

## Lab 1.3B Manipulating Variables

**How does a biologist establish experimental conditions?** In a controlled experiment, a biologist develops an experimental procedure designed to investigate a question or problem. By manipulating variables and observing results, a biologist learns about relationships among factors in the experiment.

### Procedure:

1. Create a data table with the columns labeled *Control*, *Independent Variable*, *Constants*, *Hypothesis*, and *Dependent Variable*
2. Obtain a printed maze. Seated at your desk, have a classmate time how long it takes you to complete the maze. Record this time on the chart. This is the control in the experiment.
3. Choose a way to alter experimental conditions while completing the same maze. Record this as the independent variable.
4. In the column labeled *Constants*, list factors that will stay the same each time the experiment is performed.
5. Form a hypothesis about how the independent variable will affect the time it takes to complete the maze.
6. After your teacher approves your plan, carry out the experiment. Record the time required to complete the maze as the dependent variable.
7. Repeat steps 2-6 as time allows.
8. Graph the data. Use the graph to analyze the data between the independent and dependent variables.

### Analysis:

1. **Explain** the importance of the control in this experiment.
2. How valid is the data that you obtained? How could you change the experiment to obtain more valid results?
3. **Error analysis.** By completing the maze more than once, you introduced another variable, which likely affected the time required to complete the maze. Would eliminating this variable solve the problem? Explain.