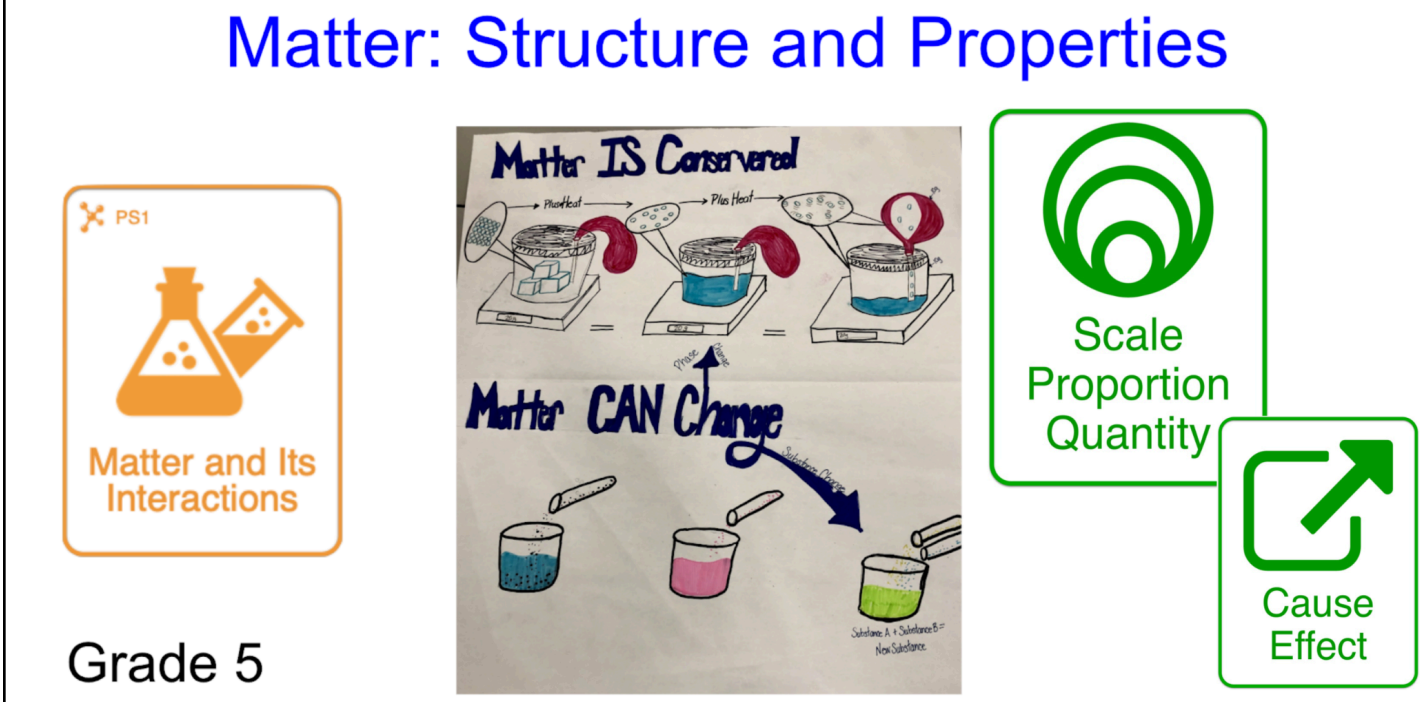
# Storyline Unit Design

Understanding by Design (UbD) Template*

| | | | |
|---|---|---|---|
| Unit | | Course(s) | |
| Designed by | | Time Frame | |



## Anchor Model




*UbD Unit Planner is from Wiggins, Grant and McTighe, Jay. Understanding by Design Guide to Creating High-Quality Units. Alexandria, VA: Association for Supervision and Curriculum Development. 2011.

