Nature of Science (NOS) is that element of the science curriculum in which students learn how science functions, how scientific knowledge is generated and tested, and how scientists do their work (McComas et al., 1998).

There is no debate regarding the importance of including NOS in the science curriculum, but some suggest that it would be best to call this domain *Nature of Science Studies, History and Philosophy of Science (HPS), Ideas-about-Science, Nature of Sciences, Nature of Scientific Knowledge*, or *Views on the Nature of Science.* However, Nature of Science (NOS) is the most common label for this aspect of science instruction.

There are many rationales for the inclusion of NOS in science instruction but the list offered by Driver et al. (1996) remains a complete set of such rationales. They state that NOS in the science curriculum as a *utilitarian* function (permits students to make sense of science), a *democratic* element (fosters informed decision making regarding scientific issues, add to *cultural understanding* (since science is part of contemporary culture); has a *moral dimension* (provides understanding of how the scientific community functions) and adds to *science learning* (by enhancing the understanding of science content).

Much has been written about how best to teach the nature of science and a review of this literature would be prohibitively lengthy. However, Lederman and Niess (1997), Khishefe et al. (2002); Abd-El-Khalick (2001) have shown that effective NOS instruction must be explicit and involve students reflection. This means that NOS is communicated directly and clearly, usually within the context of the science subject, rather than assumed to be transferred indirectly as students are learning science content. NOS must be a clear learning goal given prominence in the classroom along with traditional science content.

A number of suggestions have been made regarding what NOS should be the focus in science classrooms. Osbourn and colleagues (2003), and Lederman (2002) have offered recommendations similar to those provided by McComas (2004, 2008), listed here within three main categories. This is not a list to be memorized by students but is designed as a guide to teachers as a set of NOS elements that students should have opportunities to learn, experience, test and even debate.

Science Shares Common Tools and Products

1) Science produces, demands, and relies on empirical evidence.
2) Knowledge production in science shares many common factors: shared habits of mind, norms, logical thinking, and methods such as careful observation and data recording, truthfulness in reporting, etc.
3) Laws and theories are related but are different types of scientific knowledge.

Science has Important Human Elements

4) Science has a creative component.
5) Scientific observations, ideas, and conclusions are not entirely objective and are directed, in part, by ones prior conceptions.
6) Historical, cultural, and social influences impact the practice and direction of science.

Scientific Knowledge has Limits

7) Science, technology and engineering impact each other but are not the same.
8) Scientific knowledge is tentative, durable, yet is self-correcting. (This means that science cannot prove anything except that scientific conclusions are valuable and long lasting because of the way in which they are developed; errors will be discovered and corrected as a standardize part of the scientific process).
9) Science and its methods cannot answer all questions. In other words, there are limits on the kinds of questions that can and should be asked within a scientific framework.

These particular NOS learning goals are recommended for inclusion in the science curriculum for several reasons. They are frequently mentioned by science education experts, function across all science disciplines, do not represent an undue burden on the science curriculum and are generally understandable by teachers and students. The *Next Generation Science Standards* (see also) released in the spring of 2013 in the United States have improved on past such documents. In the NGSS, NOS is featured in dedicated appendix on this topic and refer to NOS in association with the grade level science learning goals. (WM)

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