Science Georgia Standards of Excellence

SCIENCE - Ecology

The Science Georgia Standards of Excellence are designed to provide foundational knowledge and skills for all students to develop proficiency in science. The Project 2061's *Benchmarks for Science Literacy* and the follow up work, *A Framework for K-12 Science Education* were used as the core of the standards to determine appropriate content and process skills for students. The Science Georgia Standards of Excellence focus on a limited number of core disciplinary ideas and crosscutting concepts which build from Kindergarten to high school. The standards are written with the core knowledge to be mastered integrated with the science and engineering practices needed to engage in scientific inquiry and engineering design. Crosscutting concepts are used to make connections across different science disciplines.

The Science Georgia Standards of Excellence drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. The standards are a required minimum set of expectations that show proficiency in science. However, instruction can extend beyond these minimum expectations to meet student needs.

Science consists of a way of thinking and investigating, as well a growing body of knowledge about the natural world. To become literate in science, students need to possess sufficient understanding of fundamental science content knowledge, the ability to engage in the science and engineering practices, and to use scientific and technological information correctly. Technology should be infused into the curriculum and the safety of the student should always be foremost in instruction.

Ecology is the study of the distribution and abundance of life and interactions between and among organisms and their environment, including the impact of human activities on the natural world. It draws on elements from biology, chemistry, physics, mathematics, and the social sciences. This curriculum is lab and field based. Whenever possible careers related to ecology and relevant case studies should be emphasized.

SCIENCE - Ecology

SEC1. Obtain, evaluate, and communicate information on how biotic and abiotic factors interact to influence the distribution of species and the diversity of life on Earth.

a. Develop a model describing the organizational structure of a habitat within an ecosystem.
(*Clarification statement:* Includes biotic and abiotic factors and the organizational structure; organism, population, community, ecosystems.)
b. Ask questions to predict the cause and effect of varying levels of abiotic and biotic factors on a habitat in Georgia.
(*Clarification statement:* Focus on specific habitat types, not biomes.)
c. Construct an argument based on evidence to explain factors that lead to sustainability of biodiversity in an ecosystem.

SEC2. Obtain, evaluate, and communicate information to analyze factors influencing population growth, density, and dispersion.

a. Construct an explanation of factors that regulate population density and growth within communities.
(*Clarification statement*: This includes both density dependent and density independent limiting factors and their relationship to carrying capacity.)
b. Develop and use models to predict population dispersion as a result of population growth and resource availability.
c. Construct an explanation to describe how population growth and dispersion are influenced by natural selection.
(*Clarification statement:* This includes reproductive strategies, adaptations, and competition for resources.)

SEC3. Obtain, evaluate, and communicate information to construct explanations of community interactions.

a. Construct an argument based on evidence to support how species interactions (e.g., predation, parasitism, mutualism, commensalism, and competition) and adaptations are a response to selective pressures.
b. Obtain, evaluate, and communicate information about various ecological niches within habitats and determine how interactions between species lead to resource partitioning.
c. Construct an explanation based on evidence that describes the impact of keystone, invasive, native, indicator, and rare species in Georgia ecosystems.
d. Construct an explanation about species diversity and how it relates to the stability of ecosystems and communities.
e. Develop a model to explain ecological succession in terms of changes in communities over time and the impact of disturbance on community composition.

SEC4. Obtain, evaluate, and communicate information about biogeochemical cycles and how the flow of energy influences ecosystems.

a. Plan and carry out an investigation of the movement of nitrogen and phosphorus through an ecosystem as a limiting factor in plant communities related to aquatic system succession. (*Clarification statement*: Field experience or scientific research study should be included.)
b. Construct an explanation of the movement of carbon through an ecosystem. (*Clarification statement:* Focus is on ecological processes in terrestrial and aquatic ecosystems, not on anthropogenic influences.)
c. Develop a model utilizing the first and second laws of thermodynamics and the law of conservation of matter to explain and illustrate the flow of energy and matter in ecosystems.
d. Construct an argument based on evidence to explain the relationship between net primary productivity and biodiversity.

SEC5. Obtain, evaluate, and communicate information on the impact of natural and anthropogenic activities on ecological systems.

a. Analyze and interpret data on the ecological impacts of sustainable and non-sustainable use of natural resources and predict the cause and effect of unsustainable use of natural resources on ecosystems.
b. Construct an argument based on evidence to predict the impact of climate change on an ecosystem.
c. Construct an argument based on evidence of the consequences of habitat fragmentation and habitat loss on biodiversity in relation to island biogeography.
d. Obtain, evaluate, and communicate mitigation strategies to reduce the impacts of non-sustainable activities on Georgia ecosystems.