Marywood University

Sample Lesson Plan

Lesson Overview

Name	Measures of Central Tendency, by Sarah Yeust '12
Subject	Algebra 2
Grade Level(s)	11
Date/Duration	9/7/2011, 50 minutes
Big Ideas	Outliers in sets of data change the values of the measures of central tendency. The median is the least affected by the presence of an outlier.
Essential Questions	How do outliers affect measures of central tendency?
PSSA/Core Standards	M11.E.2.1.3: Describe how outliers affect measures of central tendency.
Supervising Teacher's Signature	

Objectives

Lesson Objective #1	Students will be able to calculate the mean, median, mode, and range on a worksheet of a given data set, as displayed on the whiteboard, and will be able to calculate and verbally explain the significance of the differences in these measures of central tendency when an outlier is added to the data set.

Methods

Anticipatory Set	What if the average grade in this mathematics class was a fifty percent? Based on last class' lesson, what would this mean? What if I told you that the median grade in this class was a ninety-seven? What does this represent, and why would you like to hear this as opposed to the average grade? Would you be happy if I told you that the class mode was one hundred percent? Let's think about these vocabulary words. *Write on board- mean, median, mode, range.* Which one of these do you think is the most accurate way to describe data? Now that we know how to find mean, median, mode, and range and we have worked with the definitions of outliers, quartiles, and interquartile range, we are going to examine what happens to the measures of central tendency when outliers are added to the data. This will be important when we continue to analyze data in the future.
Key Vocabulary	mean, median, mode, range

Introduce and Model New Knowledge	1. Distribute notes-outline worksheets to the students on which they can take notes and follow the definitions and examples. Inform the students that all examples and vocabulary words will be explained in the lesson on the board and also have a specific spot to be written on the notes worksheet. 2. List Data Set 1a on the whiteboard (this set excludes outliers). Students will copy these numbers into their notes. Showing all work on the whiteboard, calculate the mean, median, mode, and range. Ask students to circle these values on their notes page. 3. Change Data Set 1a to Data Set 1b by adding an outlier to the list of numbers on the board. Instruct students to write the new list in the next section of their notes. Showing all work on the whiteboard, calculate the mean, median, mode, and range. Ask students to circle these values on their notes page. 4. Remind students that the only change between the two sets of data is the inclusion of the outlier in the second set. Circle this outlier on the board.
Guided Practice	5. Construct two lists on the board: one with the original values for the mean, median, mode, and range, and the second with the new values after the outlier was included. Ask students to subtract to find the difference between the mean, median, mode, and range from the first and second sets. Ask for a volunteer to write the difference for each value on the board. Verify that these are correct. 6. Analyze and compare. Point out that the mean and range have changed dramatically, while the median and mode have probably not changed as much. Looking at just the median and mode, ask which they think would be a more trustworthy measure of central tendency to use. Then point out that the mode might not always be reliable, since there can be a mode even when a number is repeated just once. 7. Explain why the median is the preferred measure of central tendency. Write *median* in large letters on the board and circle to emphasize.
Independent Practice	8. List Data Set 2a on the whiteboard (this set excludes outliers). Students will copy these numbers into their notes. Instruct groups of students to find the mean, median, mode, and range and assign a captain to write each group's findings on the board. Confirm the correctness of the values, and then the class will collectively calculate the difference between the original values and the new values, based on Data Set 2b (including outliers), with all work shown on the whiteboard. 9. In conclusion, once again identify the fact that the median is the number that tends to fluctuate the least, while the mean and range vary most significantly. Conclude with the reminder that students should always think critically about data presented to them.

Assessment

Closure/Check for Understanding	Student teams will share answers in front of the class. Responses will be evaluated based on the rubric.
Formative/Ongoing Assessment	Objective #1: Teacher will assess informally as the lesson is conducted, based on students' willingness/ability to provide answers.
Summative/End Of Lesson Assessment	Objective #1: 1. Team Review Sheet: Students will split into their color coded Activities Teams. Each team will have a rubric to consult as well as a sheet that has the mean, median, mode, and range on it for a supposed set of data as well as a specific grade for a student in the class. Students will be told to pretend that they are teachers, and these values represent the mean, median, mode, and range of their class. They must discuss among themselves the answers to the following: a. How does the specific student grade relate to the mean, median, mode, and range of the data? What are the possibilities for the other data values? b. What measure of central tendency regarding the class's grades would you tell a parent of one of your students and why? c. If the highest possible score on a test was 100%, what would a mean, median, mode, and range of 95% suggest? As a teacher hoping that your students perform well, which would you want as a statistic? Student teams will then be asked to share answers in front of the class. Responses will be evaluated based on the rubric.

Materials/Equipment

This lesson will require a whiteboard, dry-erase markers, multiple sets of data for reference both including and excluding outliers, notes-outline worksheets with practice problem spaces, and team review sheets with data and concept questions.