Science is…

Evidence-based: There are accepted methodologies, standards of evidence, and logical ways of answering questions in science, all of which are based on observations, tests and other types of data. The importance of the use of evidence in science cannot be over-stated. Evidence always points the way to new understandings. This explains why evidence is mentioned in most of the following points.

Testable or Falsifiable: How will you know if you are wrong about your idea? If an explanation offers no way to be tested, or does not have the potential to be proven false by evidence, then it is not scientific. Repeatability is often a goal in experimental types of science. But many fields of science do not solve problems through experimentation – they rely on inferences from patterns and observations.

Consistent: A scientific explanation needs to do more than provide a plausible account; it must fit all the observable facts better than alternative explanations do. It must be consistent with all available evidence, not just selected evidence.

Practical: Science is useful for solving everyday problems.

Making Explanations: Scientific explanations must show an explicit cause and effect relationship based on observable evidence. They involve looking for patterns and correlations. Explanations deal specifically with explaining the natural world and are not cultural or supernatural.

Reviewed by Peers: Scientific papers are published in journals to be reviewed by other scientists. Anyone can have an idea in science, it is non-discriminating and it is not sentimental. It doesn't matter who proposes an idea, it is judged based on the evidence. Individual scientists may have different agendas and can put forth a variety of opinions – these don't necessarily represent scientific knowledge. Scientific experts in one field may not know about other fields of science. This is why we look to communities of experts to help ratify explanations and judge the evidence for scientific arguments.

Self-correcting: Science is open-minded, not empty-headed. Scientists are very careful about what they say they know and how they know it – scientists must have evidence to support their claims. They try not to overstate their findings and wait to see confirming (or disproving) evidence. Scientific ideas are often changed and revised as we acquire new evidence.

Science is not…

- The absolute truth—but rather our current best approximation based on available evidence.
- Democratic—You can't vote on science, it's based on the evidence. It doesn't matter how many scientists there are with a particular opinion—the evidence is what counts. It's also not the authority of the scientist, but the quality of the evidence, that provides the strength of the argument.

Terms Used in Describing the Nature of Science

Fact: In science, an observation that has been repeatedly confirmed and for all practical purposes is accepted as "true." Truth in science, however, is never final, and what is accepted as a fact today may be modified or even discarded tomorrow.

Hypothesis: A tentative statement about the natural world leading to deductions that can be tested. If the deductions are verified, the hypothesis is provisionally corroborated. If the deductions are found to be incorrect, the original hypothesis is proved false and must be abandoned or modified. Hypotheses can be used to build more complex inferences and explanations.

Law: A descriptive generalization about how some aspect of the natural world behaves under stated circumstances.

Theory: In science, a well-substantiated explanation of some aspect of the natural world that can incorporate facts, laws, inferences, and tested hypotheses.

> The contention that evolution should be taught as a "theory, not as a fact" confuses the common use of these words with the scientific use. In science, theories do not turn into facts through the accumulation of evidence. Rather, theories are the end points of science. They are understandings that develop from extensive observation, experimentation, and creative reflection. They incorporate a large body of scientific facts, laws, tested hypotheses, and logical inferences. In this sense, evolution is one of the strongest and most useful scientific theories we have.

Adapted from Teaching About Evolution and the Nature of Science, the National Academy of Sciences (Wash, D.C.: National Academy Press, 1998.)