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Creating and Analyzing a Bell Curve

By: Amanda Martin
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**Math
Grades 9–12**

Introduction

Students will be surveyed to find the mean and standard deviation of their heights and create a bell curve (normal distribution) to be analyzed for randomization. Students will then work in groups to repeat the process using a new data set.

Learning Objectives

- Students will recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. (Common Core State Standards: Math HSS.IC.B.3)
- Students will use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. (Common Core State Standards: Math HSS. IC.B.4)

Materials Needed

- Notebooks/journals/paper
- Laptops/computer access with Microsoft Excel
- Post-It notes/notecards

Procedure

1. Define/review the following terms with the class:

- Randomization
- Population mean
- Proportion
- Standard deviation
- Margin of error

Be sure to demonstrate the proper use of each term before proceeding to the next activity. Students will need to take notes and jot down the examples in their notebooks, etc. Students will need a firm understanding of these skills to be successful during the remainder of the lesson.

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2. During this portion of the lesson, you will conduct a classroom survey to gather the heights of all students. Students should document their height measurement on the board. Once all student data is gathered on the board, discuss the terms above in relation to the student height data. Together, determine the mean and standard deviation for the student heights. On the board, display Microsoft Excel. Demonstrate how to create a normal distribution or bell curve with the class. (Here is a tutorial for creating a bell curve in Excel.)

3. Now, students will work in small groups of three or four to construct a bell curve of new survey data. Give each group a data set that lists the weights of patients who visited a doctor's office on a given day. Students must examine the data and determine the mean and standard deviation. Students must use Excel on a laptop or computer to create a bell curve for the data. Groups must examine the data for factors of randomization and margin of error.

4. When groups have completed their bell curves, they will now have a chance to view the work of other groups. Ask groups to leave their bell curve on their computer screen. Groups should rotate around the room and view the bell curves created by the other groups. If students find discrepancies among the bell curves, they should leave a note on a Post-It or notecard for the group to view when they return. Once students have viewed all the bell curves, students should return to their original groups. Allow students roughly 3-5 minutes to make any changes or adjustments to their group work based on the notes received from the other students. Be sure to rotate around the room to facilitate learning and ensure that groups are making adjustments to their bell curves properly.

5. To close the lesson, students will explain randomization and how it relates to both data sets: classroom height data and patient weights data. Students should cite evidence from the data to support their claims, and they must show how randomization affected the data. Students should complete this portion of the lesson individually so that learning can be evaluated.

Evaluation

Students must identify how randomization relates to both data sets from the lesson. Students must determine if randomization was present and how it affected the data. Students must cite evidence from the data in their response. Please use the following checklist to evaluate student learning:

The student determines if randomization is present.	Yes	No
The student explains how randomization affected the data.	Yes	No
The student explains how randomization relates to both data sets.	Yes	No
The student cites evidence to support his or her claims.	Yes	No

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