

# Educational Resources from *Phenomenon Science Education*

## Student Proficiency Goals for **NGSS HS-PS4-1**



### Information about HS-PS4-1

#### **NGSS Performance Expectation HS-PS4-1.**

Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

#### **Clarification Statement.**

*Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.*

#### **Assessment Limits.**

*Assessment is limited to algebraic relationships and describing those relationships qualitatively.*

#### **Science and Engineering Practice (Using Mathematics and Computational Thinking)**

- Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.

#### **Disciplinary Core Idea (PS4.A: Wave Properties)**

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.

#### **Crosscutting Concept (Cause and Effect)**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

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## Student Proficiency Goals for **NGSS HS-PS4-1**



### Student Proficiency Goals

#### SEP (Using Mathematics and Computational Thinking):

- Students describe the relationships among the frequency, wavelength, and speed of waves traveling within different media.
- Students use the formula  $v = f\lambda$  to show that regardless of the frequency or wavelength, the speed of a wave is constant within a specific medium.
- Students use the formula  $v = f\lambda$  to explain the change in wavelength that occurs when a wave enters a new medium.
- Students use the formula  $v = f\lambda$  to solve for one quantity when the other two quantities are known and distinguish between cause and correlation in variation of any of the three quantities.

#### DCI (PS4.A Wave Properties):

- Students infer that the wavelength and frequency of a wave are related by the speed of the wave.
- Students know that the speed of a wave depends on the type of wave and the medium through which it is passing.

#### CCC (Cause and Effect):

- Students consider how empirical evidence can support or refute claims of causation versus correlation regarding the behavior of waves traveling within different media.
- Students consider the effects of media on the speed of travel, and thus the wavelength and frequency, of waves.