

Declaration of the Importance of Earth Systems Science Education

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Position Paper

Subjects

Groundwater, education, geoscience

Audience

Educators, public officials, students, groundwater professionals

Declaration

The National Ground Water Association joins other geoscience organizations, the state-based national alliance, and federal agencies in recognizing that a science-literate citizenry is vital to the nation's well-being and security. To address future environmental and resources challenges, including complex water resources evaluation and sustainability issues, requires a better understanding of the interrelationships between Earth systems' processes. NGWA endorses adoption of National Science Education Standards by all public and private school systems. Such standards, developed by the National Academies, integrate the cross-disciplinary earth science expertise necessary to apply this knowledge for the betterment of the environment and society.

Earth systems science education—a national revolution

A national revolution began in 2001 to reform earth and space science education. Results from national conferences identified the critical importance of Earth systems science and outlined a blueprint for change.¹ Scientific advances and technological developments over the last 50 years revolutionized our understanding of the Earth and its systems and also emphasize the necessity of earth science education at national and global scales. Earth science education integrates and synthesizes the disciplines of physics, biology, chemistry, geology, hydrology, oceanography, meteorology, and all other sciences that study life, Earth, and space. While many state curricula include earth science topics, many lack earth science as important subject matter. The U.S. Geological Survey and the National Oceanic and Atmospheric Administration recognize that earth science education needs to be as "dynamic as Earth itself."² Because the Earth represents endless interconnected and dynamic systems exhibiting intricate behaviors on space and time scales relevant to society, a broad understanding of the linkages between Earth systems' processes is needed. The challenge is to bring together a diverse range of interrelated scientific disciplines. Through Earth systems science education, students learn to understand Earth's complexity. Moreover, science-educated youth appreciate the significance of wise utilization of the Earth's resources. Earth science education promises to play an ever-expanding role in meeting society's needs. Essentially, Earth systems science education constitutes a core element of students' curriculum.



Phone/ Toll-free 800 551.7379/ 614 898.7791 Fax/ 614 898.7786
Web/ www.ngwa.org and www.wellowner.org
Address/ 601 Dempsey Road/ Westerville, Ohio 43081-8978 U.S.A

Earth systems science education initiatives

Escalated efforts are needed to elevate earth science education awareness across all avenues of society. Effective implementation necessitates:

- Uniting geoscience organizations in their support of Earth systems science education
- Supporting the national science education reform and National Science Education Standards
- Promoting Earth systems science education through National Ground Water Awareness Week, Earth Science Week, and other science education events
- Providing examples of applied Earth systems science to organizations that develop educational training materials and resources
- Providing opportunities for engaging students and others in interactive learning by creating “outdoor” classrooms with hands-on activities
- Promoting Earth systems science education at all levels, including the necessary collection of data to better understand the complexity of all Earth systems, including the hydrologic system, and implement actions necessary to address future challenges.

Other supporters and resources

Other organizations demonstrating their support of Earth systems science education efforts include:

- American Geological Institute’s development of the brochure *Why Earth Science?* to communicate how earth science benefits society
- Geological Society of America’s policy statement on *The Importance of Teaching Earth Science in Schools*
- Groundwater Resources Association of California, an NGWA Associated State Society.

An important educational information resource is the *Digital Library for Earth System Education*. DLESE, formed in 2000 in response to National Science Foundation initiatives, is a distributed community effort involving educators, students, and scientists working together to improve the quality, quantity, and efficiency of teaching and learning about the Earth system at all levels.

The National Aeronautics and Space Administration is recognized for its instrumental role in space exploration and science education. NASA developed the Education Enterprise Strategy in 2003 to unify aeronautics, biological, and physical research, earth science, exploration systems, space flight, and space science. This strategy discusses “expanding knowledge of how people learn, and the communitywide interest in revolutionizing earth and space science education” . . . and builds on the “accomplishments that the earth Science Enterprise (ESE) has made over the last decade in studying Earth as a system.” NASA created the “Earth Science Education Plan, Inspire the Next Generation of Earth Explorers” (Office of Earth Science, June 1, 2004, NASA Headquarters, Washington, D.C., earth.nasa.gov) that embodies “comprehensive, practicable plans for inspiring our children; providing educators with the tools they need to teach science, technology, engineering, and mathematics (STEM); and improving our citizens’ scientific literacy.” NASA’s ESE Education Program extends its accomplishments in Earth system science and the development of remote sensing and geospatial technologies in support of national priorities for STEM education.

Footnotes

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² NOAA/USGS: A Statement on the Importance of Earth and Space Science Education.

Contact

Cliff Treyens

NGWA Public Awareness

601 Dempsey Rd.

Westerville, OH 43081-8978

614 898.7791

fax 614 898.7786

info@ngwa.org

Resources

www.ngwa.org/PROGRAMS/educator/index.aspx

www.wellowner.org

www.groundwateradventurers.org

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