

# Critical Issues for Helping Students Perform Inference Successfully

1. Which inference method to choose
  - Estimating or testing a claim
  - Means, proportions, relationships between categorical/quantitative variables
2. The different purposes of random selection and random assignment
  - Random selection in sampling settings allows for generalizability
  - Random assignment in experiments allows cause-and-effect conclusions
  - Both permit the use of probability distributions as models in inference
3. How technology can be used as a tool for aiding inferential thinking
  - Simulation to understand sampling distributions
  - Calculations for inference methods
4. Different inferential thinking for hypothesis tests in experiments and sampling
  - Experiments: is there a treatment effect, or could the difference we observe be due to the chance involved in the random assignment?
  - Sampling: could the difference we observe be due to chance variation in the sampling process?
5. Conditions for using each inference method, and why they are important
  - Random sampling/random assignment
  - Normality
  - Independence (of measurements/samples)
6. Distinguishing between samples, populations, and sampling distributions.
7. Communicating effectively.
  - Using notation and statistical terminology correctly
  - Stating technically correct conclusions in context

## Choosing the correct inference method

- a.  $t$  test
- b.  $t$  interval
- c. two-sample  $t$  test
- d. two-sample  $t$  interval
- e. one proportion  $z$  test
- f. one proportion  $z$  interval
- g. two proportion  $z$  test
- h. two proportion  $z$  interval
- i. chi-square test for goodness-of-fit
- j. chi-square test for association/independence
- k. chi-square test for homogeneity
- l. linear regression  $t$  interval for slope
- m. linear regression  $t$  test for slope

- \_\_\_\_\_ 1. Which brand of AA batteries last longer—Duracell or Eveready?
- \_\_\_\_\_ 2. According to a recent survey, a typical teenager has 38 contacts stored in his/her cellphone. Is this true at your school?
- \_\_\_\_\_ 3. What percent of students at your school have a MySpace page?
- \_\_\_\_\_ 4. Is there a relationship between the age of a student's car and the mileage reading on the odometer at a large university?
- \_\_\_\_\_ 5. Is there a relationship between students' favorite academic subject and preferred type of music at a large high school?
- \_\_\_\_\_ 6. Who is more likely to own an iPod—middle school girls or middle school boys?
- \_\_\_\_\_ 7. How long do teens typically spend brushing their teeth?
- \_\_\_\_\_ 8. Are the colors equally distributed in Fruit Loops?
- \_\_\_\_\_ 9. Which brand of razor gives a closer shave? To answer this question, researchers recruited 25 men to shave one side of their face with Razor A and the other side with Razor B.
- \_\_\_\_\_ 10. How much more effective is exercise and drug treatment than drug treatment alone at reducing the incidence of heart attacks among men aged 65 and older?

# Which inference method?

