Educational Resources from *Phenomenon Science Education*

Instructions for Describing the Student Proficiency Goals of a Three-Dimensional Performance Expectation

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Instructions for Proficiency Goals Using NGSS 5-PS1-1 as an Example

Parse the Performance Expectation's dimensions here:
Three-dimensional performance expectations (3D PEs) are constructed from dimensions. Most PEs can be parsed into text that relates to the Science and Engineering Practice, text that relates to the Disciplinary Core Ideas, and text that relates to the Crossing Concept. For example, **NGSS 5-PS1-1** can be parsed as follows:
Develop a model to describe that matter is made of particles too small to be seen.

Similar breakdowns of all NGSS PEs can be found at https://www.nextgenscience.org/.

List any clarification statements for the Performance Expectation here:
Performance expectations often come with a statement that clarifies "intent" or provides classroom examples for that PE. The clarification statement for 5-PS1-1 reads: *Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water*.

List any assessment limits for the Performance Expectation here:
Performance expectations often come with a description of topics and concepts that are considered out-of-bounds when assessing student performance. The assessment boundary for 5-PS1-1 reads: *Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles*.

List the specific bullets of the Performance Expectation's dimensions here:

Science and Engineering Practice (Developing and Using Models)

- Develop a model to describe phenomena.

Disciplinary Core Idea (PS1.A: Structure and Properties of Matter)

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Crosscutting Concept (Scale, Proportion, and Quantity)

- Natural objects exist from the very small to the immensely large.

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SEP (Developing and Using Models):

List actions related to the SEP that students should be proficient in by the end of instruction. Using the SEP bullet of 5-PS1-1, we have:

- With guidance, students develop physical and/or conceptual models capable of addressing phenomena related to the particle nature of matter.
- With guidance, students identify components needed for models that can address phenomena related to the particle nature of matter and identify the roles of those components in the models.
- Students use their models to address phenomena related to the particle nature of matter and identify relationships among particles in matter.

DCI (PS1.A Structure and Properties of Matter):

List the DCI science knowledge that students should know at the end of instruction. Using the PS1.A bullet for 5-PS1-1, we have:

- Students know the particles that make up matter cannot be directly seen because those particles are too small. However, students know the particles exist because the particles can be detected in ways that students can observe.
- Students know that particles of matter can act on other particles of matter, resulting in events that are observable, even though the particles themselves cannot be directly observed.
- Students infer that all matter is made of particles.

CCC (Scale, Proportion, and Quantity):

List ways that students can use the CCC to consider and make sense of relevant phenomena. Using the CCC bullet of 5-PS1-1, we have:

- Students consider concepts of particle scale in models that explore phenomena related to the behavior of particles in matter, using this perspective to make better sense of those phenomena.
- Students consider characteristics related to the behavior of particles that can be observed and/or measured (e.g., mass), and how those characteristics can provide evidence of the particle nature of matter.

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Completed Student Proficiency Goals of NGSS 5-PS1-1
NGSS Performance Expectation 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. **Clarification Statement.** *Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.* **Assessment Limits.** *Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.* **Science and Engineering Practice (Developing and Using Models)** • Develop a model to describe phenomena. **Disciplinary Core Idea (PS1.A: Structure and Properties of Matter)** • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. **Crosscutting Concept (Scale, Proportion, and Quantity)** • Natural objects exist from the very small to the immensely large.

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SEP (Developing and Using Models): • With guidance, students develop physical and/or conceptual models capable of addressing phenomena related to the particle nature of matter. • With guidance, students identify components needed for models that can address phenomena related to the particle nature of matter and identify the roles of those components in the models. • Students use their models to address phenomena related to the particle nature of matter and identify relationships among particles in matter.	
DCI (PS1.A Structure and Properties of Matter): • Students know the particles that make up matter cannot be directly seen because those particles are too small. However, students know the particles exist because the particles can be detected in ways that students can observe. • Students know that particles of matter can act on other particles of matter, resulting in events that are observable, even though the particles themselves cannot be directly observed. • Students infer that all matter is made of particles.	**CCC (Scale, Proportion, and Quantity):** • Students consider concepts of particle scale in models that explore phenomena related to the behavior of particles in matter, using this perspective to make better sense of those phenomena. • Students consider characteristics related to the behavior of particles that can be observed and/or measured (e.g., mass), and how those characteristics can provide evidence of the particle nature of matter.

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