Observations And Inferences

Observations can be anything we become aware of through one or more of our senses. In science, our observations can be described in several ways.

Direct Observations: Noticing of phenomena, events, processes without any intervening factor between the observer and that which is being observed. For example, you are asked to determine what parts of the metal blade of a shovel have rust on them, and by looking at the shovel you can clearly see where the rust is.

Indirect Observations: Noticing of phenomena, events, processes but there is an intervening factor between the observer and that which is being observed. For example, you are asked to determine what parts of the metal blade of a shovel have rust on them, only this time you are not allowed to look at the shovel. Instead, with your eyes closed, you can run your finger tips across the surface of the shovel. You may notice some areas are smoother while other areas are rougher. Based on rusted surfaces you have seen, you know that those areas are rougher. Therefore, areas that feel rougher to your fingertips are more likely to be areas with rust.

Qualitative Observations: these are descriptions of what we observe. For example, its hot outside today.

Quantitative Observations: these are measurements of what we observed. For example, it's 90 degrees Fahrenheit outside today.

Scientists usually try to use quantitative observations because they are more precise.

When we make measurements, they should be the best measurements possible. To do this our measurements should be accurate and precise.

Accuracy refers to how correct a measurement is.

Precision refers to how exact the measurement is. The more decimal places a measurements contains means it has more precision than a measurement having fewer decimal places.

Consider the following example. Three students are asked to measure the length of an object that is actually 12.000 centimeters in length. The first students measurement is given as 12 cm, while the second students measurement is given as 12.00 cm., while the third students measurement is given as 11.5001 cm.

The first two students made an accurate measurement but the second students measurement is more precise and indicates that even to the one hundredth place, it is still zero. The third students measurement is the most precise of all, having measured to the nearest 10 thousandths of a centimeter. However, the third students measurement is the least accurate since the object being measured is 12 cm long.

Inferences are simply an explanation of an observation. They're based on observations you have made. The only rule of inferring is to be logical. Inferences are often changed when new observations are made. Using the above example of a rusted shovel, a student infers that the shovel might have become rusted by being left outside in damp weather.