Demystifying Differentiation in Middle School
Tools, Strategies, and Activities to Use NOW

Chapter 5: Math

Tiered Assignment: Graphing and Data Analysis

Overview: These tiered activities ask students to apply their skill with graphing and data collection. The readiness level for the activities is modified based on the complexity of the types of graphs selected at each level. It is assumed that these assignments will be offered after instruction on reading and constructing graphs is completed. Students may work independently or in similar-readiness, cooperative learning groups to complete the tasks, with the teacher making that determination.

Standards:
- Collect, organize, analyze, and display data in graphic format
- Select, create and use appropriate graphical representations of data

Objectives:
The students will **KNOW**
- The value of representing mathematical data in a visual format.
- A variety of graphic methods exists to organize and display data.

The students will **UNDERSTAND THAT**
- Interpreting graphs allows one to analyze quantities of data with minimal time expended.
- Collecting and organizing data to construct a graph develops valuable research skills.
- Graphs reduce a large amount of data into a small, manageable space.
- Graphs are easily adaptable to a variety of technological formats.

The students will **BE ABLE TO**
- Collect data and construct a graph that accurately displays the data.
- Analyze and interpret a graph to determine the information it conveys.
- Distinguish between a bar, line, and circle graph and determine which is best suited for the data collected.

Basis for Differentiation: Student readiness with regard to:
- understanding of various graphic formats
- higher-level thinking skills
- open-endedness
- sophistication of data collection

Tier One = lower readiness
Tier Two = middle readiness
Tier Three = higher readiness

Math

Tier One

Choose one of the following sources to gather a set of data:
- The website of a favorite sports team. The data may be generated by the team, such as win-loss records over a period of years, or by individual players.
- The Weather Channel website. There is a wealth of weather data listed here for individual cities that can be found as you explore this site. The highs or lows of different cities can be compared, or you can collect data for one specific city.
- The United States Census Bureau's website (www.census.gov) contains a large variety of data on people who live in the United States. Explore this website to find a topic of interest to you.
- The Bureau of Transportation website on airline statistics (www.bts.gov/programs/airline_information/)
- The World Almanac for Kids (www.worldalmanacforkids.com/explore/index.html)

After you have chosen a set of data, use it to create a bar or line graph. You may generate this graph using a computer program or design it on 5-inch graph paper. Give the graph a title and label both the horizontal axis and vertical axis. Once the graph is constructed, compose five interesting questions that your graph answers. Trade your graph and questions with another student so that you each can interpret each other's graphs.

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Tier Two

Choose one of the following sources to gather a set of data that is based on percentages:
- The website of a favorite sports team. The data may be generated by the team, such as win-loss records over a period of years, or by individual players.
- The Weather Channel website. There is a wealth of weather data listed here for individual cities that can be found as you explore this site. The highs or lows of different cities can be compared, or you can collect data for one specific city.
- The United States Census Bureau's website (www.census.gov) contains a large variety of data on people who live in the United States. Explore this website to find a topic of interest to you.
- The Bureau of Transportation website on airline statistics (www.bts.gov/programs/airline_information/)
- The World Almanac for Kids (www.worldalmanacforkids.com/explore/index.html)

After you have chosen a set of data, use it to create a circle graph. Give the graph a title and label the different sections of the circle. Once the graph is constructed, compose five interesting questions that your graph answers. Trade your graph and questions with another student so that you each can interpret each other's graphs.

Tier Three

Choose a topic from the list below and conduct a survey of students in your school. Collect data from at least 25 students. Topics you may choose to survey include:

- What type of pets do you have in your home?
- Which ice cream flavor would be your first choice when ordering at an ice cream store? (Give students a choice from 10 popular flavors – vanilla, chocolate, butter pecan, strawberry, chocolate chip, cookies and cream, vanilla fudge ripple, pralines and cream, mint chocolate chip, rocky road.)
- Which toppings would you choose if you were ordering a pizza? You may choose as many as you would order on one pizza. (Give students a choice from 10 popular toppings – cheese, pepperoni, chicken, sausage, ham, ground beef, mushrooms, green pepper, pineapple, onions.)
- What kind of music do you listen to most often? (Give students the choice of classic rock and roll, rap, hip hop, top forty, country, alternative rock, classical, or *"I don't listen to music."*)

You may choose another topic of your own choice with the approval of your teacher.

Once you have chosen your topic, design a way to organize your data. When it is collected, determine the fractional part of the whole sample that each response represents. Turn these fractions into percentages, using a calculator if desired.

Construct a circle graph to display the results of your survey.

Compose two paragraphs, one describing your experience conducting the survey and the other analyzing the results. Include in the second paragraph what conclusions can be drawn from the data concerning the students in your school.

Tiered Assignment: Mean, Median, Mode, and Range

Overview: These tiered activities provide students with the opportunity to apply their knowledge of and skill with mean, median, mode, and range as they work with lists of data. It is assumed that these assignments will be offered after instruction of these concepts is completed. Thus, these activities can serve as an assessment of students' understanding and skill related to statistics. Students may work independently or in cooperative learning groups to complete the tasks, with the teacher making that determination. Teachers may allow the use of calculators for each tier.

Standards:
- Calculate, use, and interpret the mean, median, mode, and range for a set of data
- Create and solve problems involving the measures of central tendency (mean, median, mode) and the range of a set of data

Objectives:
The students will **KNOW**
- The mean of a number set is the sum of the numbers, divided by the total number of numbers in the set.
- The median of a number set is the middle value of the set.
- The procedure for determining the median differs depending on whether there is an odd or even number of number in the set.
- The mode of a number set is the most frequent value found in the set (the number which appears most often).
- A set can have more than one mode or no mode at all.
- The range of a set of numbers is the largest value in the set minus the smallest value in the set.

The students will **UNDERSTAND THAT**
- The mean, median, mode, and range form patterns and relationships.
- Appropriate statistical methods can be selected and used to analyze data.
- Data must be organized by listing values from smallest to largest in order to determine the mead, median, mode, and range.

The students will **BE ABLE TO**
- Organize data to calculate the mean, median, mode, and range.
- Use a variety of graphical methods to display, organize and interpret data.
- Make inferences and predictions based on analysis of a set of data.
- Use the mean, median, mode and range to create and solve problems.

Basis for Differentiation: Student readiness with regard to:
- mastery of mean, median, mode, and range
- structure versus open-endedness
- defined versus fuzzy problem

Tier One = lower readiness

Note to the teacher: Students will need access to a variety of basketball box scores. The box scores are compiled for each game and list each player on the team and how many points that player scored during the game.

If it is basketball season, these can be obtained from the local newspaper. If basketball is not in season, these statistics are posted on-line. Type "basketball box scores" into your search engine and a variety of sites will provide this information. Students may select a favorite team for this activity.

In reality, most sports in the newspaper provide statistics which could be compiled into a list of data, e.g. listing the points scored by each local football team who played a game on a given weekend. In the following directions, just substitute the sport addressed for basketball box scores.

Tier Two = middle readiness

Tier Three = higher readiness