Module 4: Test Statistics and Analysis

Passport to Great Teaching – Creative Assessment

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Goals for this Module

- Describe, explain, and calculate descriptive Statistics – mean, median, mode, variance, and standard deviation.
- Review Validity and Test Reliability
- Reinforce, analyze, and interpret item difficulty and discrimination, and test reliability

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Module 4a: Introduction to Descriptive Test Statistics

Mean, Median, Mode, Variance, and Standard Deviation

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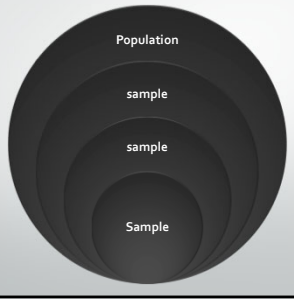
Populations versus Samples



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Measures of Central Tendency

- Distributions
- Central Tendency – mean, median, mode
- Mean – the arithmetic mean of a distribution of numbers
- Mode – the most frequently occurring number
- Median – the midpoint of the distribution

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Basic Definitions

Scores on a test vary based on individual performance on the items

Variance is a numerical representation of the degree to which the scores vary. The larger the variance number, the greater the differences among the scores.

To calculate variance for complete data sets: $\sigma^2 = \frac{\sum(X-\mu)^2}{N}$

To calculate variance for data sets that are subsets (samples) from a larger set $s^2 = \frac{\sum(X-\mu)^2}{n-1}$

Key:
- $\sum$ = sum
- s^2 = the variance for a sample
- σ^2 = variance for the entire population
- X = the score
- μ = the distribution or sample mean
- *N* = the number of scores, *n* = a subset of *N*

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Basic Definitions

Standard Deviation (s or σ) - this is the square root of the variance. This statistic provides information about the distribution of the scores around the mean.

For all score distributions, 68% of scores fall within 1 standard deviation of the mean; 95% fall within 2 standard deviations from the mean; 99% fall within 3 standard deviations from the mean.

Descriptive statistics can be calculated quickly and easily using free, online calculators:

Mean, Median, and Mode Calculator

Standard Deviation Calculator

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Review: What these statistics tell you

- Mean, Median, and Mode – these describe the score set you are analyzing, and give you an idea of the *skewness* of the score set
- Variation – this is a numerical representation of the degree to which the scores vary. The larger the variance number, the greater the differences among the scores.
- Standard Deviation – this is the square root of the variance. 68% of scores fall within ±1 standard deviation of the mean.

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Pause to Think and Practice

- Think: What value does knowing the descriptive statistics for your quizzes and tests add to your teaching?
- Practice: Using the score set and online calculators provided, calculate the mean, median, mode, variance, and standard deviation for the score set provided in the resources for this module, or for a quiz or test you give. What do these statistics tell you about the scores on assessment?

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