What science is

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UNDERSTANDING THE NATURE OF SCIENCE Clearly defining the nature of science hasalways been difficult for beginning students, and even professional scientists disagree on an exact definition. I believe that science is a field of inquiry that reaches conclusions based on experimental evidence, but that it is not rigid or " always right." It is flexible and adapts to new knowledge. McComas (1996) points out that teachers often accept certain myths about science as proven facts, and then pass this along to their students. For example, there is no universally followed scientific method, but rather researchers approach problems with creativity and imagination. Science is not rigidly hierarchical or absolute, and McComas argues that the word hypothesis should be changed to the more accurate word prediction.

I could begin to define the nature of science by saying it is a way of knowing (a process of observing the world), and add that scientific knowledge changes over time, is based on theories, and involves individual human imagination and creativity (Lederman 1998). Science is based on observations of the natural world which lead to generally proven theories. Although our understanding of the natural world can change, we should arrive at conclusions using the scientific method: proposing hypotheses and proving or disproving them by experiments. There are no permanent conditions, because experiments sometimes lead to changes in the hypothesis, and no single set of assumptions works across all the sciences. Formulating and testing scientific ideas to come up with new knowledge demands diligent collection of data and multiple experiments. Scientists ask questions, and knowledge gathered during the inquiry adds to society's

knowledge bank. The learning experience itself becomes an imperative, just as important as solving the problem. There are always elements of uncertainty in scientific inquiry, but the knowledge derived from it is relatively reliable (Nickels, Nelson, and Beard 1996). As scientists examine the information placed before them, with a particular question in mind and armed with the tools of scientific inquiry, they must always remember that research could disprove their theories. They must remain as objective as possible. They begin with questions, but should proceed to answer the questions using reliable methods: accurate and thorough data collection and multiple experiments.

Alters and Nelson (2002) also present a view of how science is taught and realize some shortcomings in the teaching of science. High school biology is often the last science course some students take, and even at college level, students only retain a small percentage of what they learned. Students don’t understand even fundamental concepts, and so they have no solid foundation to understand more advanced concepts. As learning becomes more complex, levels of knowledge build upon each other to keep threads of information continually expanding.

Scientific concepts should be understood in the context of the experiments that lead to the conclusions. In order to understand the nature of science, concepts cannot be conveyed to students without them first understanding where the ideas came from. Since the nature of science is itself not a rigid construct, and theories change to reflect new knowledge, teachers should not take scientific conclusions out of context and present them to students as absolute facts. The process of scientific inquiry is as important as the answer to a scientific question, and students should experience that process

to see how researchers drew conclusions.

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