

## Lab-wide Learning Outcomes for Understanding Experimental Design

### Knowledge-Based Outcomes

Upon completion of *Understanding Experimental Design*, students should be able to:

- Given an experiment:
  1. Identify the independent and dependent variable(s).
  2. Identify the control and experimental treatments.
  3. Identify potentially confounding variables that are, or should be, held constant.
  4. Identify replicates and experimental units.

### Skills-Based Outcomes

Upon completion of *Understanding Experimental Design*, students should be able to:

- Given a scenario and hypothesis:
  1. Select appropriate independent and dependent variable(s).
  2. Choose appropriate systematic variation, with appropriate independent variable(s) and control and experimental groups, while holding constant potentially confounding variables.
  3. Choose appropriate replication.

## Understanding Experimental Design, Part 1: What Makes a Good Experiment?

### Knowledge-Based Outcomes

Upon completion of *Part 1: What Makes a Good Experiment?*, students should be able to:

1. Describe why systematic variation (varying only a single variable between treatments) is important for inferring causality.
2. Explain why replication is important for reducing uncertainty and increasing the scope of inference.

## Understanding Experimental Design, Part 2: Save the Simploids!

### Skills-Based Outcomes

Upon completion of *Part 2: Save the Simploids!*, students should be able to:

- In the design and execution of an experiment:
  1. Record data with an appropriate dependent variable.
  2. Create systematic variation, with appropriate independent variable(s) and control and experimental groups, while holding constant potentially confounding variables.
  3. Create replicates of both control and experimental treatments.
  4. Infer if data support or reject a hypothesis.
  5. Relate the conclusion back to the relevant real-world issue.