

Connecting to the Next Generation Science Standards (NGSS Lead States 2013)

| <b>Standard</b><br>MS-PS1: Matter and Its Interactions<br><a href="https://www.nextgenscience.org/dci-arrangement/ms-ps1-matter-and-its-interactions">https://www.nextgenscience.org/dci-arrangement/ms-ps1-matter-and-its-interactions</a>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                  |
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| <b>Performance Expectations</b><br>The materials, lessons, and investigations outlined in this article are just one step toward reaching the performance expectations listed below.<br><br>MS-PS1-2: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.<br>MS-PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance, when thermal energy is added or removed.<br>MS-PS1-5: Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. |                                                                                                                                                                                                                                  |
| Dimension                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Classroom Connections                                                                                                                                                                                                            |
| <b>Science and Engineering Practices:</b><br>Develop and Use Models                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Throughout this learning cycle students develop and use models to make their thinking visible (initial-revised-refined models) about the interactions of matter and energy that are part of the case studies and investigations. |
| Planning and Carrying Out Investigations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | With the support of local fire fighters, students plan and carry out investigations to make observations about ignition rates and flammability, as well as the effects of limiting a leg of the fire triangle.                   |
| <b>Cross Cutting Concepts:</b><br>Matter and Energy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Sense making that occurs after the online and fire investigations support students in thinking about the interactions of the stored energy of the matter and the thermal energy added to the system.                             |

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| <p><b>Disciplinary Core Ideas:</b></p> <p><b>PS1.A: Structure and Properties of Matter</b><br/>Each pure substance has characteristic physical and chemical properties that can be used to identify it.<br/>The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.</p> <p><b>PS1.B: Chemical Reactions</b><br/>Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.<br/>The total number of each type of atom is conserved, and thus the mass does not change.</p> <p><b>PS2.A: Definitions of Energy</b><br/>The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)</p> | <p>As a result of active participation in the totality of the learning cycle, opportunity to make progress in learning about each of these core ideas is evident. As described in the article, the types of questions posed to students, the quality of opportunities for sense-making, and use of modeling to make thinking visible all contribute to this learning progression.</p> |
| <p><i>Connections to the Common Core State Standards Connections, ELA (NGAC and CCSSO 2010)</i></p> <p>CCSS.ELA-Literacy. RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p>CCSS.ELA-Literacy. RST.6-8.3: Follow precisely multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                       |

National Governors Association Center for Best Practices and Council of Chief State School Officers (NGAC and CCSSO). 2010. *Common core state standards*. Washington, DC: NGAC and CCSSO.

NGSS Lead States. 2013. *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press. [www.nextgenscience.org/](http://www.nextgenscience.org/) *next-generation-science-standards*