



Southmoreland School District Integrated Science Curriculum Overview

Integrated Science Overview:

In our daily lives and in society, many of our decisions demand a knowledge of science. This knowledge is necessary for dealing satisfactorily with many of the situations that confront us daily in our home, health, workplace and in the environment. Science should, therefore, be an important part of our general education. Integrated Science attempts to meet this need. This course is an introduction to many of the science classes that Southmoreland students will take at the high school.

This course is an introductory level course designed to give 9th grade students a background in the major branches of science. This course will introduce topics to students that they will learn in more detail throughout their high school careers. An “integrated science” course serves the purpose of a “general science” course covering the inquiry of science, earth science, chemistry and life sciences.

This course is taught through a multifaceted approach using hands-on lab activities, research based inquiry and direct instruction. Students are expected to apply scientific principles, investigative problems and use problem solving skills to be effective in communicating scientific knowledge.

Course Outline:

- Module 1: **Scientific Method/Metric System**
- Module 2: **Natural Resources and Energy**
- Module 3: **Intro to Chemistry**
- Module 4: **Minerals and Rocks**
- Module 5: **Plate Tectonics**
- Module 6: **Fossil Record**
- Module 7: **The Atmosphere and Weather**
- Module 8: **Ecology**
- Module 9: **Characteristics of Life**
- Module 10: **Cells**
- Module 11: **Taxonomy/ Organisms**
- Module 12: **Genetics**

Module Overviews:

Module 1 Scientific Method/Metric System: This introductory module focuses on students learning how to conduct experiments using the scientific method and using the metric system for measurement in their experiments. The metric system is the standard system of measurement in science. This module describes the history and basic operation of the metric system, as well as scientific notation. The module explains how the simplicity of the metric system stems from



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having only one base unit for each type of quantity measured (length, volume, and mass) along with a range of prefixes that indicate multiples of ten. This module will also serve as an introduction to the fields of biological sciences and the nature of science. Students will become familiar with the tools and techniques of scientific inquiry. This unit will also serve as an introduction to laboratory rules and procedures.

Module 2 Natural Resources and Energy: In this unit, students focus on renewable and nonrenewable resources. They will study how people use resources for energy. In addition, they examine the engineering design behind new technologies that protect the environment. Students will identify ways in which they can impact the environment in both positive and negative terms. Students will become stewards for the environment through promoting alternative energy use.

Module 3 Intro to Chemistry: Tracking the development of our understanding of the atomic structure of matter, this module begins with the contributions of ancient Greeks, who proposed that matter is made up of small particles. The module then describes how the modern periodic table is based on Dmitri Mendeleev's 1896 observations that chemical elements can be grouped according to chemical properties they exhibit. This module explains the arrangement of elements in the periodic table. It defines periods and groups and describes how various electron configurations affect the properties of the atom. This module also introduces the properties of water, the pH scale and biological molecules.

Module 4 Minerals and Rocks: The study of minerals provides a window into the history of Earth and other planets in our solar system. Earth's materials are in constant flux. Some processes that shape the Earth happen quickly; others take millions of years. This module describes mineral classification by properties and chemical composition, the rock cycle, and rock identification. This module also describes the relationship between uniformitarianism, the rock cycle, and plate tectonics is explored in general and through the specific examples of mountain range formations.

Module 5 Plate Tectonics: The theory of continental drift was the first step toward plate tectonic theory, which became the foundation upon which modern geology is built. This module describes how the work of Alfred Wegener, Harry Hess, and others led to our understanding of plate tectonics. It explains plate tectonics as the driving force behind ongoing changes on Earth. This module also looks at the nature of tectonic plates and discusses the different boundary types that exist between them – convergent, divergent, and transform. Forces that drive the push and pull of these land masses are explored.

Module 6 Fossil Record: Earth is a dynamic system, constantly changing. This change is sometimes explosive and sudden, but more often it is like the Colorado carving the Grand Canyon – slow and steady. The purpose of this module is to learn that Earth's 4.5 billion-year history is slow and steady. It is a lesson that teaches us that given enough time, we can see considerable changes not only in geology but in the life forms that have existed. This module covers the geologic time scale, relative and radioactive dating, and the fossil record.



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Module 7 The Atmosphere and Weather: Earth's atmosphere contains many components that can be measured in different ways. This module describes these different components and shows how temperature and pressure change with altitude. Weather and climate are compared. Although weather can change every day, climate is the average of daily weather conditions over decades. This module presents factors that influence climate around the world, such as the shape, tilt, and orbit of Earth.

Module 8 Ecology: This module introduces animal ecology, the study of organisms and their relationship to the environment. We'll explore the concept of a species' ecological niche, which includes living and nonliving things that a species needs to survive. Sometimes this helps other species; other times it's detrimental. Students will also gain an understanding of the importance of biodiversity and how it impacts our ecosystems.

Module 9 Characteristics of Life: All living things share a set of unique characteristics and processes that define life. While reviewing basic laboratory and microscopy techniques, students will explore the similarity and differences between cell types. Deeply investigating different domains and kingdoms of life allows for an introduction to the history of life on Earth, common ancestry, and evolution, which are key concepts spiraled throughout the remainder of the course.

Module 10 Cells: Cells are the basic structural and functional unit of life. This module traces the discovery of the cell in the 1600s and the development of modern cell theory. This module looks at similarities and differences between different types of cells and the relationship between cell structure and function. The Theory of Universal Common Descent is presented along with evidence that all living things on Earth descended from a common ancestor. This module also explains the theory of endosymbiosis along with its origins. Convincing evidence in support of the theory is presented. The evolution of the nucleus and other organelles through invagination of the cell membrane is also discussed.

Module 11 Taxonomy/ Organisms: Modern taxonomy officially began in 1758 with *Systema Naturae*, the classic work by Carolus Linnaeus. This module species taxonomy, focuses on Linnaeus' system for classifying and naming plants and animals. This module outlines rules of forming two-term taxonomic names according to genus and species. Students will complete research on an organism that they select and present their work in their own selected format.

Module 12 Genetics: This module will introduce the field of genetics to students while allowing them to discover its many applications in our lives. Knowledge of Mendelian genetics and modern genetics will allow students to better know and appreciate the area of biology that has the greatest positive impact on our daily lives. This module will also discuss the discovery, structure, and function of DNA. Key experiments are discussed that have furthered our understanding of genetics.