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**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)

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 skill and understanding and may leave students unprepared for the challenges of later grades.

| Focus Areas of Instruction | PA Academic Standards |
|---|---|
| **Physics**<br>• Plan and carry out investigations to show how the mathematical relationship of Newton's Second Law of motion accurately predicts the relationship between the net force on objects, their mass, and the resulting change in motion.<br>• Use mathematical representations of Coulomb's Law to describe and predict the electrostatic forces between objects.<br>• Develop and use a model to explain how an object's energy is transferred or transformed as objects interact within a system.<br>• Identify problems and suggest design solutions to optimize the energy transfer between objects or systems of objects.<br>• Construct mathematical models to show how energy is transformed and transferred within a system.<br>• Plan and carry out an investigation to provide evidence that energy is conserved in a system.<br>• Use mathematical representations to support the claim that the total momentum of a system of objects is conserved through the transfer of momentum between objects when there is no net force on the system.<br>• Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.<br>• Construct explanations for the transmission, reflection, refraction and/or absorption of waves as they pass from one medium to another medium.<br>• Develop a claim and reasoning supported by evidence that describes the behavior of a wave as it passes from one medium to another medium.<br>• Construct an explanation for the application of resonance in everyday phenomena (e.g., waves in a stretched string, speech, the design of all musical instruments).<br>• Generate and analyze data to support the claim that the energy of an electromagnetic wave is directly proportional to the frequency of the wave. | **3.1.10.B** *Describe concepts of models as a way to predict and understand science and technology.*<br>**3.1.10.C** *Apply patterns as repeated processes or recurring elements in science and technology.*<br>**3.2.10.B** *Apply process knowledge and organize scientific and technological phenomena in varied ways.*<br>**3.2.12.D** *Analyze and use the technological design process to solve problems.*<br>**3.4.10.A** *Explain concepts about the structure and properties of matter.*<br>**3.4.10.B** *Analyze energy sources and transfers of heat.*<br>**3.4.10.C** *Distinguish among the principles of force and motion.*<br>**3.4.10.D** *Explain essential ideas about the composition and structure of the universe.*<br>**3.4.12.A** *Apply concepts about the structure and properties of matter.*<br>**3.4.12.C** *Apply the principles of motion and force.*<br>**3.4.12.D** *Analyze scale as a way of relating concepts and ideas to one another by some measure.*<br>**3.6.10.B** *Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving, and decoding.*<br>**3.6.12.B** *Technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.*<br>**3.7.10.B** *Apply appropriate instruments and apparatus to examine a variety of objects and processes.* |