Mini-Map for SCI.EE.8.PS.Matter-1

Subject: Science
Physical Science (PS)
Grade band: 6–8

Grade-Level Expectation

DLM Essential Element	DLM Disciplinary Core Idea Family[1]	Framework Disciplinary Core Ideas
SCI.EE.8.PS.Matter-1 Use a particle model of matter to describe the relationships between the states of matter, their characteristics and properties, and temperature.	Physical Science – Matter and Chemical Reactions	PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions

[1] DLM Science Essential Elements organize Disciplinary Core Ideas (defined in the *Framework for K-12 Science Education*) into DCI families. By combining similar concepts within a domain, science content from the general education standards is reduced in depth, breadth, and complexity to provide access for students that qualify for the DLM alternate assessment.

Linkage Level Descriptions

Initial Precursor	Distal Precursor	Proximal Precursor	Target[2]
Identify and use categorical words to describe common persons, places, objects, or events.	Use representations to classify common kinds and forms of materials according to their physical characteristics.	Use representations to describe the different forms (i.e., states) in which substances (i.e., matter) can exist.	Use a particle model of matter to describe the relationships between temperature, states of matter, and their characteristics and properties.

[2] The target linkage level description is a measurement target that describes the expectations (content and performance) of the Essential Element for assessment purposes.

Essential Element Three Dimensions

Each Essential Element is defined in the three dimensions described in the *Framework for K-12 Science Education*: disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs). The table below lists the details of each dimension from the individual DLM Essential Element descriptions, with color-coding of dimensions corresponding to the Next Generation Science Standards (NGSS). The first row (in blue) lists the SEP(s) used to construct the Essential Element and describes ways each SEP could be incorporated. The second row (in orange) describes the science concepts within the DCI family related to this Essential Element. The third row (in green) lists the CCC(s) associated with the Essential Element and explains how each might be incorporated in the grade band (quoted from NSTA, 2013, matrix of CCCs). Note that the SEP is presented first here (rather than second, as it is in the full list of Essential Elements) to reflect the emphasis on practices in instruction and across the linkage levels. The final row (in white) includes examples of how the three dimensions could work together to support instruction for the Essential Element. These examples provide ideas for integrating the dimensions and are not exhaustive, nor are they intended to limit instruction.

Science and Engineering Practices	**Developing and Using Models:** Modeling in grades 6–8 builds on K–5 experiences and progresses to developing and using models (e.g., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent relationships, events, and systems in the natural world. • Develop and use models to identify, describe, and compare components of a system. • Use models to explain and predict relationships between variables and components of a system. **Constructing Explanations and Designing Solutions:** Constructing explanations and designing solutions in grades 6–8 builds on K–5 experiences and progresses to constructing explanations about processes or relationships in the natural or designed world. • Use information, data, or models to construct descriptions and explanations of processes and relationships in the natural world.
Disciplinary Core Ideas	**Matter and Chemical Reactions** • Matter (i.e., substance) is made of different types of particles. • Matter can exist as solids, liquids, or gases depending on temperature. The changes of state that occur with variations in temperature can be described and predicted using particle models of matter. • In a solid, particles are closely spaced and vibrate in position but do not change relative locations. • Gases and liquids are made of particles that are moving about relative to each other. In a liquid, the particles are constantly in contact with each other; in a gas, they are widely spaced except when they happen to collide. Gases are made of particles that are moving freely around in space. • The changes of state that occur with variations in temperature can be described and predicted using these particle models of matter (see SCI.EE.8.PS.Energy-1 and SCI.EE.8.PS.Energy-2).

	Usually, the change occurs when adding or removing heat. The nature of the phase change depends on the direction of the heat transfer. Heat going into a substance changes it from a solid to a liquid or a liquid to a gas. Particles of matter generally move more or faster when heated. Removing heat from a substance changes a gas to a liquid or a liquid to a solid. Particles of matter generally move less or slower when cooled • Bulk properties of states of matter that can be observed or measured can include the ability to move or flow, the ability to take the shape of a container, and the ability to hold its shape or volume.
Crosscutting Concepts	**Cause and Effect: Mechanism and Explanation**: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering. • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. • Cause and effect relationships may be used to predict phenomena in natural or designed systems. • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. **Systems and System Models**: A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. • Models are limited in that they only represent certain aspects of the system under study. **Energy and Matter: Flows, Cycles, and Conservation**: Tracking energy and matter flows into, out of, and within systems helps one understand their system's behavior. • Matter is conserved because atoms are conserved in physical and chemical processes. • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. • Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion). • The transfer of energy can be tracked as energy flows through a designed or natural system.

How three dimensions support instruction for this Essential Element	Students can learn about systems and system models through a particle model of matter. Models can be used to represent and describe particles, the distance between particles, particle movement under different conditions, and the interactions between particles in the system. Understanding of cause-and-effect relationships can help students explain changes in states of matter. Students can make observations of effects when temperature changes, when the position or motion of particles in a model changes, and when states of matter change. Energy and matter concepts build on prior understanding about matter, states of matter, and how heat impacts matter. The concept of energy relates to matter through investigating relationships between the movement of particles, states of matter, and temperature or heat.

Instructional Resources

Resources
Learning modules and additional science instructional resources can be found at https://www.dlmpd.com/science/
A glossary defining key science terms found in the Essential Elements can be found at DLM Glossary for Science Learning Maps.

Link to Text-Only Map

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