

<b>Title of Resource</b>	Fast Food Fun: Understanding Levels of Measurement
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<b>Brief Description:</b>	This resource introduces students to levels of measurement and highlights the increasing granularity when moving from categorical to quantitative data. This is an activity that can be done as a class or in groups.
<b>Keywords:</b>	Statistics, Research Methods, Levels of Measurement
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**Instructors:**

This activity should be completed after students have learned about levels of measurement. You can use the example provided, you can use an example of your own creation, or you can have students create their own examples. With a small class, the instructor can record student responses on the board. In a larger class, it can be assigned as group work for later discussion as a class. This activity takes approximately 20-30 minutes.

## Levels of Measurement

Levels of measurement refer to different ways of classifying or categorizing data. The type of measurement tells you something about the relationship between the different classifications and also determines what statistical operations you can perform on the data. We usually identify four types of measurement:

**Nominal:** A nominal scale classifies data according to qualitative differences in the variable we are measuring (e.g. college major). It involves creating categories using differences in attributes (e.g. psychology versus biology), however these categories are not related to each other in any significant way, so we cannot determine the direction or the size of a difference.

**Ordinal:** An ordinal scale classifies data by organizing categories in a fixed order, for example when we rank food preferences. Because an ordinal scale involves organizing categories sequentially, it can determine the direction of a difference within a variable (e.g. liking hamburger more than pizza). However, an ordinal scale cannot determine the magnitude of a difference because the intervals are not the same size and/or a value cannot be easily assigned to a variable. So with an ordinal scale you cannot determine how much more you like hamburger than pizza.

**Interval:** An interval scale goes beyond organizing categories sequentially, because the intervals are all the same size. Because the intervals are the same size, you can now determine the distance between any two points on the scale. For example when measuring temperature in Fahrenheit, the difference between 75° and 80° is 5°. Even though distance is now meaningful, with an interval scale there is no true zero point or the zero point is arbitrary (e.g., 0° Fahrenheit does not mean the absence of any heat). This allows us to measure differences but it does not allow for expressing differences in terms of ratios (e.g. 60° is not twice as hot as 30°).

**Ratio:** A ratio scale has all the benefits of an interval scale (i.e. intervals are all the same size), but we also now have a true zero point, meaning there is a true absence of that which we are measuring. For example, when we measure height, a value of zero means that there is no existing height. This allows for both determining the magnitude of a difference within a variable and also describing those differences in terms of ratios (e.g. 60 inches is twice as tall as 30 inches).

**A note about levels of measurement:** Although the classifications for many measurement scales will be clear cut, some can be ambiguous. For example, Likert scales (see below) are commonly used in survey research when asking people to rate variables.

How much do you agree with the following statement?

I enjoy learning about research methods.

1	2	3	4	5
Strongly Agree	Disagree	Neither	Agree	Strongly Disagree

These scales are often treated like interval scales, although it is argued that the distance between the different ratings is not necessarily equal, making it more of an ordinal scale. You can think of this as a continuum, with different measurements behaving more or less like ordinal-like.

### **Fast Food Fun: Levels of Measurement – Activity**

In order to understand the differences in how each level of measurement classifies data, you are going to approach the question of what fast food chains people prefer using each type of measurement scale.

1. Choose five fast-food/quick-service restaurants.
2. Ask each student to choose the restaurant they prefer the most and simply count the number of students that fall into each category. Calculate the percentage of people that prefer each.
3. Next, ask each student to rank the fast food chains in order of preference. Find the mode for each restaurant.
4. Next, ask each student to rate their liking of each fast food chain using the following scale:

How much do you like \_\_\_\_\_?

1	2	3	4	5
Not at all		Moderately		Very Much

Calculate the median rating for each fast food chain (note again, that we are TREATING this like an interval scale although it is more ordinal-like).

5. Finally, ask each student to report how many times they have eaten at each fast food chain in the last month. Calculate a mean for each restaurant. See if you can calculate how much more people have eaten at some restaurants than others, and express that as a ratio.
6. Answer the following questions:
  - a. What conclusions can you make about fast food preferences with each of the four levels of measurement?
  - b. What additional information about fast food preferences does each level of measurement give you when moving sequentially from a nominal to a ratio scale?