Ohio Science

Nature of Science: Grades 9-12

Adopted 2018

Nature of Science

Scientific Inquiry, Practice and Applications

1. All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas. NS.1
    1. Identify questions and concepts that guide scientific investigations. NS.1.1
    2. Design and conduct scientific investigations using a variety of methods and tools to collect empirical evidence, observing appropriate safety techniques. NS.1.2
    3. Use technology and mathematics to improve investigations and communications. NS.1.3
    4. Formulate and revise explanations and models using logic and scientific evidence (critical thinking). NS.1.4
    5. Recognize and analyze explanations and models. NS.1.5
    6. Communicate and support scientific arguments. NS.1.6

Science is a Way of Knowing

a. Understand that science assumes the universe is a vast single system in which basic laws are consistent. NS.2.A

b. Understand that natural laws operate today as they did in the past and they will continue to do so in the future. NS.2.B

c. Recognize that science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge. NS.2.C

   1. Students understand that various science disciplines use diverse methods to obtain evidence and do not always use the same set of procedures to obtain and analyze data (i.e., there is no one scientific method). NS.2.1

      a. Make observations and look for patterns. NS.2.1.A

      b. Determine relevant independent variables affecting observed patterns. NS.2.1.B

      c. Manipulate an independent variable to affect a dependent variable. NS.2.1.C

      d. Conduct an experiment with controlled variables based on a question or hypothesis. NS.2.1.D

      e. Analyze data graphically and mathematically. NS.2.1.E

   2. Students understand that science disciplines share common rules of evidence used to evaluate explanations about natural phenomenon by using empirical standards, logical arguments and peer reviews. NS.2.2

      a. Empirical standards include objectivity, reproducibility, and honest and ethical reporting of findings. NS.2.2.A

      b. Logical arguments should be evaluated with open-mindedness, objectivity and skepticism. NS.2.2.B

   3. Students recognize that science arguments are strengthened by multiple lines of evidence supporting a single explanation. NS.2.3

   4. Students understand that the various scientific disciplines have practices, methods, and modes of thinking that are used in the process of developing new science knowledge and critiquing existing knowledge. NS.2.4

Science is a Human Endeavor

3. Understand that science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes. NS.3
    1. Perceive that science depends on curiosity, imagination, creativity and persistence. NS.3.1
    2. Understand that individuals from different social, cultural, and ethnic backgrounds work as scientists and engineers. NS.3.2
    3. Understand that science and engineering are influenced by technological advances and society; technological advances and society are influenced by science and engineering. NS.3.3
    4. Recognize that science and technology might raise ethical, social and cultural issues for which science, by itself, does not provide answers and solutions. NS.3.4

Scientific Knowledge is Open to Revision in Light of New Evidence

a. Students recognize that science is not static. NS.4.A

b. Students recognize that science is constantly changing as we acquire more knowledge. NS.4.B
    1. Understand that science can advance through critical thinking about existing evidence. NS.4.1
    2. Recognize that science includes the process of comparing patterns of evidence with current theory. NS.4.2
    3. Understand that some science knowledge pertains to probabilities or tendencies. NS.4.3
    4. Perceive that science should carefully consider and evaluate anomalies (persistent outliers) in data and evidence. NS.4.4
    5. Understand that improvements in technology allow us to gather new scientific evidence. NS.4.5