

# VDOE SCIENCE UPDATE

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# AGENDA

- Welcome
- Overview of the 2018 Science *Standards of Learning*
- Review of Proposed Standards for 2025 Science *Standards of Learning*
- Environmental Literacy in the Science *Standards of Learning*
- Questions



# OVERVIEW OF THE 2018 SCIENCE *STANDARDS OF LEARNING*

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## Science Standards of Learning

for  
Virginia  
Public Schools



Board of Education  
Commonwealth of Virginia

October 2018

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**Adopted: October 2018**

**Fully Implemented: 2022-2023**

Highlights of the 2018 Science *Standards of Learning* and Curriculum Frameworks

- Use of themes in K-6 to support elementary teachers in providing cohesion between science concepts within a grade level
- Scientific and Engineering Practices (SEP) are reflected in the first standard at each grade level/course and in the Essential Knowledge and Practices section of the curriculum frameworks
- Increased vertical alignment of science concepts and SEPs to support student conceptual understanding
- Explicit integration of the 5C's

# THE 2025 SCIENCE *STANDARDS OF LEARNING*

## **VDOE will conduct a review of the 2018 Science Standards as mandated by Virginia Code.**

- The process will retain the concepts and SEPs in the 2018 Standards.
- Technical edits to the format will be made to increase clarity and specificity of the 2018 Standards.
- Clarity will include the "what" and the "how" of the Standards will be experienced by students for better implementation of intended rigor of the Standard.

## **Why not a revision?**

- Due to the delayed implementation of the 2018 Science Standards, teachers have not had the time needed to implement the 2018 Science Standards with fidelity.
- Testing of the 2018 Science Standards began in May 2023. More data is needed to inform revisions to the 2018 Standards.
- Time is needed to allow teachers and students to meet the rigorous expectations of the 2018 Science Standards and Essential Knowledge and Practices.

# NEW STANDARDS FOR BOE-APPROVED COURSES

## Rationale for New Standards

- Eleven BOE-approved courses, which can currently be used to meet science graduation requirements, do not have BOE-approved standards.
- Proposed 2025 Standards for these 11 courses will support teachers in what is to be taught and to ensure rigorous expectations across the state in these courses.

## Courses Include

- Environmental Science
- Biology II courses
  - Anatomy and Physiology
  - Ecology
  - Genetics
  - Advanced Survey of Biology Topics
- Earth Science II courses
  - Astronomy
  - Geology
  - Oceanography
  - Advanced Survey of Earth Science Topics
- Chemistry II: Advanced Survey of Chemistry Topics
- Physics II: Advanced Survey of Physics Topics

# STANDARDS DEVELOPMENT AND REVIEW PROCESS

## **New Standards for BOE-approved Courses**

- Feedback collected on content guidelines over 5 years.
- Committees of educators with content expertise were selected to develop standards (Summer 2023).
- Committee had balanced regional representation.
- Draft standards shared with science instructional leaders for feedback.
- Draft Proposed 2025 Science *Standards of Learning* prepared for first board review 10/2024.

## **Review of Existing 2018 *Standards of Learning* (Through Physics)**

- Feedback collected on standards since implementation.
- Committees of educators with content expertise were selected to review standards and update to new format (summer 2024).
- Committee has balanced regional representation.
- Proposed Draft 2025 Science *Standards of Learning* prepared for first board review 10/2024.

# CHANGES IN FORMAT

## 2018 Science Standard

6.9 The student will investigate and understand that humans impact the environment and individuals can influence public policy decisions related to energy and the environment. Key ideas include

- a) natural resources are important to protect and maintain;
- b) renewable and nonrenewable resources can be managed;
- c) major health and safety issues are associated with air and water quality;
- d) major health and safety issues are related to different forms of energy;
- e) preventive measures can protect land-use and reduce environmental hazards; and
- f) there are cost/benefit tradeoffs in conservation policies.

## Draft Proposed 2025 Science Standard

6.9 The student will investigate and understand that humans impact the environment and individuals can influence public policy decisions related to energy and the environment.

*Demonstration of the essential knowledge and practices includes:*

- a) Make, support, and evaluate a claim on the importance of protecting and maintaining natural resources given increases in human population and per-capita consumption of natural resources over time.
- b) Analyze the advantages and disadvantages of implementing more sustainable practices within the home, school, and community.
- c) Identify a problem with water and air pollution that affects human health and safety and propose a solution.
- d) Compare the advantages and disadvantages (e.g., economic, environmental, human health) of different energy sources (e.g., wind, solar, fossil fuels, nuclear, hydroelectric, geothermal).
- e) Make, support, and evaluate a claim about how increases in human population and per-capita consumption of natural resources affect Earth's systems (e.g., climate, oceans, rainforest).
- f) Make, support, and evaluate a claim about how personal choices in everyday activities have costs and benefits related to the management of waste and resource use.
- g) Analyze the costs and benefits of a conservation policy or issue.



# ENVIRONMENTAL LITERACY IN THE SCIENCE STANDARDS

- Environmental and sustainable resources concept development begins in kindergarten as students learn about how to reduce, reuse, and recycle. The concept expectations expand through elementary and middle school to include the exploration of environmental concepts such as climate change and sea level rise as well as a study of current environmental policy and opportunities for stewardship.
- Students in high school have the opportunity to explore these issues further through courses such as Biology, Earth Science, Environmental Science, and Biology II: Ecology.
- Environmental and sustainable resource concepts coupled with educational experiences that utilize scientific and engineering practices (SEP) provide students with the content and skills needed to make informed decisions as adults.