# Stage 1: Desired Results

## Performance Expectations

**5-PS1-1: Particle Model of Matter**
Develop a model to describe that matter is made of particles too small to be seen. (Scale, Proportion, and Quantity)

**5-PS1-2: Conservation of Matter**
Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. (Scale, Proportion, and Quantity)

**5-PS1-3: Material Properties**
Make observations and measurements to identify materials based on their properties. (Scale, Proportion, and Quantity)

**5-PS1-4: Mixing Substances**
Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (Cause and Effect)

## Anchoring Phenomenon

Anchoring Phenomenon Worksheet
Cooking

| Enduring Understandings | Essential Questions |
|---|---|
| **There are particles of matter too small to be seen.**<br><br>**There are observable characteristics in matter that can be classified and measured (color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, solubility).**<br><br>**Heating, cooling or mixing matter may cause changes depending on its properties.**<br><br>**Describe how to collect and record data from a given investigation.**<br><br>**Determine the purpose of an investigation and describe the evidence from the given data.** | How can we use models to describe that matter is made of particles that are too small to be seen?<br><br>How does matter respond to heating, cooling or mixing?<br><br>How can we identify materials based on their properties? |

## Stage 2: Assessments

5-PS1-1 - Onion Proof Goggles
5-PS1-2 - Diet and Regular Coke
5-PS1-3 - Reverse Engineer at Flashlight
5-PS1-4 - Self-Inflating Balloons

Assessment Screening Tools

Backward Design Elements

| What new skills (practices) will students need to learn? | What thinking concepts will students need to learn? | What science concepts will students need to learn? |
|---|---|---|
| Planning and carrying out investigations<br>Using mathematics and computational thinking<br>Developing and using models | Scale, proportion, quantity<br>Cause and effect | Substance<br>Matter<br>Heating<br>Cooling<br>Mixing<br>weight<br>States of matter<br>Particle(s) |

## Stage 3: Learning Plan

|  Phenomenon or Problem |  Learning Performance - What will they do?<br>The three dimensions woven together into a single learning performance. |  Why is this important?<br>How does this activity help build understanding of the anchoring phenomenon. |  Learning Experience - How will they do it?<br>Graphic organizers, protocols, scaffolds, labs, mini-lesson, student discourse, etc. |
|---|---|---|---|
| Jello time-lapse | Students will **observe** the **changes** of the **jello**. | **Ask questions** about the process the jello is going through.<br><br>**Obtain information** about the characteristics of the states of matter. | Show students a time-lapse video on making a jello dessert.<br><br>Students make observations on the process of making jello and<br><br>Students measure and weigh the ingredients needed to make jello.<br><br>Students will follow the steps to make their own jello dessert.<br><br>Mini-lesson on obtaining information based on their observations on a process. |

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| Formative Assessment - What information are you collecting to know that they met the target? | | Students gather their observations and communicate them through a model and a graphic organizer. | |
| Melting ice | Students will **observe** the **changes** in the state of **ice** and recognize a pattern in changes of matter when heating and cooling. | **Ask questions** about the process the jello is going through.<br><br>**Obtain information** about the characteristics of the states of matter. | |
| Formative Assessment - What information are you collecting to know that they met the target? | | | |
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| **Summative Assessment**<br>What information are you collecting to know that they met the target? | | | |
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| **Summative Assessment**<br>What information are you collecting to know that they met the target? | | | |

## Materials / Resources

**Vocabulary**

5-PS1-1
Matter
Bulk matter (macroscopic)
Particles of matter (microscopic)
States of matter
Scale

5-PS1-2
Matter
Amount (mass or weight)
Conservation of matter
Change (e.g. heating, cooling, phase change, dissolving, mixing)
Properties
Scale, Proportion, and Quantity

5-PS1-3
Material (e.g. metal, minerals, liquids)
Properties (e.g. color, hardness, reflectivity, conductivity, response to magnetic forces, solubility)
Scale, Proportion, and Quantity

5-PS1-4
Mixing
Substances
Properties
- Quantitative (e.g. weight or mass)
- Qualitative (e.g. state of matter, color, texture, odor)

