

# Position Statement - Earth Sciences Education for Each K-12 Grade Band

*This statement was formerly known as the Position Statement on High School Earth Science Instruction, which was adopted in 2012. Revised in May 2023.*

## Position Statement:

NAGT affirms the critical need for a society literate in the Earth sciences to address challenges of energy and natural resources stewardship, natural hazards preparedness and mitigation, environmental impacts of human activities (including climate change), and environmental justice and equity. In alignment with the National Research Council's *K-12 Framework for Science Education*, Earth sciences is an essential component of non-optional science curricula, and it should make up an equivalent percentage of the science content at each grade level. ***Earth sciences should be taught as required content in every K-12 grade band.***

## Rationale:

Some of the greatest challenges facing society today are grounded in the Earth sciences. Students should know that the water we drink, food we eat, resources we consume, technology we use, and the buildings in which we live, work, and attend school are all the products of geologic processes. The decisions we make in our daily lives affect the ground, water, air, and other life on Earth. An Earth literate society is necessary to address energy concerns, natural resources stewardship, climate change mitigation and adaptation, natural hazards preparedness, and matters related to environmental justice. Earth sciences education includes but is not limited to the disciplines of geology, soil science or agronomy, oceanography or marine sciences, meteorology or atmospheric science, astronomy or space sciences, or Earth systems science. Earth sciences give students the ability to investigate, understand, and pose solutions to essential challenges. For this reason, the Next Generation Science Standards (NGSS Lead States, 2013) and state standards based on the *K-12 Framework for Science Education* position Earth sciences equally with physical sciences and life sciences at all levels of the curriculum.

Prior interaction, association, and knowledge about geology or the Earth and its systems are unique for each student. Although many K-12 students have no direct experience with earthquakes or volcanoes, they do engage with geologic events such as erosion and deposition, rainfall infiltration and runoff, and so on. Students should be aware that the natural environment around them is formed by Earth processes that influence their lives. Lack of exposure and instruction leads to common misconceptions of how the Earth works, causing students to dismiss the Earth systems that surround and impact their lives. Teachers can use geoscientific phenomena to help students make sense of key concepts and processes in any science discipline and help students enrich their worldview with perspectives about their interconnectivity with Earth and its systems.

Earth sciences education connects ideas and phenomena that are inherently engaging to students. Earth systems science applies physics, chemistry, and biology to explain the natural world around us. Earth sciences concepts help students become better citizens, voters, and problem solvers. Earth sciences skills are life skills which offer students the opportunity to work for a range of organizations and industries, including resource extraction and conservation, construction, environment, communication, governance, and education, and at the local, state, and national levels. The role of Earth sciences in meeting society's needs is vital.

## Recommendations:

- Earth and Space Sciences (ESS) concepts should be taught in all K-12 grade bands.
- ESS curriculum should be based on the *K-12 Framework for Science Education* (NRC, 2012).
  - In high school, ESS should comprise one full year equivalent of science content.
  - In blended courses, ESS should comprise  $\frac{1}{3}$  of the course content.
  - In every science course at each grade level, place-based Earth sciences phenomena should be integrated into the curriculum.
- The College Board should develop an Advanced Placement Earth Sciences course in addition to the AP Environmental Sciences course already offered.
- High school dual-enrollment ESS courses should be offered in partnership with local colleges and universities.
- Local businesses and non-profit organizations should support ESS career exploration and workforce development for high school students through internships, externships, and other place-based learning opportunities.
- State departments of education, school districts, and local administrators should support teachers who seek further Earth sciences content knowledge through professional development such as: continuing education credits, graduate coursework, microcredentials, or other accredited certifications.
- Teachers of all science disciplines should be encouraged to broaden their knowledge of Earth sciences pedagogy, including but not limited to: phenomena-based instruction, 3-dimensional storylines, place-based learning opportunities, and real world or virtual field experiences.
- University faculty and professional organization members should facilitate further collaboration between K-12 educators and geoscience education researchers to improve classroom practice and student learning.
- K-12 school districts, local colleges, museums, and other regional non-profit or for-profit Earth sciences partners should partner to develop local ESS educational ecosystems.

## Summary:

Earth sciences should be taught as required content in every K-12 grade band. Earth sciences education gives students the ability to investigate, understand, and pose solutions to critical societal challenges. Science teachers should be encouraged and supported when seeking Earth sciences professional development or opportunities to include Earth sciences content in their own disciplinary curricula.

## References:

National Research Council (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, D.C.: The National Academies Press. <https://doi.org/10.17226/13165>

NGSS Lead States (2013). *Next Generation Science Standards: For States, By States*. Washington, D.C.: The National Academies Press. <https://www.nextgenscience.org/standards/standards>

**NAGT's Commitment:** In support of high-quality Earth Sciences education, NAGT has and will continue to sponsor professional development programs for geoscience educators, including workshops, seminars, and teacher-scientist collaborations. NAGT disseminates evidence-based practices in the *Journal of Geoscience Education*, in *In the Trenches*, and on the Teach the Earth website. In doing so, the organization supports a diverse, inclusive, and thriving community of educators and education researchers to improve teaching and learning about the Earth.