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RE: Proposed changes to Academic Standards in Science and Technology and Environment and Ecology

Karen Molchanow, Executive Director
State Board of Education
333 Market Street
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Ms. Molchanow:

The Pennsylvania Department of Education proposes to combine existing Academic Standards for Environment and Ecology and Science and Technology Standards. These new standards effectively remove specific requirements contained in the existing standards for environmental, ecological, and agricultural education. When the current standards were adopted in 2002, they placed Pennsylvania at the forefront of environmental and ecological education. Since then, the occupational landscape has changed dramatically and many of those standards have become even more important for preparing Pennsylvania's students for the 21st century.

Why not retain standards that expand on, rather than eliminate, requirements to teach about alternative and renewable energy resources not just because of their importance in the 21st century job market but also because of their importance for educating an informed citizenry in the 21st century?

Why not retain standards for Environment and Ecology that expand on, rather than eliminate, these existing requirements in response to current occupational realities? In the U.S. Bureau of Labor Statistics list of "Fastest Growing Occupations" between 2019 and 2029,[1] the first and third slots go to jobs in alternative (renewable) energy fields: wind turbine service technicians and solar photovoltaic installers. Three "traditional" jobs in the gas and oil extraction industry occupy slots 12 through 14. At the academic level, Penn State University offers a Bachelor's degree in "Plant Science and Integrated Pest Management" – a critical approach to protecting the local and global environment and food supply that was recognized in Pennsylvania's science standards nearly 20 years ago and is even more important today.

A 2016 document from Pennsylvania's Department of Agriculture, *Ag and Food Careers in Pennsylvania: A Desk Guide for Educators and Counselors,* notes that "agriculture-related industries are the backbone of the statewide economy" and cites "workforce development efforts… on behalf of the state economy…" The existing standards show how agricultural science should be considered an important part of environmental and ecological science. For example, *Section 4.4 Agriculture and Society* in the *Standards for Environment and Ecology* requires that across grade levels 4-12, Pennsylvania's public schools "shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to" understand the increased use of "efficiency in agriculture through technology" and "the value of both natural and alternative energy sources…" *Section 4.5 Integrated Pest Management*, requires teaching about "health benefits and risks associated with integrated pest management… [and] the health risks associated with chemicals used in common pesticides."

[1] https://www.bls.gov/ooh/fastest-growing.htm

The *Pennsylvania's Vision* section in the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* states, that "Science, environment, ecology, technology and engineering can be explored through an integrated and active learning process." The *What is an Integrated Science, Environment and Ecology Education* section states that the proposed standards "makes the standards more accessible when developing innovative STEM curricula that integrate related content."

This is a commendable goal. There may be logical arguments favoring the integration of science and technology with environment and ecology standards. However, we believe that the proposed standards should expand upon and not retreat from the distinct and crucial role that environmental and associated sciences play in the 21st century. We believe that retaining environmental and ecological science standards as separate and equal topics is the best way to strengthen schools' abilities to develop high-quality STEM programs responsive to a rapidly changing occupational and civic landscape in a rapidly changing world. We understand that "hands-on" learning is an essential component of responsive STEM education; environmental, ecological, and agricultural sciences provide many unique opportunities for expanded hands-on activities that can be integrated with classroom-based science education. We believe that material relevant to 21st century needs not specifically included in science standards will not be taught to our students.

Based on our concerns, the Board of Directors of the *Institute for Earth Science Research and Education (IESRE)*, a Pennsylvania-incorporated 501(c)(3) non-profit organization, unanimously opposes the new proposed standards. *IESRE*'s mission[2] includes "Development of activities and materials to support participation by educational institutions, teachers, students, and others in research and education activities of the Institute, consistent with the scientific findings that underlie our current understanding of natural and anthropogenic influences on Earth systems and the environment, and appropriate responses to those influences." In support of its mission *IESRE* has received funding from NASA, NOAA, NSF, and corporate foundations. All of us have taught or are currently teaching at the university level and each of us has many decades of experience working with students and teachers in the U.S. and around the world. Two of us (Drs. Boger and Brooks) have been funded by the federally sponsored GLOBE K-12 environmental science and education program.[3]

We ask that Pennsylvania continue having separate standards for Environment and Ecology and that any new standards retain and expand upon specific topics found in the existing standards, including agricultural technology and the use of alternative energy sources.

Board of Directors, *Institute for Earth Science Research and Education:*

Rebecca Boger, PhD, Associate Professor of Earth and Environmental Sciences, Brooklyn College, NY, NY.

David Brooks, PhD, founder and president of IESRE.

Jennifer Swann, PhD, Professor of Biological Sciences, Lehigh University, Bethlehem, PA.

[2] https://instesre.org/about.htm

[3] www.globe.gov