Teaching Biological Evolution

Position Statement:
The National Association of Geoscience Teachers (NAGT) recognizes that the scientific theory of biological evolution is a foundational and robustly supported concept of science and, therefore, must also be a cornerstone of science education. The study of the evolution of life over Earth's history provides society with the perspective necessary to understand how Earth's biosphere developed and interacts with other Earth Systems including the hydrosphere, atmosphere, and lithosphere; provides insight into the natural processes active on Earth; and shapes our view of the future of the Earth and life on it. Incorporating evolution into the curriculum and assessment at all levels of biological and geoscience education is essential.

Rationale:
Evolution, the changing of systems through time, is a cross-cutting concept that underlies science, including biological evolution, cosmic evolution, geologic evolution, planetary evolution, and cultural evolution. Each of these disciplines provides evidence that evolution is pervasive: galaxies, stars and planets (including Earth), and life forms on Earth have all changed and continue to change through natural processes. Evolution is therefore a factual description of how natural systems develop over time and is a unifying concept of the natural sciences. The origin of species through biological evolution has been and continues to be contested in our society, despite being one of most important and well supported scientific concepts with no serious modern scientific dissent.

Evolution is a core concept for science disciplines and provides students with the foundation to help them understand the natural world. For this reason, the Next Generation Science Standards (NGSS), the National Science Teaching Association (NSTA), the National Center for Science Education (NCSE), numerous national education policy documents, and individual states, through their published science teaching guidelines, all recognize the importance of evolution education, including a scientific understanding of biological evolution. NAGT fully agrees with and supports the scientific validity of evolution as reflected in the position statements of the numerous scientific societies that unanimously support evolution on scientific grounds. NAGT further maintains that scientific theories of biological evolution should be taught to students of all grade levels as unifying concepts without distraction of non-scientific or anti-scientific influence.

Published and reaffirmed position statements on the scientific validity of biological evolution by scientific societies with relevant expertise clearly demonstrate that the modern scientific community no longer debates whether biological evolution has occurred.* While scientific investigation of biological evolution and the interconnected details of mechanism, process, history, and outcome remain at the current scientific forefront of evolutionary studies, the fact that biological evolution occurred is no longer the subject of any genuine scientific debate. This is the nature of scientific inquiry itself: to continually evaluate scientific theories with an eye toward improving our scientific models and adding more details to our understanding of the natural world. Scientists often disagree about explanations of how biological evolution works, the relative importance of specific evolutionary processes, or the patterns that are observed, but all agree that biological evolution has occurred and is occurring now.

In science, disagreements are subject to rules of scientific evaluation, and this includes the methodologies of teaching scientific concepts. Scientific conclusions are tested by experiment, observation, and evaluation. Sound practices of scientific education are tested and evaluated much the same way. NAGT recognizes that invoking non-naturalistic or supernatural events or beings, often referred to as "creation science," "scientific creationism," or "intelligent design theory," is not scientific in character, does not conform to the scientific usage of the word theory, confuses students, and should not be part of valid science curricula.

*Position statements supporting biological evolution: https://nagt.org/nagt/policy/ps-evolution.html

Recommendations:
NAGT fully accepts its role in the evaluation and betterment of the teaching of scientific evolution in formal and informal educational settings, with the explicit goal of supporting evolution education that recognizes:

- NAGT will promote an understanding and acceptance of biological evolution as vital to informed decision making on a wide variety of issues of public and personal importance, including medicine and epidemiology, agriculture, ecological functioning, and the response of organisms and communities to global change.
- NAGT will encourage the teaching of evolutionary science as inherently interdisciplinary and constituting a key component of our scientific understanding not only of biology, but as critical to a comprehensive scientific understanding of the universe, integrating knowledge from Biology, Geoscience, Physics, Chemistry, and Anthropology
- Federal and state departments of education, school districts, and local administrators should ensure the concepts of biological evolution are taught in all grade levels
- Federal and state departments of education, school districts, and local administrators should support teachers who teach biological evolution at the K-12 level
- Venues of informal science learning should not present or feature non-scientific concepts of the origin of biodiversity as scientific
- Science educators should recognize and consider using evolution as an excellent area for illustrating the nature of science more broadly and helping develop the ability to distinguish scientific from nonscientific reasoning
- Science educators should not present non-scientific alternative explanations for biological diversity as scientific challenges to the theory of biological evolution and federal and state departments of education, school districts, and local administrators should not require educators to do so.
- Science educators can address religious and other worldview-based concerns related to biological evolution by discussing the differences between those approaches and the scientific approach as a way to improve the understanding and acceptance of biological evolution
- Science educators should use culturally responsive teaching techniques to integrate biological evolution into a broader understanding of lived experiences, including religious or cultural experiences, to ensure all learners feel accepted and included in an evolution class environment
- Science educators should develop students' media literacy, including the ability to evaluate the credibility of information and soundness of arguments, as well as distinguish scientific from non-scientific or pseudoscientific explanations is essential to evolution literacy, geoscience literacy, and science literacy more broadly

NAGT's Commitment:
In support of high-quality geoscience education, NAGT has and will continue to broaden and disseminate knowledge of evidence-based evolutionary science pedagogy.

- The *Journal of Geoscience Education* publishes papers related to research concerning the pedagogy, assessment, history, philosophy, and culture of teaching and learning about the geosciences, especially of fundamental concepts like geologic time and faunal and stratigraphic succession, all aspects of biological evolution.
- NAGT supports published articles, workshops, and special sessions at conferences on teaching biological evolution.
- NAGT supports education programs designed for both pre-service and continuing education for teachers engaged in science education as a means to strengthen their own understanding of biological evolution and facilitate the best learning experience for their students.

About NAGT: The National Association of Geoscience Teachers (www.nagt.org) champions its strong vision that *everyone* experiences welcoming, inspiring, and effective Earth education. NAGT promotes high-quality Earth education; fosters and disseminates research in geoscience education; drives change toward an equitable and inclusive system of geoscience education; and supports all geoscience educators throughout their careers.

Once adopted, NAGT position statements remain in effect for five years, as per the Procedure for Approval of NAGT Position Statements.

To be included on the statement web site page:

Published and reaffirmed position statements on the scientific validity of biological evolution by scientific societies with relevant expertise:
https://www.evolutionsociety.org/content/education/statement-on-evolution.html
https://www.geosociety.org/GSA/Science_Policy/Position_Statements/Current_Statements/gsa/positions/position1.aspx
https://www.agiweb.org/gapac/evolution_statement.html
https://www.agu.org/science-policy/position-statements/evolution
https://esa.org/esa-position-statement-evolution/
https://nap.nationalacademies.org/catalog/6024/science-and-creationism-a-view-from-the-national-academy-of

More statements, including archived versions, are available at the National Center for Science Education website:
https://ncse.ngo/statements-scientific-and-scholarly-organizations

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