

WHAT IS SCIENCE?

Albert Einstein described science as "... a refinement of everyday thinking."

Our focus here at the middle school will be on teaching each of you **how to do science**. Science in this case is a **process** by which we answer scientific questions about the world around us.

Learning how to do science involves:

- Learning how to ask scientific questions.
- Learning how to do research in science.
- Learning how to make predictions.
- Learning how to design experiments that test our predictions.
- Learning how to use and care for laboratory equipment.
- Learning how to make critical observations.
- Learning how to collect, manipulate, display and interpret data.
- Learning how to draw conclusions and make inferences.
- Learning how to use scientific models to help explain how something works.
- Learning how to communicate results of our experiments.

In addition to learning how to do science, we will also learn about **topics in science**.

Learning about topics in science is important because we need some basic understanding before we begin to learn the skills involved in doing science. We gather the information for this basic understanding from various sources including:

Textbooks
Class notes and discussion
Media sources including videos, newspaper and magazines articles
Scientific Papers

The following excerpt is from a book written by physicist Richard Feynman. I like it because it illustrates the difference between doing science and topics in science.

Richard Feynman on "What is Science?"

Regarding this business about names and words, I would tell you another story. We used to go up to the Catskill Mountains for vacations. In New York you go to the Catskill Mountains for vacations. The poor husbands had to go to work during the week, but they would come rushing out for weekends and stay with the families. On the weekends, my father would take me for walks in the woods. He often took me for walks, and we learned all about nature, and so on, in the process. I'm not trying to tell you how to teach, because what my father was doing was with a class of just one student; if he had a class of more than one, he was incapable of doing it. So we went alone for our walk in the woods. But mothers were very powerful in those days as they are now, and they convinced the other fathers that they had to take their own sons out for walks in the woods. So, all fathers took all sons out for walks in the woods on Sunday afternoon. The next day, Monday, we were playing in the fields and this boy said to me, "See that bird standing on the wheat there? What's the name of it?" I said, "I haven't got the slightest idea." He said, "It's a brown-throated thrush. Your father doesn't teach you much about science." I smiled to myself, because my father had already taught me that that doesn't tell me anything about the bird. He taught me "See that bird. It's a brown-throated thrush, but in Germany it's called a halzenflugel, and in Chinese they call it a chung ling and even if you know all those names for it, you still know nothing about the bird. You only know something about people; what they call the bird." "Now that thrush sings, and teaches its young to fly, and flies so many miles away during the summer across the country, and nobody knows how it finds its way," and so forth. There is a difference between the name of the thing and what goes on.

...It is not science to know how to change Centigrade to Fahrenheit. It's necessary, but it is not exactly science.

...It's a good idea to try to see the difference, and it's a good idea to know when we are teaching the tools of science, such as words, and when we are teaching science itself....

