

Process of Science

Using the experiments on the effect of bee predators on bee feeding behavior as a model

There is no single one way that scientists study the natural world, but there is a general process that most scientists use.

Key Elements in the Process of Science Are:

- 1. Observations
- 2. Questions
- 3. Hypotheses
- 4. Predictions
- 5. Tests/ Experiments
- 6. Communicating

Most people get hypotheses and predictions confused.

- Hypothesis: A tentative explanation for a natural phenomenon.
- Prediction: A forecasted outcome of an event based on evidence or a hypothesis.

Using Our Bee Experiment As a Model

- Jesse <u>observes</u> that bees as a group will avoid areas where there are predators.
- So, she <u>questions</u>: Why do bees avoid areas with predators?
- She <u>hypothesizes</u>:
- Maybe because bees can smell when a bee dies, and avoid these areas.
- Maybe because bees can see large predators, and avoid these areas.
- Maybe bees can smell the odors of predators

Making Predictions

Scientists use deductive reasoning to predict the results of new observations and experiments.

Deductive reasoning follows:

an "ifand.... then" logic.

If our hypothesis is correct, and we test it, then we can expect a particular outcome.

Let's Use Our First Hypothesis

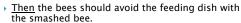
- Jesse <u>observes</u> that bees as a group will avoid areas where there are predators.
- So, she <u>questions</u>: Why do bees avoid areas with predators?
- She <u>hypothesizes</u>:
- Maybe because bees can smell when a bee dies, and avoid these areas.
- Maybe because bees can see large predators, and avoid these areas.
- Maybe bees can smell the pheromones of the predators

Making Our Own "If...and...then" Statement

- If the bees avoid predators because bees can smell when a bee dies, and avoid these areas,
- question and hypothesis



- And we have two feeding dishes and put a smashed bee on a filter paper next to one feeding dish,
- experiment



prediction



Qualities of a Good Experiment

It is controlled.

- ▶ There are two parallel test groups
- The variable of interest is changed in one group (the test group), but everything else remains the same.
- Sample size

Now you design your own experiment

- 1. Generate three hypotheses
- 2. Choose a hypothesis
- Write an If....and...then statement for your hypothesis.

Review the experiments

- Does the experiment match the hypothesis?
- Does the prediction match the experiment?