Cause and Effect

**Mini Lessons**

Scale Level 3 - Scale and Perspective
Scale Level 3 - Scale and Perspective Thinking Slides
Quantity Level 2 - Physical Quantities
Quantity Level 2 - Physical Quantities Thinking Slides
Causation Level 3 - Causal Relationships Mini-Lesson

Causation Level 3 - Causal Relationships Thinking Slides

**Graphic Organizers**

5-PS1-1 - Particle Model of Matter Graphic Organizer (Student Version)
5-PS1-1 - Particle Model of Matter Graphic Organizer (Teacher Version)
5-PS1-2 - Conservation of Matter Graphic Organizer (Student Version)
5-PS1-2 - Conservation of Matter Graphic Organizer (Teacher Version)
5-PS1-3 - Material Properties Graphic Organizer (Student Version)
5-PS1-3 - Material Properties Graphic Organizer (Teacher Version)
5-PS1-4 - Mixing Substances Graphic Organizer (Student Version)
5-PS1-4 - Mixing Substances Graphic Organizer (Parent Version)
Phenomena Observation Graphic Organizer
Questioning Graphic Organizer
Modeling Graphic Organizer
Planning an Investigation Organizer
Investigation Evidence Organizer
Engaging in Argumentation Organizer

## Differentiation / Modifications

## Phenomenon Worksheet

Back to Stage 1

◁ **5-PS1-1 - Particle Model of Matter**
◁ **5-PS1-2 - Conservation of Matter**
◁ **5-PS1-3 - Material Properties**
◁ **5-PS1-4 - Mixing Substances**
◁ **Local**
◁ **Favorite**
◁

Ball in cold weather ◁
Compressing a syringe ◁
Dissolving salt or sugar in water ◁
Evaporating salt water ◁
Onion makes you cry ◁
Phase changes (melting ice, freezing water, etc.) ◁
Dry ice ◁
Weight increase from rusting (e.g. burning steel wool) ◁◁◁◁
Weight loss through gas loss (e.g. alka seltzer in water ◁◁◁◁
Chemical reaction (“weight change”) ◁◁◁
Cooking ◁◁◁
Various materials (e.g. wood, metal, plastic) ◁
Properties of material (e.g. color, reflectivity, magnetic properties) ◁
Materials science (engineering) ◁
Chemical reaction or not?◁◁◁
- Baking soda and vinegar ◁◁◁
- Burning materials ◁◁◁
- Phase change (e.g. boiling water) ◁◁◁◁
Magnetic slime ◁
Crystals ◁
Different smells (e.g. perfume) ◁
Floating cans of soda (diet Coke floats, Coke sinks) ◁

## Screening Tools

Back to Stage 2

### 5-PS1-1: Particle Model of Matter

Evidence Statement

**Assessment: Onion Proof Goggles (PDF) (Google Template)**

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Developing and Using Models**<br>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.<br>• Use models to describe phenomena. | **PS1.A: Structure and Properties of Matter**<br>• 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. | **Scale, Proportion, and Quantity**<br>• Natural objects exist from the very small to the immensely large. |

**Reflections:** *Type Here*

| | No | Partial | Yes |
|---|---|---|---|
| 1. The assessment contains a **phenomenon** (science) or a **problem** (engineering) | | | |
| 2. The **prompts** match the Science and Engineering Practice (SEP) and engage students in sense making. | | | |
| 3. The **stimuli** have multiple and sufficient information needed to utilize the SEP. (e.g. multiple data sets to analyze) | | | |
| 4. The **prompts** elicit observable understanding of the Disciplinary Core Idea (DCI). | | | |
| 5. The **prompts** explicitly mention the Crosscutting Concept (CCC). | | | |
| 6. The **prompts** include language (i.e. bullets) from grade appropriate progressions. (SEP)(DCI)(CCC) | | | |
| 7. The **phenomenon** or **problem** is novel to show the transfer of knowledge. (i.e. not in the unit) | | | |

