



## **Committee on Academic Standards/Chapter 4**

**Dr. Lee Williams, Chair**

**September 8, 2021**

### **Next Steps on Proposed Amendments to 22 Pa. Code Chapter 4 (Regulation #6-347)**

Proposed amendments to 22 Pa. Code Chapter 4 (Regulation #6-347) adopted by the State Board of Education (Board) were published in the *Pennsylvania Bulletin* for public comment on June 5, 2021. The proposal seeks to update the current academic standards for Science and Technology and Environment and Ecology by replacing the current standards with the *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology and Engineering (Grades K-5)*, *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)*, and *Pennsylvania Technology and Engineering Standards (Grades 6-12)*.

The Board received comments on its proposed rulemaking from educators, environmental organizations, professional associations, members of the General Assembly, the Department of Conservation and Natural Resources, and other concerned citizens. Following the close of public comment, the Board received additional comments from the Independent Regulatory Review Commission on August 5, 2021. Commentators raised concerns about whether certain content relevant to Environment, Ecology, and Agriculture either was omitted or weakly linked in the proposed new academic standards. Other commentators asked the Board to consider refinements to content addressed elsewhere in the proposed new standards.

The Academic Standards/Chapter 4 Committee (Committee) has been delegated responsibility for preparing revised regulations for recommendation to the Board. The Committee appreciates the perspectives shared by interested stakeholders through the opportunity to submit public comments on the Board's proposed rulemaking. To address concerns raised by stakeholders specific to the content of the proposed new standards and to facilitate building consensus surrounding those concerns, the Committee directs the Department of Education to reconvene the Science Standards Content Committee and Steering Committee, designated through action of the Board in May 2020, to develop additional recommendations for the Committee's consideration.

Individuals named to serve on these advisory bodies were selected for their content expertise, with consideration to ensuring representation across grade spans; geographic regions; urban, rural, and suburban communities; institutions (Intermediate Units, out-of-school learning providers, colleges and universities, school districts, charter schools, career and technical centers,

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etc.); types of educators (school teachers, informal educators, school administrators, curriculum experts, postsecondary education, professional learning providers, etc.); and races, ethnicities, and genders reflective of the learners in the Commonwealth. Content Committee and Steering Committee members further were evaluated based on their depth and breadth of expertise in overall education experience, understanding of the existing standards and current research, equity and access in education and meeting needs of diverse learners, and curriculum and standards development. Further, the Content Committee is reflective of individuals who hold expertise across numerous scientific disciplines, including multiple individuals with identified content expertise in Environment, Ecology, and Agriculture.

The Committee charges the Science Standards Content Committee and Steering Committee with reviewing and formulating recommendations on the stakeholder concerns identified below. The Committee requests that these advisory bodies either develop additional language to supplement or amend the proposed new standards adopted by the Board in Regulation #6-347 or, in areas where the advisory bodies determine that further amendments to the proposed rulemaking are not warranted, provide perspective to the Board as to why, in their expert opinions, further amendments are unnecessary.

Recommendations developed by the Science Standards Content Committee and Steering Committee in response to this request shall be presented to the Academic Standards/Chapter 4 Committee at a Special Meeting on December 1, 2021. The meeting to convene to receive such recommendations will be conducted in a manner that is open and accessible to the public per the Sunshine Act. Recommendations developed by the Science Standards Content Committee and Steering Committee will be considered by the Academic Standards/Chapter 4 Committee in formulating a final rulemaking and will be made available for review by all members of the State Board of Education.

The Committee requests that the Science Standards Content Committee and Steering Committee review and formulate recommendations on how, or whether, the following suggestions and concerns identified by stakeholders should be addressed in the proposed new standards:

- Ensure that the proposed new standards incorporate the following essential principles of environmental education:
  - *Systems Thinking* recognizes the complexity of our natural world and reinforces the interconnectivity between nature and our physical, chemical, and biological processes.
  - *Human Health* reinforces the inextricable connection between a healthy earth and the sustainability of people-made systems, including social, economic, political, cultural and technology.
  - *Diversity, Equity, and Inclusion* underscores the need for an inclusive, respectful and equitable approach to environmental education that embraces different cultural backgrounds and experiences.
  - *Direct Experience* ensures that students have direct connections with nature. These experiences, which foster critical cognitive skills and an appreciation of

natural systems, are particularly meaningful when they relate to their communities and surroundings.

