

NORTH CAROLINA STANDARD COURSE OF STUDY K-12 Science, Earth and Environmental Science

The North Carolina 2023 K-12 Science Standards are intended to foster conceptual understanding and help develop scientifically literate students. The standards provide foundational knowledge and practices within each grade band and course. The standards are organized within 11 strands which articulate vertical alignment. As students progress from one grade to the next, the depth of knowledge and level of sophistication increases.

Engaging in science encourages students' curiosity, interests, and prepares them for the broadest range of postsecondary opportunities, be it college, career, or military service. The 2023 K-12 Science Standards are designed to allow students to become active participants in science - building their understanding of the natural world through observations and investigations.

The scientific method provides a common framework for introducing the traditional experimental design and hypothesis-testing process. The methodologies or approaches utilized by scientists can vary depending on the nature of their research questions and available tools. Steps that all scientists follow when conducting scientific investigations usually involve asking questions, the collection and analysis of relevant data, the use of logical reasoning, opportunities to communicate and collaborate with others, and the development of explanations.

The Science and Engineering Practices (SEP) are embedded in the standards to support a greater emphasis on how students develop science knowledge and the durable skills within the NC Portrait of a Graduate. While one practice is identified in each objective, teachers should utilize other practices to support students' progress towards mastering the standards.

The North Carolina Science Standards maintain the respect for local control of each Public School Unit (PSU). These standards and objectives are not intended to be the curriculum, nor do they indicate the whole of a curriculum which will be written by a PSU or school. The K-12 Science Standard Course of Study has been developed to serve as the framework for a well-planned science curriculum which provides opportunities for investigations, experimentation, and technological design.

Earth and Environmental Science	
Strand: Earth's Place in the Universe	
Standard	Objectives
ESS.EES.1 Explain how Earth's position relative to the sun influences conditions on Earth.	ESS.EES.1.1 Use models to illustrate the formation of the solar system.
	ESS.EES.1.2 Use mathematics and computational thinking to analyze Earth's motion through space.
	ESS.EES.1.3 Use models to illustrate how the sun produces energy.
	ESS.EES.1.4 Construct an explanation to infer how incoming solar radiation interacts with Earth systems to support life.
Strand: Earth's Systems	
Standard	Objectives
ESS.EES.2 Analyze how the geosphere is shaped by plate tectonics and the rock cycle.	ESS.EES.2.1 Use models to explain how mantle convection powers plate tectonics.
	ESS.EES.2.2 Analyze and interpret data to predict locations of volcanoes and earthquakes based on plate boundaries.
	ESS.EES.2.3 Use models to explain how plate tectonics influence topography.
	ESS.EES.2.4 Carry out investigations to explain how the rock cycle and rates of weathering, erosion, and soil formation influence Earth's systems.
	ESS.EES.2.5 Analyze and interpret data to explain how volcanic activity influences changes in Earth's atmosphere, geosphere, biosphere, and hydrosphere.
Standard	Objectives
ESS.EES.3 Analyze how the interactions between the hydrosphere and atmosphere transfer energy and influence climate.	ESS.EES.3.1 Carry out investigations to explain the properties of water.
	ESS.EES.3.2 Use models to explain how water is an agent of energy transfer.
	ESS.EES.3.3 Analyze and interpret data to explain how major greenhouse gases influence climate.
	ESS.EES.3.4 Analyze and interpret data to attribute how atmospheric composition and surface conditions influence heat retention in the troposphere.
	ESS.EES.3.5 Construct an explanation to conclude that heat exchange between the ocean and atmosphere results in local, regional, global weather phenomena, and climate patterns.

Standard	Objectives
ESS.EES.4 Analyze the connections between the biosphere and other Earth systems (geosphere, hydrosphere, atmosphere).	ESS.EES.4.1 Use models to explain how abiotic/biotic interactions shape various ecosystems.
	ESS.EES.4.2 Analyze and interpret data to explain how carbon cycling influences various ecosystems.
	ESS.EES.4.3 Analyze and interpret data to explain past climate trends.
	ESS.EES.4.4 Construct an explanation to predict how potential future changes in abiotic factors could impact biodiversity and species distribution.
	ESS.EES.4.5 Obtain, evaluate and communicate information to explain how biodiversity impacts ecosystem resilience.

Strand: Earth and Human Activity	
Standard	Objectives
ESS.EES.5 Evaluate how human consumption patterns impact Earth's systems.	ESS.EES.5.1 Analyze and interpret data to explain the impacts of land use on Earth's systems.
	ESS.EES.5.2 Analyze and interpret data to evaluate how human use of ground and surface waters impacts water quality and availability in river basins, wetlands, estuaries, and aquifers.
	ESS.EES.5.3 Construct an argument to evaluate the ways that human activities influence atmospheric composition.
	ESS.EES.5.4 Construct an argument to evaluate the benefits and trade-offs of using non-renewable or renewable energy sources for electricity production and transportation fuels.
	ESS.EES.5.5 Construct an argument to evaluate potential solutions that will ensure sustainable consumption of Earth's resources.
	ESS.EES.5.6 Construct an argument to evaluate a range of solutions to mitigate impacts of human activities on Earth's systems.

Standard	Objectives
<i>ESS.EES.6 Analyze how Earth's systems impact humans and the biosphere.</i>	ESS.EES.6.1 Analyze and interpret data to infer how use of natural resources impacts ecosystems and human populations, including human health.
	ESS.EES.6.2 Construct an argument to infer how some natural hazards (such as flooding and wildfires) are increasing in frequency and intensity due to human activities.
	ESS.EES.6.3 Construct an argument to explain how natural hazards and other environmental problems may impact some human populations more than others.

