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Teaching science

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What is science?

Science is a way of knowing, a method of learning about nature. Rooted in common sense, its formal, systematic method is called scientific inquiry. In doing scientific inquiry, scientists use a variety of empirical approaches, techniques, and procedures to collect

data from nature, examine and analyze that data, and construct knowledge based on it. This knowledge relates to living organisms, non-living matter, energy, and events that occur naturally. To analyse data scientists often, but not always, use mathematics, and they always

apply logical arguments that obey strict empirical standards and healthy skepticism.

The product of scientific inquiry is the body of scientific knowledge. Scientific knowledge takes four forms: hypotheses, facts, laws, and theories. Hypotheses are tentative statements about relationships between variables in nature. Long ago the rotation of the earth on its axis and the orbit of the earth about the sun were hypotheses. Over time and through scientific inquiry, hypotheses may become facts. Facts are scientific observations that have been tested

and confirmed repeatedly. The motion of a Foucault pendulum over a 24-hour period documents Earth’s rotation on its axis. Observations of the shifting shadows of fixed objects over several weeks and the changing hours of daylight and darkness over several months help

document Earth’s revolution around the sun. Earth’s rotation and orbit are now scientific facts. Hypotheses may also become laws. Laws describe the behaviour of specific aspects of nature under specific conditions. Boyle’s Law states that the volume (one property) of an

ideal gas varies inversely (behaviour) with its pressure (second property) when the temperature (third property) of the gas is constant (specific condition). Theories are explanations about broad aspects of nature that encompass large numbers of hypotheses, facts, laws, and events. These explanations are well tested and valued for their ability

to predict new scientific knowledge and produce practical benefits. Evolutionary theory explains the extensive diversity across living organisms as well as the underlying unity. Scientists in health, agriculture, and industry use evolution to develop new medicines, hybrid crops, and new molecules that enhance the performance of systems and benefit individuals and societies.

Education in science serves three purposes. First, it prepares students to study science at higher levels of education. Second, it prepares students to enter the workforce, pursue occupations, and take up careers. Third, it prepares them to become more scientifically literate citizens. The relative priority and alignment of these three purposes varies extensively across countries and cultures. Regardless of the setting, a sound education in science emphasizes that science is both a way of knowing and a body of knowledge; it also emphasizes integrating scientific inquiry with scientific knowledge. Much is known about teaching science effectively to learners of all ages. This knowledge comes from research and scholarship conducted in both developed and developing countries.

**References**

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