in the course, these distributions will typically be simulated by a computer).

Procedure [Time needed, include additional steps if needed].

Pre-Class Individual Space Activities and Resources: Outline the major steps for the preparatory activities and be sure to tie the steps to the basic learning objectives you have noted above. Note resources required for learner preparation.

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: View the lecture video on Canvas (Big Picture of Statistics).	Introduce students to a basic overview of statistics.	25 minutes	All basic objectives
Step 2: Complete the guided notes associated with the lecture video as you watch it (document handed out in class, but also available on Canvas).	Serves to hold the student accountable for watching the video, as well as providing practical notes to be used in class.	15 minutes	All basic objectives

In-Class Group Space Activities and Resources. Outline the major steps for the in-class activities and be sure to tie the steps to the advanced learning objectives you have noted above. Also note any resources needed/developed to provide effective active learning activities within class.

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: Provide an opportunity for students to ask questions regarding the lecture video, then collect their completed guided notes (to be checked and stamped for completion while the students take the quiz on the lecture video).	Allows students to clarify anything that was unclear from the lecture video before they have to take the quiz on it.	5 minutes	All basic objectives

Step 2: Students will take a short quiz on the lecture video while the instructor stamps their guided notes. After the quiz is collected, pass the guided notes back and briefly go over the answers to the quiz.	Tests students on their comprehension of the individual space activities.	7 minutes	All basic objectives
Step 3: In pairs, have the students review the first half of the classwork handout together, which establishes the details of the case study and the question at hand (i.e, was the Westvaco Corporation guilty of age discrimination?)	Establishes a meaningful and realistic context for the application of statistics.	10 minutes	All advanced objectives
Step 4: Have students tear a sheet of paper into ten small pieces, and then write the age of each employee on each one. They will then fold each piece of paper and mix it in a pile, from where they will draw a random sample of 3 ages from the pile. The ages they draw will be entered into the pre-formulated spreadsheet and averaged. Each student will repeat this process ten times, entering the ages they draw along the row with their name in the spreadsheet. The spreadsheet will automatically convert the averages into a dotplot. Emphasize that these are descriptive statistics at this point (means, etc.).	Provides an opportunity to manually construct a sampling distribution of means to better understand what they represent and recall the steps in constructing one.	20 minutes	#1 (Advanced)

Step 5: Have the students compare the resulting dotplot distribution (the sampling distribution) to the original sample distribution of the three fired employees. They should attempt to determine how likely it would be to get the same average age of the fired employees in the sample to the same average age in the sampling distribution. Emphasize that this is where we are making the leap from descriptive to inferential statistics.	Provides practice in probability principles and comparison of a sampling distribution to a sample in order to make inferences about a population.	20 minutes	#2 (Advanced)
Step 5: The students should now make a decision as to whether or not they feel this was truly a case of discrimination or just a result of random chance.	Gives students their first chance to make important decisions using statistical principles.	15 minutes	#3 (Advanced)

Post-Class Individual Space Activities and Resources. Outline the major steps for the post-class activities and be sure to tie the steps to the advanced learning objectives you have noted above. Also note any resources learners will need to complete any post-class activities assigned after the group space activities.

Steps	**Purpose**	**Estimated Time**	**Learning Objective**
Step 1: Complete the concept check handout with reflective questions about why we took the steps we did in building the sampling distribution and how we arrived at a decision about the question of discrimination.	To determine whether students were able to connect each step of the lesson to the larger processes involved in inferential statistics.	25 minutes	All advanced objectives

Evaluation:

Analysis. In this section, note what you think will work, and what challenges you think you may face in implementation.

They generally find it interesting and enjoyable to read the case study and draw the samples that they enter into the spreadsheet. They will likely have a harder time connecting the result to the concept of a probability distribution, and making a distinction between the "sample" and the "sampling" distribution. This needs to be

made as clear as possible. They may also have difficulty grasping how we made the decision regarding discrimination by comparing the samples to each other, and assessing the likelihood of a random chance event by doing so. They may also miss the important distinction between the parts that are descriptive statistics, and where we make the jump to inferential statistics.

Connections to Future Lessons. In this section, note how you think this lesson plan connects to your next topics in the course.

Nearly every lesson going forward will connect back to this lesson, including the concept of sampling distributions, comparison of the sample and sampling distribution, probability principles, and making decisions/interpreting the result of such comparisons in order to make inferences about a population.