# ADDITIONAL STANDARDS THAT SUPPORT ENVIRONMENTAL LITERACY (2025 DRAFT)

4.8 The student will investigate and understand that Virginia has important natural resources.

*Demonstration of the essential knowledge and practices include:*

- a) Describe characteristics of Virginia’s waterways (e.g, rivers, bays, lakes, Atlantic Ocean), name an example of each, and discuss the importance of the waterways to Virginia.
- b) Develop and use a model of a watershed to explain the relationship between water and land. *Students are not expected to identify all the major watersheds in Virginia. They should be able to identify the watershed in which they live.*
- c) Support and evaluate the statement, “We all live downstream.”
- d) Plan and conduct an investigation to demonstrate ways that water is replenished to support the health of the watershed.
- e) Identify practical applications and uses of Virginia natural resources (plants, animals, forests, minerals, ores, and rocks). *Students are not expected to know specific minerals and do not need to differentiate among minerals, ores, and rocks.*
- f) Investigate the school yard or local ecosystem to identify questions, problems, or issues that affect a natural resource in that area, determine a possible solution to an identified problem, and implement the solution.**

# ADDITIONAL STANDARDS THAT SUPPORT ENVIRONMENTAL LITERACY (2025 DRAFT)

6.8 The student will investigate and understand that land and water have roles in watershed systems.

*Demonstration of the essential knowledge and practices includes:*

- a) Develop and use a model to describe the major components (land, tributaries, and divides) of watershed systems in Virginia. *Students are not expected to know the names of specific rivers and streams in a watershed.*
- b) Make, support, and evaluate a claim about the significance of the functions of wetlands and estuaries, especially the Chesapeake Bay, including their importance to humans.**
- c) Explain the relationships between abiotic and biotic features in the students' local watershed.
- d) Make, support, and evaluate a claim about how natural processes and human activities affect the health of a watershed system (e.g., water quality, biodiversity, runoff, erosion).**

# ADDITIONAL STANDARDS THAT SUPPORT ENVIRONMENTAL LITERACY (2025 DRAFT)

LS.8 The student will investigate and understand that organisms, populations, communities, and ecosystems are dynamic and change over time due to both natural events and human activity.

*Demonstration of the essential knowledge and practices includes:*

- a) Explain ecological organization of organisms (organism, population, community, and ecosystem) and the benefit(s) of daily, seasonal, and/or long-term responses (phototropism, geotropism, migration, dormancy, and circadian rhythm) to their survival. *Students are not expected to know the terms torpor and estivation.*
- b) Predict the effect of changes of biotic and/or abiotic factors on the size and distribution of populations in an ecosystem (e.g., availability of resources, habitat destruction, disease, overharvesting).
- c) **Predict the short-term and long-term environmental effects of naturally occurring events and human activity on organisms in an ecosystem (e.g., eutrophication, wildfires, floods, tornados, climate change, ocean acidification, sea-level rise, pollution).**
- d) **Describe the impact of human activity (e.g. actions that influence climate, water supply, air quality, and include energy production, ocean acidification, waste management, invasive species) on the biotic and abiotic factors within an ecosystem.**
- e) Debate the advantages and disadvantages of human land use vs. habitat and ecosystem stability.
- f) Predict the impact of population disturbances on species competition and species survival.

# ADDITIONAL STANDARDS THAT SUPPORT ENVIRONMENTAL LITERACY (2025 DRAFT)

BIO.8 The student will investigate and understand that complex interactions affect populations, communities, and ecosystems.

*Demonstration of the essential knowledge and practices include:*

- a) Make, support, and evaluate a claim about how biotic and abiotic factors affect carrying capacity.
- b) Predict changes that could occur in population size as the result of population interactions (e.g., predation, competition, disease).
- c) Develop and use models (food chain, food web, energy pyramid, and biomass pyramid) to explain the flow of energy through trophic levels.
- d) Develop and use models to support claims that matter (water, carbon, and nitrogen) cycles among organisms in an ecosystem.
- e) Make, support, and evaluate a claim about how complex interactions in ecosystems maintain relatively consistent biodiversity in stable conditions but changing conditions may result in succession.
- f) Describe the cause-and-effect relationship between changes in the abiotic and biotic conditions in an ecosystem and succession.
- g) Describe the patterns of succession found in aquatic and terrestrial ecosystems of Virginia.
- h) Make, support, and evaluate a claim about how habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change can disrupt an ecosystem and threaten the survival of species.**
- i) Design, evaluate, and refine a solution for reducing the negative effects of human activity on a Virginia watershed or ecosystem.**

# ADDITIONAL STANDARDS THAT SUPPORT ENVIRONMENTAL LITERACY (2025 DRAFT)

ENV.9 The student will investigate and understand that their actions as an environmentally literate citizen will play a role in environmental policies.

*Demonstration of the essential knowledge and practices includes:*

- a) Analyze how consumer choices in Virginia impact the environment.
- b) Compare the priorities (e.g., political, legal, social, economic, industrial) of multiple stakeholders involved in an environmental issue that affects global and/or local ecosystem health.**
- c) Debate the advantages and disadvantages of possible solutions to an environmental problem.
- d) Propose a solution that reduces impacts of human activities on natural systems.

# QUESTIONS

Send questions for the science team  
to [vdoe.science@doe.virginia.gov](mailto:vdoe.science@doe.virginia.gov)