- *Expand* environmental science and ecology principles across disciplines to enrich cross-curricular connections and reinforces the strong links between environmental education and the sciences and humanities.
  - *Critical and Creative Thinking* are imperative for active and meaningful learning, instilling lifelong skills that rely on observation, analysis, inference, and communication.
  - *Sustainability* reinforces the interrelationship between the needs of society and the natural resources and services that support society. It is essential that students understand environmental, social, and economic responsibility and the role each of us play in shaping the future of our planet.
- As it pertains to the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)*, include content related to the following either through the addition of a fifth domain within the proposed standards or through an alternative construct:
    - Watersheds and Wetlands – Cycles, Roles of Watersheds, Physical Factors, Characteristics and Functions of Wetlands, Impacts of Watersheds and Wetlands
    - Renewable and Nonrenewable Resources – Uses, Influential Factors
    - Environmental Health – Biological Diversity
    - Agriculture and Society – Society Needs, Agriculture Science, Agriculture Systems, Technology
    - Integrated Pest Management – Effects Benefits an Impacts, Health Risks, Management Practices
    - Ecosystems and their Interactions – Change Over Time
    - Threatened, Endangered, and Extinct Species – Management Strategies
    - Humans and the Environment – Society Needs, Sustainability, Supply and Demand
    - Environmental Laws and Regulations – Environmental Laws and their Impacts
    - The North American Association for Environmental Education Guidelines for Excellence in the following areas:
      - Human Systems – Individuals Groups and Societies, Culture, Political Systems, Economic Systems
      - Decision-Making and Action Skills – Forming and Evaluating Personal Views, Evaluating Need for Action, Planning and Taking Action, Evaluating Results of Action
      - Personal and Civic Responsibility – Recognizing Rights and Responsibilities, Recognizing Efficacy and Developing Agency, Accepting Personal Responsibility

- Consider whether the proposed new standards should include Pennsylvania’s Environmental Rights Amendment set forth in Article 1, Section 27 of the state constitution.
- Whether the proposed new standards should emphasize the major role that human activities play in causing the rise in global temperature, similar to how the Next Generation Science Standards add a clarifying statement in its related middle school standard on factors that have caused the rise in global temperatures over the past century to recognize that these factors include human activities.
- Whether climate change should be more explicitly addressed in content at all grade levels and all scientific disciplines.
- Whether more detailed content related to agriculture should be required for students in kindergarten through grade 5.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* for Grades 6-8, Weather and Climate, that expects students to, “Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century” should be limited to looking at rising temperatures only of the last century and whether framing the standard to consider this timeframe reflects confirmation bias.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* for Grades 6-8, Human Impacts, that expects students to, “Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects” reflects an assumption that man is causing temperature increase and that man can somehow create a system to mitigate our current climate and whether there are other causes of which students should be made aware.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* for Grades 6-8, Human Impacts, that expects students to, “Apply scientific principles to design a method for monitoring and minimizing human impact on the environment” ignores improvements over recent years in air and water cleanliness and that the Earth heals itself.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* for Grades 6-8, Human Impacts, that expects students to, “Construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth’s systems” is more pertinent to politics and the unfair distribution of natural resources.

- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* for Grades 9-12, Weather and Climate, that expects students to, “Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate” is an attack on fossil fuels.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment and Ecology (Grades 6-12)* for Grades 9-12, Earths Systems, that expects students to, “Analyze geoscience data to make the claim that one change to Earth’s surface can create feedback that causes changes to other Earth systems” more appropriately belongs in social studies due to a lack of scientific evidence that support the theory that man’s activity is significantly changing temperatures or climate on Earth.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Kindergarten, Earth’s Systems, that expects students to, “Use observations of local weather conditions to describe patterns over time” should include students sharing with each other as a critical part of three dimensional learning/communication.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 3, Life Science – Ecosystems: Interactions, Energy and Dynamics that expects students to, “Construct an argument that some animals have physical and behavioral adaptations that help members survive” does not match the title of the section in which it is included and whether the proposed standard already appears appropriately under the Grade 3 standard for Life Sciences – Biological Evolution: Unity and Diversity #2 that addresses evolutionary adaptations.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 3, Physical Science – Motion and Stability that expects students to, “Make and communicate observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion” asks students to complete two practices in one standard and, to reconcile this, communication should be removed from the proposed standard.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 4, Physical Science – Energy that expects students to, “Make and communicate observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents” asks students to complete two practices in one standard and, to reconcile this, communication should be removed from the proposed standard.

- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 5, Earth and Space Sciences – Earth’s Place in the Universe that expects students to, “Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth” should be rephrased to replace “compared to” with “and” to reflect the intention of the standard to focus on patterns more than just our star.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 5, Earth and Space Sciences – Earth and Human Activity that expects students to, “Generate and design possible solutions to a current environmental issue, threat, or concern” reflects an added proposed standard that is not written three dimensionally, does not connect with the rest of the K-5 standards, and should be removed due to a lack of 3D, lack of clarity, addition of a standard without removing another, and lack of vertical coherence.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 5, Physical Science – Matter and Its Interactions that expects students to, “Make and communicate observations and measurements to identify materials based on their properties” asks students to complete two practices in one standard and, to reconcile this, communication should be removed from the proposed standard.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grade 5, Physical Science – Matter and Its Interactions that expects students to, “Interpret and analyze data and observations to make decisions about how to utilize materials based on their properties” is not 3D, is similar to standard #3 within the same section, and should be removed due to a lack of 3D/clarity, the addition of a standard without removing another, a lack of coherence, and similarity to another standard.
- Whether the proposed *Pennsylvania Integrated Standards for Science, Environment, Ecology, Technology, and Engineering (Grades K-5)* for Grades K-2 Environment and Ecology are too vague for teachers, not grade appropriate, not 3D, and more appropriately belong in social science standards.
- Whether the proposed new standards include sufficient content on simple machines, compound machines, or mechanical advantage.

- Whether “Applied Science” should be added as a ninth crosscutting concept reflecting how applied, multidisciplinary, real world projects can be used to show how core sciences work together.