

## Norton City Schools Standard-Based Science Course of Study 2003

### NINTH/TENTH GRADES

**NATURE OF SCIENCE-These scientific process skills should be integrated into OGT Requirement courses.**

**Science and Technology Standard (ST)**

**Scientific Inquiry Standard (SI)**

**Scientific Ways of Knowing Standard (SK)**

9-10 Benchmarks	Grade Level Indicators and Sub-Objectives	Teaching Strategies/Resources
<p>By the end of the 9-10 program, the student will:</p> <p><b><u>Science and Technology</u></b></p> <ul style="list-style-type: none"> <li>★ Explain the ways in which the processes of technological design respond to the needs of society. (ST-A)</li> <li>★ Explain that science and technology are interdependent; each drives the other. (ST-B)</li> </ul> <p><b><u>Scientific Inquiry</u></b></p> <ul style="list-style-type: none"> <li>★ Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations. (SI-A)</li> </ul> <p><b><u>Scientific Ways of Knowing</u></b></p> <ul style="list-style-type: none"> <li>★ Explain that scientific knowledge must be based on</li> </ul>	<p>By the end of Ninth/Tenth Grades, the student will:</p> <p><b><u>Understanding Technology</u></b></p> <ul style="list-style-type: none"> <li>★ Describe means of comparing the benefits with the risks of technology and how science can inform public policy. (ST-9-1)</li> <li>★ Cite examples of ways that scientific inquiry is driven by the desire to understand the natural world and how technology is driven by the need to meet human needs and solve human problems. (ST-10-1)</li> <li>★ Describe examples of scientific advances and emerging technologies and how they may impact society. (ST-10-2)</li> </ul> <p><b><u>Abilities To Do Technological Design</u></b></p> <ul style="list-style-type: none"> <li>★ Identify a problem or need, propose designs and choose among alternative solutions for the problem.</li> <li>★ Explain why a design should be continually assessed and the ideas of the design should be tested, adapted and refined. (ST-9-2)</li> <li>★ Explain that when evaluating a design for a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced and disposed of in addition to who will sell, operate and take care of it. Explain how the costs associated with these considerations may introduce additional constraints on the design. (ST-10-3)</li> </ul> <p><b><u>Doing Scientific Inquiry</u></b></p> <ul style="list-style-type: none"> <li>★ Distinguish between observations and inferences given a scientific situation. (SI-9-1)</li> </ul>	

Note: Ohio Academic Content Standards, Benchmarks and Indicators, are typed in bold print and designated by a “★”.

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<p>evidence, be predictive, logical, subject to modification and limited to the natural world. (SK-A)</p> <p>★ Explain how scientific inquiry is guided by knowledge, observations, ideas and questions. (SK-B)</p> <p>★ Describe the ethical practices and guidelines in which science operates. (SK-C)</p> <p>★ Recognize that scientific literacy is part of being a knowledgeable citizen. (SK-D)</p>	<ul style="list-style-type: none"> <li>★ Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, Material Safety Data Sheets [MSDS], eyewash, goggles and ventilation). (SI-9-2)</li> <li>★ Construct, interpret and apply physical and conceptual models that represent or explain systems, objects, events or concepts. (SI-9-3)</li> <li>★ Decide what degree of precision based on the data is adequate and round off the results of calculator operations to the proper number of significant figures to reasonably reflect those of the inputs. (SI-9-4)</li> <li>★ Develop oral and written presentations using clear language, accurate data, appropriate graphs, tables, maps and available technology. (SI-9-5)</li> <li>★ Draw logical conclusions based on scientific knowledge and evidence from investigations. (SI-9-6)</li> <li>★ Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g., OSHA, MSDS, eyewash, goggles and ventilation). (SI-10-1)</li> <li>★ Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology. (SI-10-2)</li> <li>★ Use mathematical models to predict and analyze natural phenomena. (SI-10-3)</li> <li>★ Draw conclusions from inquiries based on scientific knowledge and principles, the use of logic and evidence (data) from investigations. (SI-10-4)</li> <li>★ Explain how new scientific data can cause any existing scientific explanation to be supported, revised or rejected. (SI-10-5)</li> </ul> <p><u>Nature of Science</u></p> <ul style="list-style-type: none"> <li>★ Comprehend that many scientific investigations require the contributions of women and men from different disciplines in and out of science. These people study different topics, use different techniques and have different standards of evidence but share a common purpose – to better understand a portion of our universe. (SK-9-1)</li> <li>★ Illustrate that the methods and procedures used to obtain evidence must be clearly reported to enhance opportunities for further investigations. (SK-9-2)</li> <li>★ Demonstrate that reliable scientific evidence improves the ability of scientists to offer accurate predictions. (SK-9-3)</li> </ul>	
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- ★ Discuss science as a dynamic body of knowledge that can lead to the development of entirely new disciplines. (SK-10-1)
- ★ Describe that scientists may disagree about explanations of phenomena, about interpretation of data or about the value of rival theories, but they do agree that questioning, response to criticism and open communication are integral to the process of science. (SK-10-2)
- ★ Recognize that science is a systematic method of continuing investigation, based on observation, hypothesis testing, measurement, experimentation, and theory building, which leads to more adequate explanations of natural phenomena. (SK-10-3)

### Ethical Practices

- ★ Explain how support of ethical practices in science (e.g., individual observations and confirmations, accurate reporting, peer review and publication) are required to reduce bias. (SK-9-4)
- ★ Recognize that ethical considerations limit what scientists can do. (SK-10-4)
- ★ Recognize that research involving voluntary human subjects should be conducted only with the informed consent of the subjects and follow rigid guidelines and/or laws. (SK-10-5)
- ★ Recognize that animal-based research must be conducted according to currently accepted professional standards and laws. (SK-10-6)

### Scientific Theories

- ★ Justify that scientific theories are explanations of large bodies of information and/or observations that withstand repeated testing. (SK-9-5)
- ★ Explain that inquiry fuels observation and experimentation that produce data that are the foundation of scientific disciplines. Theories are explanations of these data. (SK-9-6)
- ★ Recognize that scientific knowledge and explanations have changed over time, almost always building on earlier knowledge. (SK-9-7)

### Science and Society

- ★ Illustrate that much can be learned about the internal workings of science and the nature of science from the study of scientists, their daily work and their efforts to advance scientific knowledge in their area of study. (SK-9-8)

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	<ul style="list-style-type: none"><li>★ Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue. (SK-9-9)</li><li>★ Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue. (SK-10-7)</li></ul>	
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