

# Understanding the Experiment

An Introduction to Experimental Design

# Hypothesis

- You might be familiar with the “If, Then” statement
- IF = Predictor/Independent Variable
- THEN = Outcome/Dependent Variable
- Since (IF) black paper absorbs heat, (THEN) ice will melt more quickly on black paper than on other colors.
  
- More advanced:
- The IF and THEN can be separate statements.
  - **Hypothesis = IF**
  - Ice melts at different speeds on different color paper.
  - **Prediction = THEN**
  - Ice will melt most quickly on black paper.
  - **Justification = WHY**
  - Black paper absorbs heat.

# Study Subject and Variables

- **Study Subject**
  - This is the thing you are studying.
- **Independent Variable**
  - “Predictor”
  - This is the thing you change in order to see how the study subject reacts.
- **Dependent Variable**
  - Outcome
  - This is the thing you measure to see if the study subject reacted the way you expected.

## Control Subject/Group

- This is used to establish a baseline.
- “What would normally happen if nothing is changed”
- Measure the dependent variable (outcome) for the control subject **WITHOUT** changing the independent variable (predictor).

# Controlled Variables

- These must remain the same for every study subject and every repeated attempt (trial).
- Not the predictor
  - Does not change
- Not the outcome
  - Not measured
- The purpose of controlled variables is to make sure that your predictor is the reason the outcome changed.

# Sample Size and Repeated Trials

- **Sample Size**
  - How many study subjects you test
  - The more you have, the more accurate your results will be
- **Repeated Trials**
  - How many times you test the study subjects
  - The more you have, the more precise your results will be
- **Accuracy: how close you are to the true value/answer**
- **Precision: how alike your results are to each other**
- **BOTH are important, therefore, sample size and repeated trials are important**