## Screening Tools

Back to Stage 2

**5-PS1-2: Conservation of Matter**

Evidence Statement

**Assessment: Diet and Regular Coke (PDF) (Google Template)**

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Using Mathematics and Computational Thinking**<br>Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.<br>• Measure and graph quantities such as weight to address scientific and engineering questions and problems. | **PS1.A: Structure and Properties of Matter**<br>• The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.<br>**PS1.B: Chemical Reactions**<br>• No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) | **Scale, Proportion, and Quantity**<br>• Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.<br>- - - - - - - - - - - - - - - - - - -<br>***Connections to Nature of Science***<br>**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**<br>• Science assumes consistent patterns in natural systems. |

**Reflections:** *Type Here*

| | No | Partial | Yes |
|---|---|---|---|
| 1. The assessment contains a **phenomenon** (science) or a **problem** (engineering) | | | |
| 2. The **prompts** match the Science and Engineering Practice (SEP) and engage students in sense making. | | | |
| 3. The **stimuli** have multiple and sufficient information needed to utilize the SEP. (e.g. multiple data sets to analyze) | | | |
| 4. The **prompts** elicit observable understanding of the Disciplinary Core Idea (DCI). | | | |
| 5. The **prompts** explicitly mention the Crosscutting Concept (CCC). | | | |
| 6. The **prompts** include language (i.e. bullets) from grade appropriate progressions. (SEP)(DCI)(CCC) | | | |
| 7. The **phenomenon** or **problem** is novel to show the transfer of knowledge. (i.e. not in the unit) | | | |

## Screening Tools

Back to Stage 2

**5-PS1-3: Material Properties**

Evidence Statement

**Assessment: Reverse Engineering a Flashlight (PDF) (Google Template)**

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Planning and Carrying Out Investigations**<br>Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.<br>• Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. | **PS1.A: Structure and Properties of Matter**<br>• Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) | **Scale, Proportion, and Quantity**<br>• Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. |

**Reflections:** *Type Here*

| | No | Partial | Yes |
|---|---|---|---|
| 1. The assessment contains a **phenomenon** (science) or a **problem** (engineering) | | | |
| 2. The **prompts** match the Science and Engineering Practice (SEP) and engage students in sense making. | | | |
| 3. The **stimuli** have multiple and sufficient information needed to utilize the SEP. (e.g. multiple data sets to analyze) | | | |
| 4. The **prompts** elicit observable understanding of the Disciplinary Core Idea (DCI). | | | |
| 5. The **prompts** explicitly mention the Crosscutting Concept (CCC). | | | |
| 6. The **prompts** include language (i.e. bullets) from grade appropriate progressions. (SEP)(DCI)(CCC) | | | |
| 7. The **phenomenon** or **problem** is novel to show the transfer of knowledge. (i.e. not in the unit) | | | |

## Screening Tools

Back to Stage 2

**5-PS1-4: Mixing Substances**

Evidence Statement

**Assessment: Self-Inflating Balloons (PDF) (Google Template)**

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
|---|---|---|
| **Planning and Carrying Out Investigations**<br>Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.<br>• Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. | **PS1.B: Chemical Reactions**<br>• When two or more different substances are mixed, a new substance with different properties may be formed. | **Cause and Effect**<br>• Cause and effect relationships are routinely identified and used to explain change. |

**Reflections:** *Type Here*

| | No | Partial | Yes |
|---|---|---|---|
| 1. The assessment contains a **phenomenon** (science) or a **problem** (engineering) | | | |
| 2. The **prompts** match the Science and Engineering Practice (SEP) and engage students in sense making. | | | |
| 3. The **stimuli** have multiple and sufficient information needed to utilize the SEP. (e.g. multiple data sets to analyze) | | | |
| 4. The **prompts** elicit observable understanding of the Disciplinary Core Idea (DCI). | | | |
| 5. The **prompts** explicitly mention the Crosscutting Concept (CCC). | | | |
| 6. The **prompts** include language (i.e. bullets) from grade appropriate progressions. (SEP)(DCI)(CCC) | | | |
| 7. The **phenomenon** or **problem** is novel to show the transfer of knowledge. (i.e. not in the unit) | | | |