

## SIXTH GRADE: OVERVIEW

The academic standards for sixth grade establish the content knowledge and skills for Tennessee students necessary to prepare them for the rigorous levels of higher education and future job markets. The course provides students with a wealth of scientific practical experiences. The academic standards for science in sixth grade are based on research and the National Research Council's *Framework for K-12 Science Education*.

The academic standards herein establish the core content and practices of science and engineering, as well as what Tennessee students need to know by the end of sixth grade. Disciplinary core ideas for sixth grade include:

| Sixth Grade                                                           |                                                    |                                |                                                            |
|-----------------------------------------------------------------------|----------------------------------------------------|--------------------------------|------------------------------------------------------------|
| Physical Sciences (PS)                                                | Life Sciences (LS)                                 | Earth and Space Sciences (ESS) | Engineering, Technology, and Applications of Science (ETS) |
| Matter and Its Interactions                                           | From Molecules to Organisms: Structure and Process | Earth's Place in the Universe  | Engineering Design                                         |
| Motion and Stability: Forces and Interactions                         | Ecosystems: Interactions, Energy, and Dynamics     | Earth's Systems                | Links Among Engineering, Technology, Science, and Society  |
| Energy                                                                | Heredity: Inheritance and Variation of Traits      | Earth and Human Activity       | Applications of Science                                    |
| Waves and Their Applications in Technologies for Information Transfer | Biological Change: Unity and Diversity             |                                |                                                            |

The standards incorporated into this grade have been streamlined for the students' K-12 coherent experience for a diversity of learners. A foundational standard introducing the crosscutting concept of systems serves as an anchor point for exploration of the theme of energy as well as essential components that are presented in seventh and eighth grades. The sixth grade standards focus on how energy, found in multiple systems and scales, drives ecosystems (populations, food chains/webs), Earth's natural resources, and Earth processes (oceans, weather, and climate). In turn, oceans, weather, and climate help determine characteristics of ecosystems. A focus on science literacy is placed through

the use of the science and engineering practices. Students are required to gather information from reliable sources to construct evidenced-based arguments (e.g., 6.LS2.3). Finally, STEM integration is supported as a stand-alone disciplinary core idea.

By the end of sixth grade, it is expected that students should be able to demonstrate the skills and content knowledge emphasized in the following standards in preparation for future learning in science and its practice.

## SIXTH GRADE: ACADEMIC STANDARDS

### **6.PS3: Energy**

- 1) Analyze the sources of energy in a system to gather evidence supporting that energy is conserved during transfers of kinetic, potential (elastic, gravitational, and chemical), and/or thermal energy.
- 2) Use a model to gather evidence to support changes to a system can be caused by transfers of sound or thermal energy (i.e., conduction, convection, or radiation).

### **6.LS2: Ecosystems: Interactions, Energy, and Dynamics**

- 1) Use data to evaluate and communicate the impact of environmental variables, both living and nonliving (e.g., food, water, oxygen, and other resources), on population size within a system.
- 2) Construct an explanation that predicts patterns of competitive, symbiotic, and predatory interactions among organisms across ecosystems.
- 3) Use a model to construct an explanation about the transfer of energy through a food web and energy pyramid in an ecosystem.
- 4) Construct an explanation that uses abiotic (e.g., precipitation, temperature, soil) and biotic (e.g., biodiversity, number of organisms) patterns in earth's terrestrial and aquatic ecosystems (e.g., tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater) as measures of ecosystem health.
- 5) Analyze existing evidence about the effect of a specific invasive species on native populations in Tennessee and design a solution to mitigate its impact.

### **6.LS4: Biological Change: Unity and Diversity**

- 1) Explain how changes to biodiversity in a system would impact human resources (e.g., food, medicine, and clean water) and "ecosystem services" (e.g., climate stabilization, decomposition of waste, and pollination).

### **6.ESS2: Earth's Systems**

- 1) Diagram oceanic and atmospheric convection patterns in a system that flow due to uneven heating of the earth.

- 2) Gather evidence to justify that oceanic convection currents in a system are caused by the sun's transfer of thermal energy and differences in salinity leading to global water movement.
- 3) Construct an explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer.
- 4) Develop and use a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- 5) Analyze and interpret data to determine the impact of humans and other organisms on the water cycle, landforms (e.g., rain shadow effect) and atmospheric systems.
- 6) Develop a model to explain the role of greenhouse gases in regulating the Earth's average surface temperature and keeping it habitable.
- 7) Collect data to provide evidence for how the interactions of air masses result in changes in local weather conditions and how that data can be used to predict probable local weather patterns.

## **6.ESS3: Earth and Human Activity**

- 1) Use data to explain the consumption and sustainability of natural resources (non-renewable and renewable) and the resulting impact on Earth's system.
- 2) Investigate and compare existing and developing technologies that utilize renewable and alternative energy resources.
- 3) Obtain, evaluate, and communicate information about the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction.

## **6.ETS1: Engineering Design**

- 1) Design, evaluate, and improve a possible solution for maintaining biodiversity of ecosystems.
- 2) Design, construct, and test a device that either minimizes or maximizes thermal energy transfer by combining solutions or parts of solutions to solve a problem that can be communicated and explained to others.