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DEPARTMENT OF EDUCATION

PA Core Standards: Science

Introduction

The 2020–21 school year presents a unique set of opportunities and challenges due to the disruption to instruction in spring 2020 as well as the uncertainty as the school year unfolds. Educators know that every school year there are students who require support in addressing unfinished learning from prior grades; a challenge that will be felt more prominently in the 2020–21 school year. It is vitally important that educators are supported to make deliberate instructional choices that allow all students to effectively engage with grade-level work.

The most effective and equitable way to support students in their learning is to ensure that the vast majority of time is spent engaging with grade-level content and accelerating as needed. It is entirely possible to hold high expectations for all students while addressing unfinished learning in the context of grade-level work. Since time is a scarce commodity in classrooms — made more limited by anticipated closures and remote or hybrid learning models in the fall of 2020 — strategic instructional choices about which content to prioritize must be made.[1]

Assessing students at the start of the year will identify learning gaps and provide data to inform instruction. Diagnostic Assessments determine student strengths, weaknesses, knowledge, and skills. Administering diagnostic assessments permits the instructor to intervene at the point where students begin to struggle or when they are performing below grade level expectations (running record, Classroom Diagnostic Tests [CDT]). Diagnostic assessments allow teachers to adjust the curriculum to meet the unique needs of all students. While some concepts have greater emphasis in a particular year, all standards deserve a defined level of instruction. Neglecting concepts may result in learning gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

This guidance document is designed to identify and define areas of high-level focus in Science instruction supported by key PA Academic Standards. Note that while all standards deserve a defined level of instruction, neglecting key concepts may result in learning gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade. Not all content in a given grade is emphasized equally in the standards. Some focus areas require greater emphasis then others based on the depth of the ideas, the time taken to master, and/or their importance to the future science grade levels. More time in these areas is also necessary for students to meet the Standards for Inquiry and Design and Unifying Themes.

[1] Adapted from 2020–21 Priority Instructional Content in English Language Arts/literacy and Mathematics, Student Achievement Partners/Achieve the Core. May 2020

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GRADE 9 – 12 FOCUS OF INSTRUCTION (2020-2021)

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Focus Areas of Instruction	PA Academic Standards
Earth and Space Science • Use models to describe the sun's place in space in relation to the Milky Way Galaxy and the distribution of galaxy clusters in the universe. • Use data about the expansion, scale and age of the universe to explain the Big Bang theory as a model for the origin of the Universe. • Compare and contrast the life cycles of stars of different masses and compositions, including our sun. • Develop a model of how the competing forces of gravity and thermal expansion effect a star's density throughout its life cycle. • Use observational data to construct an explanation of a star's apparent (relative) magnitude based on its distance from the observer and its mass. • Describe the mechanism by which heavier and heavier elements are produced within a star's core throughout its life cycle. • Develop a three-dimensional model to illustrate how Earth's internal and surface processes operate to form continental and ocean floor features. • Incorporate a variety of data including geological evidence from maps and representations of current plate motions to predict future plate motions. • Use a model for Earth's interior including the mechanisms of thermal convection to support the explanation for the cycling of matter within the Earth. • Construct explanations using the theory of plate tectonics for patterns in the general trends of the ages of both continental and oceanic crust. • Integrate evidence from seismic waves, reconstructions of Earth's magnetic field and states of matter to map the boundaries of the internal structure of the Earth. • Develop qualitative models to describe biogeochemical cycles among the hydrosphere, atmosphere, geosphere, and biosphere. • Use models of the flow of energy between the sun and Earth's atmosphere, ocean and land to support explanations of how Earth's radiative energy balance is affected by the absorption and retention of heat in Earth's atmosphere. • Evaluate the impact of the availability of renewable and nonrenewable resources on the development of a civilization.	**3.1.10.A** *Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.* **3.4.10.D** *Explain essential ideas about the composition and structure of the universe.* **3.4.12.D** *Analyze the essential ideas about the composition and structure of the universe.* **3.1.12.E** *Evaluate change in nature, physical systems, and man-made systems.* **3.5.10.A** *Relate earth features and processes that change the earth.* **3.5.10.B** *Explain sources and uses of earth resources.* **3.5.10.C** *Interpret meteorological data.* **3.5.10.D** *Assess the value of water as a resource.* **3.5.12.A** *Analyze and evaluate earth features and processes that change the earth.* **3.5.12.B** *Analyze the availability, location, and extraction of earth resources.* **3.5.12.C** *Analyze atmospheric energy transfers.* **3.8.10.A** *Analyze the relationship between societal demands and scientific and technological enterprises.* **3.8.10.B** *Analyze how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.* **3.8.10.C** *Evaluate possibilities consequences and impacts of scientific and technological solutions.* **3.8.12.A** *Synthesize and evaluate the interactions and constraints of science and technology on society.* **3.8.12.B** *Apply the use of ingenuity and technological resources to solve specific societal needs and improve the quality of life.* **3.8.12.C** *Evaluate the consequences and impacts of scientific and technological solutions.*