

Independent Research Project

The Research Process

Chemistry I Honors
Mrs. Johannesson

Problem

You must start by defining your problem statement. Begin by making observations of things you see around you, in magazines, or on TV. Your problem statement should address these observations and state the purpose of your experiment. Often, you can phrase this as, "How does 'A' affect 'B'?" where 'A' is the independent variable and 'B' is the dependent variable.

Hypothesis

After making initial observations and conducting background research, you should be able to make a prediction regarding the outcome of your experiment. The hypothesis should be testable using your procedure and should state the expected results in measurable terms.

Experiment Design

Before beginning your experiment, you must design the procedure you will use. Your procedure must definitively test your hypothesis and must provide a detailed explanation of how you will conduct the experiment. Your procedure should be like a recipe. Another person should be able to perform your experiment following your procedure. Don't forget to include how you will measure your results (type of measurement, time interval, etc.). Be sure to address the following:

- **Independent variable** – What you change.
- **Dependent variable** – What you measure.
- **Constants** – Other factors that you need to keep from changing so they don't interfere with your results. Brainstorm as many potential interfering factors as you can.
- **Control Group** – The unaltered test group that will serve as a basis for comparison so you can tell whether your independent variable is really having any effect. Not every experiment will necessarily have a control.
- **Repeated trials** – Repeat the experiment several times and/or use several test subjects in each test group. This will help ensure reliable results. The more trials, the better. For non-human test subjects, shoot for a minimum of 5 items/group; for human subjects, 10 people/group.

Observations & Data

Once you begin data collection, you need to keep a detailed journal of observations, data, and results. Your journal should contain a record of everything you did as well as data measurements and written observations. You will also need to document your experiment with photographs (at least one must show you taking part in the experiment).

Results

After collecting data, you need to analyze it using graphs and tables. Then, you need to explain the meaning of your data. How did the independent variable influence the dependent variable, if at all? Was your hypothesis proven correct? It's important to take into account the limitations of your experiment. Were there some variables you weren't able to keep constant. Did you have small test groups?

Conclusion

Your experiment is over and the data have been analyzed. Now it's time to look at the big picture.

- What is the answer to your problem statement?
- What are some possible applications of your results?
- What are potential areas for future study?
- If you repeated this project, what would you change? What improvements could be made?