**Progression for Seventh Grade Common Core State Standard 7.SP.A, using *Elementary Statistics: Picturing the World*, Mrs. Lefebvre’s classroom**

**Overview**

In sixth grade students were introduced to the concept of variability and were asked to summarize and describe single distributions, in a general way, but nothing more. At the seventh grade level, students are introduced to specific statistical concepts for the first time. They are expected to be able to work with multiple distributions to make comparisons between populations and answer questions about differences that may or may not exist between the populations. They are introduced to the concept of random sampling and the generation of data sets. They also learn about the concept of representative sampling, and begin to evaluate whether or not sampling methods are valid.

This learning narrative is designed to cover Common Core State Standard (CCSS) 7.SP.A.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.A.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data.*

*Gauge how far off the estimate or prediction might be*.

**Use random sampling to draw inferences about a population**

**Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.** Students are introduced to the relationship between samples and a population. While randomly generated samples are generally good predictors of the characteristics of a population, students must learn that no two samples generally result in exactly the same results, just as no one sample will likely be the exact value that truly exists within the population. However, we generally cannot determine if any of our samples result in the same exact value as our population when doing real-world sampling. This is because if the value for the population could be determined, there would be no reason to do sampling.

 In order to provide an accurate generalization about a population, samples must be valid representations about that population. Careful planning, and in some cases even preliminary sampling, must be done prior to selecting a sample in order to ensure that we are collecting a valid sample that can be relied upon when imputing what we wish to know. Explanations and demonstrations should be made to show why non-random sampling does not result in valid inferences.₁

₁Demonstration Activity. Using a sewing tape, measure the circumference of 2-3 students’ heads (select the students using some random method, such as drawing names; depending on how many students are there that day; don’t use more than 20% of the students.

 1. Have students calculate the average circumference

 2. Ask them if they think this measurement would be a good guess for the entire class

 3. Measure everyone else and calculate the class average; ask if their hypothesis regarding the sample was correct

 4. Ask them if they think the measurement would be a good guess for average head circumference of every adult in the U.S. (the correct answer is no). Have them come up with reasons why not.

A. Ask if anyone knows the special term we use for how we selected our sample.

B. Discuss the concept of “random”; what it is, what is isn’t

C. Purposely pick a non-random sample form the students’ head measurements and ask why this sample would not be representative (choose measurements that

make it obvious that the sample average is not close to the class average).

D. Ask the students why they think random sampling allows valid inferences

**Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.**

 Students will examine data produced by random sampling to determine the likelihood of the presence or absence of a characteristic of interest within the identified population.

 Students learn to use different methods to generate random samples. Drawing names from a hat, using random number generators found in Excel or online, and other methods will be introduced. Methods for synthesizing the results of multiple samples in order to make a prediction about a population should be discussed. Students will then use random samples to make predictions, such as the outcome of class elections.₂

while non-random sampling does not (equal chance of being chosen)

A. Computer program that generates random samples and calculates average value, which can be compared to population value, so that students can see that each sample will generate a slightly different value, none of which will likely be exactly the same as the population average but will be close.

₂Demonstration activity.

A. Purchase a multipack of “fun size” M&Ms and give a package to each student.

 1. Outer package will state the expected weight of each package in ounces;

have students as a group convert this weight to grams

 2. Each student uses a kitchen scale to measure the weight in grams of his or her package

B. Collect data from all students (have all students write them down; instructor

keeps a master copy)

C. Have students create a dot plot, with assistance if needed, from the data gathered

D. Have students write 1-2 sentences describing the general pattern of variation

seen, and an additional sentence stating whether or not they got what was paid

for in purchasing the package (in other words, was the weight of the candies

at least equal to the stated weight on the package).

E. Students may then eat the M&Ms if they wish