

Academic Standards for Environment and Ecology

*June 1, 2009 FINAL
Grades 3-8, 10,12*



Pennsylvania Department of Education

*These standards are offered as a voluntary resource for Pennsylvania's schools and await action by the State Board of Education.
The course level standards are offered as a voluntary resource for Pennsylvania's schools.*

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Environment and Ecology

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XI. INTRODUCTION

This document includes Environment and Ecology standards that describe what students should know and be able to do in these areas:

- ◇ 4.1. Ecology
- ◇ 4.2. Watersheds and Wetlands
- ◇ 4.3. Natural Resources
- ◇ 4.4. Agriculture and Society
- ◇ 4.5. Humans and the Environment

The Declaration of Rights, Article I of the Pennsylvania Constitution states in Section 27: “The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and aesthetic values of the environment. Pennsylvania’s public natural resources are the common property of all people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.” To this end it is our responsibility to develop a citizenry that is aware of and concerned about the total environment and has the knowledge and skills to work toward solutions to current problems and the prevention of new ones.

Environment and Ecology is grounded in the complexity of the world we live in and its sustainability. It examines the world’s natural processes and systems. Environment and Ecology places its main emphasis in the real world. Allowing students to understand, through a sound academic content base, how their everyday lives evolve around their use of the natural world and the resources it provides.

These standards establish the essential elements of what students should know and be able to do at the end of grades four, seven, ten and twelve. The sequential nature of this document reflects the need for rigorous academic content that students will be expected to achieve. The document reinforces all areas across the grade levels with increasing degrees of difficulty as the students mature intellectually.

The study of Environment and Ecology will allow students to be active participants and problem solvers in real issues that affect them, their homes, schools and communities.

A glossary is included to assist the reader in understanding terminology contained in the standards.

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Science as Inquiry: Understanding of science content is enhanced when concepts are grounded in inquiry experiences. The use of scientific inquiry will help ensure that students develop a deep understanding of science content, processes, knowledge and understanding of scientific ideas, and the work of scientists; therefore, inquiry is embedded as a strand throughout all content areas. Teaching science as inquiry provides teachers with the opportunity to help all students in grades K-12 develop abilities necessary to understand and do scientific inquiry. These are very similar across grade bands and evolve in complexity as the grade level increases.

Grades K-4	Grades 5-7	Grades 8-10	Grades 11-12
<ul style="list-style-type: none"> • Distinguish between scientific fact and opinion. • Ask questions about objects, organisms and events. • Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known. • Plan and conduct a simple investigation and understand that different questions require different kinds of investigations. • Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information. • Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge. • Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced and review and ask questions about the work of other scientists. 	<ul style="list-style-type: none"> • Understand how theories are developed. • Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions. • Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations. • Describe relationships using inference and prediction. • Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations. • Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments and are based on scientific principles, models, and theories. • Analyze alternative explanations and understanding that science advances through legitimate skepticism. • Use mathematics in all aspects of scientific inquiry. • Understand that scientific investigations may result in new ideas for study, new methods or procedures for an investigation, or new technologies to improve data collection. 	<ul style="list-style-type: none"> • Compare and contrast scientific theories. • Know that both direct and indirect observations are used by scientists to study the natural world and universe. • Identify questions and concepts that guide scientific investigations. • Formulate and revise explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models. 	<ul style="list-style-type: none"> • Examine the status of existing theories. • Evaluate experimental information for relevance and adherence to science processes. • Judge that conclusions are consistent and logical with experimental conditions. • Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution. • Communicate and defend a scientific argument.