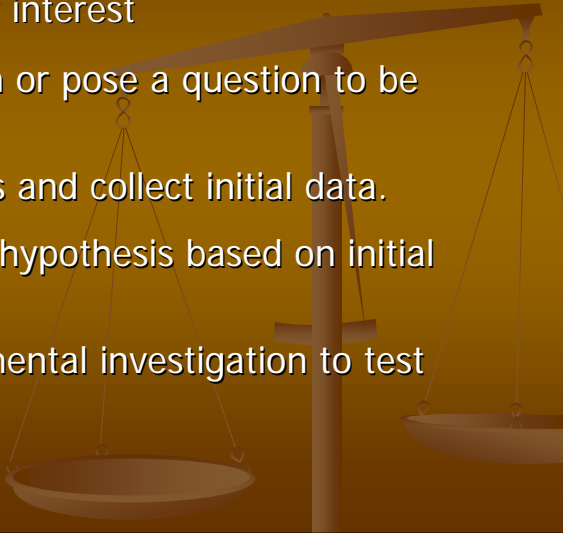


Science Fair Project Design



Designing a Science Fair Project

- Choose an area of interest
 - Identify a problem or pose a question to be answered.
 - Make observations and collect initial data.
 - Form a "testable" hypothesis based on initial observations.
 - Design an experimental investigation to test your hypothesis.
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The Scientific method

Step 1: Make observations

- A common misconception is that the scientific method starts with the formation of a hypothesis.
- In reality a hypothesis should be formed after the collection of the fundamental information or data relating to the system being observed.
- A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event based on the information that currently known.

The Scientific method

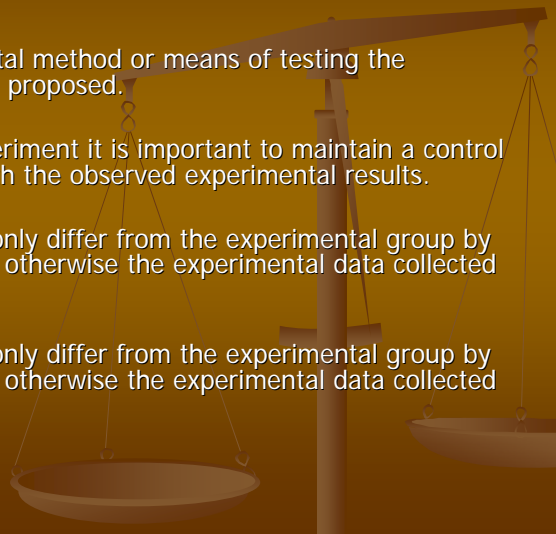
Step 2: Formulate a Hypothesis

- A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event based on the information that currently known.
- A useful hypothesis is testable statement that can be used to predict the outcome of future observations.

The Scientific method

Step 3: Design an experiment

- Determine an experimental method or means of testing the hypothesis that has been proposed.
- When designing the experiment it is important to maintain a control group for comparison with the observed experimental results.
- The control group must only differ from the experimental group by the variable being tested otherwise the experimental data collected is likely invalidated.
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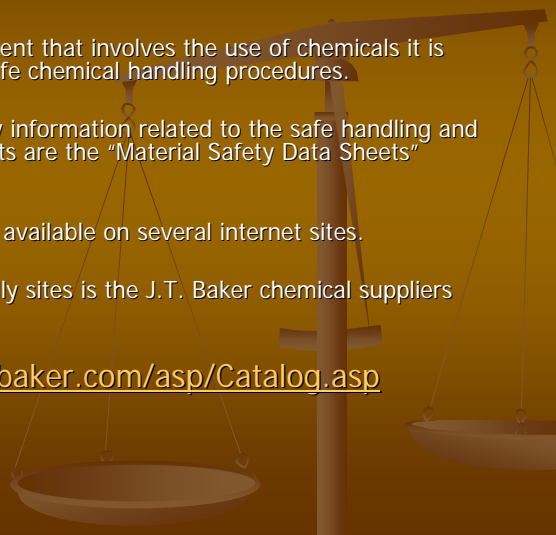


Safety

Designing a safe experiment

- When designing an experiment that involves the use of chemicals it is important to be aware of safe chemical handling procedures.
- The best resource for safety information related to the safe handling and disposal of chemical reagents are the "Material Safety Data Sheets" (MSDS).
- MSDS information is readily available on several internet sites.
- One of the more user friendly sites is the J.T. Baker chemical suppliers website:

<http://www.jtbaker.com/asp/Catalog.asp>



Safety

Material Safety Data Sheets provide information on:

- Product name and chemical composition
- Hazards
- First Aid Measures in case of exposure
- Fire fighting measures
- Accidental release measures
- Safe handling and storage information
- Appropriate personal protection measures; (gloves, goggles, protective clothing etc.)
- Physical and chemical properties
- Chemical reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Other pertinent information specific to the particular chemical

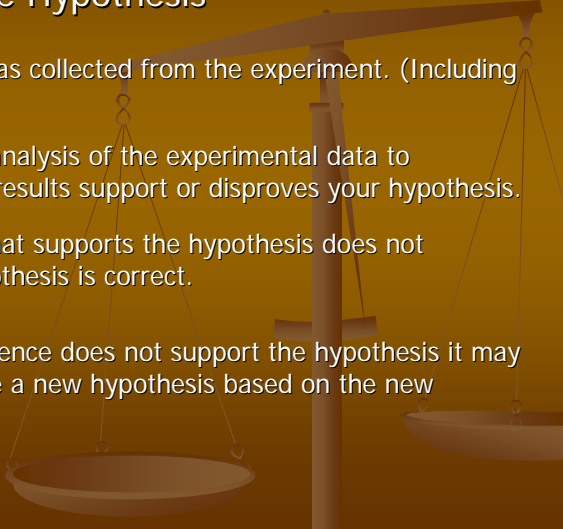
The Scientific method

Step 4: Test the Hypothesis

- Perform the experiment that has been designed.
- Collect all data including observations made during the course of the experiment.
- Collect all data related to your experiment including variables beyond your control.

The Scientific method

Step 5: Evaluate the Hypothesis

- Analyze the data that was collected from the experiment. (Including statistical analysis)
 - Evaluate the statistical analysis of the experimental data to determine whether the results support or disproves your hypothesis.
 - The collection of data that supports the hypothesis does not guarantee that the hypothesis is correct.
 - If the experimental evidence does not support the hypothesis it may be necessary to propose a new hypothesis based on the new experimental data.
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The Scientific method

Step 6: Evaluation of Experimental Method

- If the experimental data does not support the hypothesis or provides inconclusive evidence it may be necessary to redesign your experimental approach.
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