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Think Outside The Box

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Scientific Observation ^[1]

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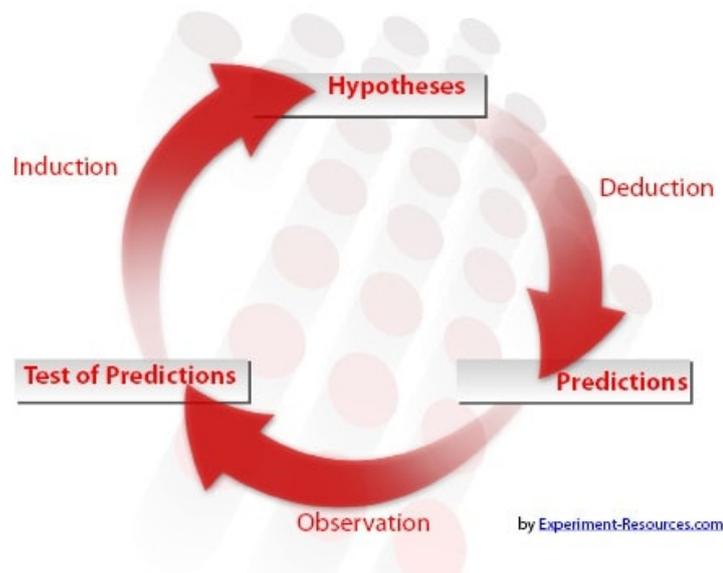
Scientific observation is the central element of scientific method or process. The core skill of scientist is to make observation.

Observation consists of receiving knowledge of the outside world through our senses, or recording information using scientific tools and instruments. Any data recorded during an experiment ^[3] can be called an observation.

The Scientific Process

A scientific process or scientific method requires observations of nature and formulating and testing the hypothesis. It consists of following four steps.

1. Observe something and ask questions ^[4] about a natural phenomenon (scientific observation)
2. Make your hypothesis ^[5]
3. Make predictions about logical consequences of the hypothesis
4. Test your predictions by controlled experiment, a natural experiment, an observational study ^[6] or a field experiment ^[7]
5. Create your conclusion ^[8] on the basis of data or information gathered in your experiment.



So How It Works?

Make notes as you answer these questions

- Who are the subjects [9]? What do they look like? What are they doing?
- Are the subjects interacting with each other? How?
- What is the environment like?
- Is the environment affecting behavior?

To make an observation you must look closely and notice details.

Now develop a question about what you see going on...

- Ask how, what, when, where, and why
- Be sure that the question can be answered with an experiment

Forming a Hypothesis

- After you have asked the question give a possible answer
- Try to explain what was observed
- This is called forming a "hypothesis"

Let's Take an Example:

- You and your friend observed that white cats were found to be playing with white cats and black with black cats.
- You form a hypothesis that "Cats like to play with cats same color as theirs"
- The prediction is what you think will happened if the hypothesis [5] is true
- Predictions in this case could be...
- H_1 = White cats will play with white cats
- H_2 = Black cats will play with black cats

- Now after the hypothesis is formed and predictions are made, this is the time to test them through experiment
- An experiment [3] is a way to test a hypothesis and see if what was predicted is correct or not

HYPOTHESIS: "Cats will play with cats of same color as theirs"

Let's Experiment

1. Get cats in a variety of colors say black, white, grey
2. Put them together in a room
3. Install close circuit cameras to record their activities

Results

- After about a week, you learnt that cats will play without regarding any color. You found white cats playing with black and vice versa.
- Our hypothesis proven incorrect and we may need to readjust it to try again
- It is important to remember that even if hypothesis is proven false does not mean that our experiment has failed. Many discoveries were made through the process of trial and error.

One important thing to note is that human senses are subject to errors [10] in perception e.g., optical illusions which can results in erroneous scientific observation [11]. This is why scientific instruments [12] were developed to improve and magnify human powers of observations like microscopes, cameras, telescopes, weight scales, computers, oscilloscopes, radio receivers etc.

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