

Worksheet No. 7: Experiment - Hypothesis Formation

Fill out this worksheet to formulate the hypothesis you want to test.

FOR INSTRUCTORS: Explain hypothesis formulation (in conversation):

A hypothesis (an assumption about how the world works that you want to prove) usually expresses an A-B relationship. In other words, “If I change A, then this change will do something to B”; for example, “If I heat up wax (A) the wax will melt (B).” When you formulate your hypothesis, try to be as concrete as possible (e.g. When I heat up bees wax to 150 Degree Fahrenheit, the wax will change from a solid state into a liquid state). This way you can test if your hypothesis is correct. You can measure the temperature the wax is exposed to, and then observe (test) if the wax becomes liquid (melts).

It is in this way that scientists prove or disprove their hypotheses. Scientists make (informed) guesses about how the world works, based on what we already learned through other experiments, and then try as hard as possible to *disprove* their hypothesis. Very simply put, when we say that science proved something (says something is “true”), it means that we were not able to show that our hypothesis is not true. This seems strange, but this is how science works. Scientists look at their theories as a “proved hypothesis” because they were not able to disprove them – the theories work well when we use them in the world. The process of *disproving* is called “falsification.”

A good experiment relies on controlling everything else that might mess with your results. So, for our wax example, maybe the temperature, the air pressure, or the humidity of the room maybe change at what temperature wax melts. Other things could be, how the wax was made, how it is heated up, ... This why we have laboratories: to provide experiment conditions that “mute” all these other things that might interfere with your experiment. You want to test the relationship between two “variables”: here “temperature” (Variable A) and “the state wax” (Variable B) and what their relationship is (Variable A changes Variable B from a solid state to a liquid change). To test this you have to “fix” all the other variables, so they are always the same, regardless of where you do the experiment, when, and who does it. These “fixed” variables, such as room temperature, air pressure, etc. are called “controlled for Variables”. The variables you test are called independent variables. The independent variable (A) you assume that makes things change and the dependent variable (B) you assume that will change because of the independent variable.

To test if your experiment was successful, you have to know what you are looking for. This is what we might call an “expected outcome.” In our example, one such outcome might be “If I increase the temperature above a certain point, the wax will become liquid.” To test this, you will want to assess the state of the wax (is it liquid or not?), measuring its current temperature, and then apply heat to the wax, increasing its temperature. You have to document this, writing all of the details down on paper. After the experiment, you will “test” if the wax is liquid. If it did, you can assume that there is a relationship between the temperature and wax.

For your own experiments, you will have to:

- a) decide what variables you want to experiment with
- b) what you think the relationship between the variable is (which one influences the other? How do you expect the influence to be?)
- c) think about what things you want to keep the same, so you can be sure that only the two variables you want to observe are “interacting” (influencing each other)
- d) want to figure out how you can *test* if your experiment was successful (how you can see that your assumption was correct).

Make a list of independent variables

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Make a list of dependent variables

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What do you want to achieve:

Write down your hypothesis in a full sentence:

	What is the variable	Why?
Independent Variable		
Dependent Variable		
Expected Relationship		

Controlled for variables

Note down the variables you want to “fix” (i.e. control for) to rule out their interference with your experiment.

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