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**Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project**

**Grade 8 Science**

**Unit 4 End of Unit Assessment Unpacking Tools**

**Providing Solutions to Problems Using Simple Wave Properties**

**August 2023**

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A group of people in a circle

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| **NGSS Performance Expectation: MS-PS4-1.** Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.] | | | | |
|  | **Science and Engineering Practices (SEP)** | **Disciplinary Core Ideas (DCI)** | **Crosscutting Concepts (CCC)** | |
| **Foundations** | **SEP: Using Mathematics and Computational Thinking**  Use mathematical representations to describe and/or support scientific conclusions and design solutions. | **PS4.A: Wave Properties**  A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. | **CCC: Patterns**  Graphs and charts can be used to identify patterns in data. | |
| **Key Aspects** | * Use mathematical representations to describe scientific conclusions. * Use mathematical representations to support scientific conclusions. * Use mathematical representations to describe design solutions. * Use mathematical representations to support design solutions. | * A simple wave has a repeating pattern. * A simple wave has a specific wavelength. * A simple wave has a specific frequency. * A simple wave has a specific amplitude. * The wavelength and frequency of a wave are related to one another by the speed of travel of the wave. * The higher the frequency of the wave the shorter the wavelength. * The lower the frequency of the wave the longer the wavelength. * The higher the frequency of the wave the higher the amplitude. * The lower the frequency of the wave the lower the amplitude. | * Use graphs to represent and identify patterns. * Use charts to represent and identify patterns. * Identify the presence of patterns in phenomena or data. * Characterize the strength, direction, or nature of patterns in phenomena or data. | |
| **Prior Knowledge** | * Knowledge of units and unit conversions. * Knowledge of ratio relationships. * Ability to interpret qualitative data. * Ability to represent proportional relationships. * Knowledge of linear relationships. | * Waves can cause objects to move.   + Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). | **Relationships to SEPs:**  **5) Using Mathematics and Computational Thinking and 2) Developing and Using Models** | * A sense of scale is necessary in order to know what properties and what aspects of shape or material are relevant at a particular magnitude or in investigating particular phenomena. * Patterns are helpful when interpreting data, which may supply valuable evidence in support of an explanation or a particular solution to a problem. * Models include mathematical representations. * Models may be used to analyze a system or to test possible solutions to a problem. |

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| **NGSS Performance Expectation: MS-PS4-2** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [*Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]* | | | | |
|  | **Science and Engineering Practices (SEP)** | **Disciplinary Core Ideas (DCI)** | **Crosscutting Concepts (CCC)** | |
| **Foundations** | **SEP: Developing and Using Models**  Develop and use a model to describe phenomena. | **PS4.A: Wave Properties**  A sound wave needs a medium through which it is transmitted. | **CCC: Structure and Function**  Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. | |
| **Key Aspects** | * Develop a model to predict phenomena. * Develop a model to describe phenomena. * Identify appropriate aspects of a given phenomenon to include in a model. * Explain the relationships among the components of a model. * Specify or identify the limitations of the model and describe why these limitations exist. | * Sound waves need a medium (air, water, or solid material) to travel through. | * Design structures to serve different functions. * Design structures based on the properties of its materials. * The shape and stability of structures of natural and designed objects are related to their function(s). | |
| **Prior Knowledge** | * Knowledge of units and unit conversions. * Knowledge of ratio relationships. * Ability to interpret qualitative data. * Ability to represent proportional relationships. * Knowledge of linear relationships. | * Waves can cause objects to move. * Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). | **Relationships to SEPs:**  **2) Developing and Using Models and 5) Using Mathematics and Computational Thinking** | * A sense of scale is necessary in order to know what properties and what aspects of shape or material are relevant at a particular magnitude or in investigating particular phenomena. * Data analysis serves to demonstrate the relative magnitude of some properties or processes. |