Back to basics using scientific reasoning

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Any teaching techniques I have tried so far all revolve around the same goal: teaching my students the process of science, from the scientific method to using communication skills to explain their findings. Many of my students come to my course with a fear of science; most of them truly believe that they are not good in sciences. So, in this short essay I will explain two of my most influential activities that so far, have changed the dynamic of my courses. Instead of pushing the science, I prefer to explain the discovery process before I tackle any geoscience topic. Two activities are used: (1) What is it? (2) Describe and Sketch.

The first activity called "What is it?" is a simple activity using your senses. I give my students a box with different items for example, a rock for the touch, food for the smell and a bag of sprinkles for sound. This activity does not involve taste or sight therefore they need to have their eyes closed while going through each object. After each student interacted with each object the boxed is closed. In a sheet of paper, each student writes notes. At this point I like to test their ability to take notes; I often don't give precise instructions on what should be written in the notes. I leave it up to them. A class discussion culminates the activity. This activity is a fantastic way for students to learn about their own discovery process. The first thing students say after the activity is "Wow, that was fun!" From the class discussion students notice how they describe, some mention how they try really hard to find an object they've seen previously and use that as a descriptor and other focus on what they got correct/incorrect. I ask for what techniques where used in the identification process and each student is eager to tell me. Students listened to one another, often fascinated by how each group came up with a solution. Another important part I like to discuss is their note-taking. Each group did a great job explaining the process of identification verbally but, none of the amazing techniques used was written. In fact, very rarely have I had students writing their methodology, descriptions (i.e. size or feel) or sketches in their notes; they simply write the name of the object. This is one major challenge that I tackle every semester.

The second activity, called Describe and Sketch, ties nicely with the 1st activity. Students work in pairs, they sit back to back. Between them they decide which person will be the describer and sketcher. The describer will hold an object where he/she will proceed to describe the object without naming it. Sketcher upon descriptions will sketch the object to the best of its abilities. A class discussion culminates the activity. One of the major discoveries students find among themselves is the ambiguity of the descriptions. The sketchers realize the inability to generate an image when the descriptions are not clear. The descriptors often mention about not knowing what words to use especially if the object was too simple (i.e. marker) or too complicated (i.e. picture of a trilobite). This activity is an eye opener for many students. I ask them in what ways they could fix these issues and there is always one student that mentions "it would be easier if we could measure it". This is the moment because students realize how communication skills matter and how math in science adds a level of clarity to our findings.

Both of these activities are very simple but powerful, they are the basis of my course. During the entire semester students observe, generate hypotheses, put it to the test and conclude. My entire curriculum is created on continually building on this process. If by the end of the semester my students know the direction of propagation of a seismic wave and its particle motion that is awesome. But, what really matters is that they learned the skills of a scientist and how useful the scientific process can be to our daily lives.