Ohio | Department of Education

The Nature of Science

Table 1: Nature of Science

Nature of Science One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.	
Categories	**K-2**
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.	• Apply knowledge of science content to real-world challenges. • Plan and conduct simple scientific investigations using appropriate safety techniques based on explorations, observations and questions. • Employ simple equipment and tools to gather data and extend the senses. • Use data and mathematical thinking to construct reasonable explanations. • Communicate with others about investigations and data.
Science is a Way of Knowing Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past, and they will continue to do so in the future. 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.	• The world is discovered through exploration. • Exploration leads to observation. Observation leads to questions. • Natural events happen today as they happened in the past. • Events happen in regular patterns and cycles in the natural world.
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	• Everyone explores the world which generates questions. • The answer is not always as important as the process. • Questions often lead to other questions. • Discoveries are communicated and discussed with others. • People address questions through collaboration with peers and continued exploration. • Everyone can see themselves as scientists.
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	• It is essential to learn how to identify credible scientific evidence. • Ideas are revised based on new, credible scientific evidence.

*Adapted from Appendix H – Understanding the Scientific Enterprise: The Nature of Science in the Next Generation Science Standards

Table 1: Nature of Science (continued)

Nature of Science One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.	
Categories	**3-5**
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.	• Observe and ask questions about the world that can be answered through scientific investigations. • Design and conduct scientific investigations using appropriate safety techniques. • Use appropriate mathematics, tools and techniques to gather data and information. • Develop and communicate descriptions, models, explanations and predictions. • Think critically and ask questions about the observations and explanations of others. • Communicate scientific procedures and explanations. • Apply knowledge of science content to real-world challenges.
Science is a Way of Knowing Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. 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.	• Science is both a body of knowledge and processes to discover new knowledge. • Science is a way of knowing about the world around us based on evidence from experimentation and observations. • Science assumes that objects and events occur in consistent patterns that are understandable through measurement and observation.
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	• People from many generations and nations contribute to science knowledge. • People of all cultures, genders, and backgrounds can pursue a career in science. • Scientists often work in teams. • Science affects everyday life. • Science requires creativity and imagination.
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	• Science develops theories based on a body of scientific evidence. • Science explanations can change based on new scientific evidence. •

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Categories	**6-8**
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.	• Apply knowledge of science content to real-world challenges. • Identify questions that can be answered through scientific investigations. • Design and conduct scientific investigations using appropriate safety techniques. • Use appropriate mathematics, tools and techniques to gather data and information. • Analyze and interpret data. • Develop descriptions, models, explanations and predictions. • Think critically and logically to connect evidence and explanations. • Recognize and analyze alternative explanations and predictions. • Communicate scientific procedures and explanations. • Design technological/engineering solutions.
Science is a Way of Knowing Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. 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.	• Science is a way of knowing about the world around us based on evidence from experimentation and observations. • Science is a continual process and the body of scientific knowledge continues to grow and change. • Science assumes that objects and events occur in consistent patterns that are understandable through measurement and observation. • Science should carefully consider and evaluate all data including outliers. • Science is based on observable phenomena and empirical evidence. • Science disciplines share common rules for obtaining and evaluating empirical evidence.
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	• Individuals from different social, cultural, and ethnic backgrounds work as scientists and engineers. • Scientists and engineers are guided by habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism and openness to ideas. • Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination and creativity.
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	• Science explanations are subject to revision and improvement in light of additional scientific evidence or new understanding of scientific evidence.

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Table 1: Nature of Science (continued)

Nature of Science One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.	
Categories	**High School**
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.	• Identify questions and concepts that guide scientific investigations. • Design and conduct scientific investigations using a variety of methods and tools to collect empirical evidence, observing appropriate safety techniques. • Use technology and mathematics to improve investigations and communications. • Formulate and revise explanations and models using logic and scientific evidence (critical thinking). • Recognize and analyze explanations and models. • Communicate and support scientific arguments.

Science is a Way of Knowing
Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past and they will continue to do so in the future. 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.
	• 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).
	  ○ Make observations and look for patterns.
	  ○ Determine relevant independent variables affecting observed patterns.
	  ○ Manipulate an independent variable to affect a dependent variable.
	  ○ Conduct an experiment with controlled variables based on a question or hypothesis.
	  ○ Analyze data graphically and mathematically.
	• Science disciplines share common rules of evidence used to evaluate explanations about natural phenomenon by using empirical standards, logical arguments and peer reviews.
	  ○ Empirical standards include objectivity, reproducibility, and honest and ethical reporting of findings.
	  ○ Logical arguments should be evaluated with open-mindedness, objectivity and skepticism.
	• Science arguments are strengthened by multiple lines of evidence supporting a single explanation.
	• 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.

Nature of Science
One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.

Categories	High School
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	• Science depends on curiosity, imagination, creativity and persistence. • Individuals from different social, cultural, and ethnic backgrounds work as scientists and engineers. • Science and engineering are influenced by technological advances and society; technological advances and society are influenced by science and engineering. • Science and technology might raise ethical, social and cultural issues for which science, by itself, does not provide answers and solutions.
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	• Science can advance through critical thinking about existing evidence. • Science includes the process of comparing patterns of evidence with current theory. • Some science knowledge pertains to probabilities or tendencies. • Science should carefully consider and evaluate anomalies (persistent outliers) in data and evidence. • Improvements in technology allow us to gather new scientific evidence.

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