

Inquiry Lab: The Candle in the Jar - A Guide (© Eric Hanson 2015)

Purpose

To introduce teachers to the strategy of inquiry labs, which are a step towards authentic science and a step away from cookbook recipe activities that pretend to be science. This is not a student lab instruction sheet but simply an introduction for the possibilities of planning an inquiry approach to science education.

Apparatus & Materials

1 glass jar, 1 candle, 1 lid, 1 glass plate, 1 pneumatic trough, matches, water, other apparatus & materials you might require.

Safety Measures

Wear goggles whenever you are heating a glass jar with a candle because the jar might shatter. Lab coats are recommended.

Procedure

This is an open-ended inquiry investigation. Given the apparatus and materials specified above, you will be confronted with a question, which your inquiry will try to answer using the scientific method.

- 1) The first step in the Cycle of Proof (Scientific Method) is to become familiar with a phenomenon, which is called a database. This is not necessarily data from a lab, but information from informal observations, chance occurrences, and/or context.
- 2) The database will lead you to a question, which makes you curious about how the phenomenon happens.
- 3) In the process of trying to answer the question, you will develop a hypothesis, often in an "**If...then...because...**" format. This should isolate one factor or variable which might be the major cause of the phenomenon you witness.

The **If** segment of the hypothesis introduces an explanation of the mechanism involved which should begin to answer your question to the problem: how does this happen? The **then** segment offers a prediction, which you expect to happen if the hypothesis is valid. The **because** segment gives more detail to the explanation.

For example

If the balloon floats because the helium is lighter than air, **then** the helium balloon should weigh less than a balloon with the same amount of air **because** an equal amount of helium weighs less than an equal amount of air.

- 4) Test the hypothesis with an experiment.
- 5) Your database will increase.
- 6) As a result of your conclusion to the experiment above, your hypothesis will be strengthened or invalidated.
- 7) A strengthened or weakened first hypothesis will lead to a second hypothesis which might just refine or fine tune your original hypothesis, or consider another variable in the experiment.
- 8) The second hypothesis will lead to another experimental test.
- 9) Through another experimental test, the database will increase.
- 10) More data will lead to another conclusion which will either strengthen your second hypothesis or invalidate it.
- 11) The Cycle of Proof goes on, and on.

Your task is to go through these 10 steps today and record brief notes on these 10 steps. Again this is not designed as a student handout but a brief introduction to an inquiry lab, which should help you to develop student instructions for other inquiry labs.