

## Teacher and Student Preparation for *DAW*

Vocabulary words:

Estuary

Scientific Method

Microscope

Vertebrate

Invertebrate

Experiment

Bar graph

Compare and Contrast

Food web/Food chain/ Direction of energy flow

Quantitative observations

Qualitative observation

Independent variable

Dependent variable

Symbiosis

## Variables

Independent and dependent variables are mathematical tools used in an experiment to keep track of what's going on. They allow you to maintain control over your experiment in a quantitative way.

Independent Variable - The one thing you are in control of or the thing you can manipulate. The Independent part is what you, the experimenter, changes or enacts in order to do your experiment.

Dependent Variable - What you are measuring. The dependent variable is what changes when the independent variable changes - the dependent variable depends on the outcome of the independent variable.

## Observations

Quantitative - Describes something with a number. Example: Measuring or weighing an item. If you weigh your snail, and it weighs 3 grams, you have just made a quantitative observation.

Qualitative - How something looks, smells, feels, behaves, ect. Example: If you observe your snail has a proboscis, you have just made a qualitative observation.

**Symbiosis** is a close ecological relationship between the individuals of two (or more) different species.

### Symbiotic Relationships

Mutualism - both species benefit

Commensalism - one species benefits, the other is unaffected

Parasitism - one species benefits, the other is harmed

Competition - neither species benefits

Neutralism - both species are unaffected

Scientific Method (understanding that there is more than one way to skin a cat)

## Scientific Method

The process begins with some type of *preliminary observation* of some kind of phenomenon.

Observation: Salmon swim up a particular river every fall.

Following these initial observations is usually a series of questions defined by the observer's curiosity.

Example: I wonder if they are the same fish? Where do these fish spend the rest of the year? If they come from the ocean, how do they know there is a stream here?

The next step in the process is the development of a hypothesis...the educated guess. It is your best explanation of the preliminary observations.

Hypothesis 1. I think these are the same salmon that swim up the stream every year.

Hypothesis 2. I think the salmon can smell the river from the ocean.

The process of experimentation separates the scientist from the casual observer. This is the point when you develop a method for testing your hypothesis. How would you test hypothesis 2?

One little understood aspect of the science experiment is the inability to *prove* your hypothesis is correct. Why? You cannot know fully all the operating parts or phenomena that may affect the problem at hand. A great example of this is that during the tobacco trials the defendants prime defense was that science has never proven that smoking causes cancer.

To help get around this, we test the *null hypothesis*.

The null hypothesis is the hypothesis of *no difference*.

An example of this would be: The fish cannot smell difference between ocean water and river water. If we do the experiment and find out that in fact the fish can tell a difference, we can then throw out the null hypothesis (that they can't tell the difference). Throwing out the null hypothesis helps support your true hypothesis. On the other hand, if you tested the true hypothesis with the same experiment and got the same results, you have not proven your hypothesis correct. There are many other factors that may have affected the outcome. Maybe, the fish can see the difference or sense a difference in salinity.

Important points for our students:

1. You start with observations.
2. Then, develop an educated guess, hypothesis, to explain the observation.
3. The experiment helps determine if you can accept or reject the hypothesis.

## 5 things in order to survive

### **Mollusks (gastropods) - SNAILS**

1. Breath - They have gills
2. Eat - They have a proboscis (mouth) with a radula (teeth) to eat with. They will bore hole in clams and eat the meat
- Find food - They smell through their siphon
3. Take in water -They take in water through their siphon
4. Protection/Shelter - They create their shell, mostly with calcium carbonate
5. Reproduce - Most are separate sexes and they mate. Some are hermaphrodites

### **Mollusks (Bivalves) -oysters, mussels, clams**

1. Breath - They have gills
2. Eat- filter feeders, filter food particles (plankton) out of the water
3. Take in water -Through the siphon
4. Protection/Shelter - They create their shell, mostly with calcium carbonate
5. Reproduce - Most are hermaphrodites

### **Arthropods - Crabs and spiny Lobster**

1. Breath - They have gills
2. Eat- They have a mouth, anything they can off the ocean floor
3. Take in water -Through the mouth
4. Protection/Shelter - They create their shell, mostly made from chitin  
Except: The Hermit Crab will move into someone else's shell after they die
5. Reproduce - Separate sexes, they mate

### **Echinoderms - Sea stars, sea urchins, sea cucumbers**

1. Breathe - They breathe through their tube feet.
2. Eat - They have a mouth, they capture food with their tube feet, then one of their stomachs (they have 2) comes out to surround the food.
3. Take in water - They have an opening on the dorsal side called a mandeoporite, this is for water circulation
4. Protection/Shelter - They hide or some have spines
5. Reproduce - Starfish are capable of both sexual and asexual reproduction. Individual starfish are male or female.

### **Cnidarians - sea anemone**

1. Breath - Through their skin
2. Eat- filter feeders and they can capture food with their tentacles (stinging cells at end)
3. Take in water -Through the mouth
4. Protection/Shelter - Stinging cells

5. Reproduce -The sexes in sea anemones are separate for some species while some are hermaphroditic. Both sexual and asexual reproduction may occur. In sexual reproduction males release sperm which stimulates females to release eggs, and fertilization occurs. The eggs or sperm are ejected through the mouth.