

NGSS Unit Planning with UbD

Teacher Name: 5th Grade Team

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School Site: E. Hale Curran

Unit: Matter: Identifying Identifying Substances by their Properties, Module 2

NGSS Covered:

5-PS1-3 Make observations and measurements to identify materials based on their properties. Examples of materials to ID include: baking soda, other powders, metals, minerals, and liquids. Properties include: color, hardness, reflectivity, electric properties (electrical conductivity), heat properties (thermal conductivity), response to magnetic forces, and solubility. Assessment does not include density or distinguishing mass and weight.

Disciplinary Core Ideas: PS1.A- Structure and Properties of Matter: Measurements of a variety of properties can be used to identify materials.

Crosscutting Concepts: Scale Proportion, and Quantity: Standard units are used to measure and describe physical quantities such as weight, time, temperature and volume.

CCSS ELA Covered:

CCSS.ELA-LITERACY.RI.5.2

Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

CCSS.ELA-LITERACY.RI.5.4

Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

CCSS.ELA-LITERACY.RI.5.5

Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.

CCSS.ELA-LITERACY.RI.5.7

Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

CCSS.ELA-LITERACY.RI.5.9

Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

CCSS.ELA-LITERACY.W.5.1.B

Provide logically ordered reasons that are supported by facts and details

CCSS.ELA-LITERACY.W.5.2

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-LITERACY.SL.5.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.5.1.A

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

CCSS.ELA-LITERACY.SL.5.1.C

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

CCSS.ELA-LITERACY.SL.5.1.D

Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

CCSS Mathematics Covered:

CCSS.MATH.CONTENT.5.MD.A.1

Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Represent and interpret data.

CCSS.MATH.CONTENT.5.MD.B.2

Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.

Note: This module should take about 10 to 14 days

Understanding by Design NGSS Unit Plan

Stage 1: Desired Results

Understand

1. Substances have characteristic properties.
2. Properties are used to identify substances.

VOCABULARY

Matter, property, characteristic, physical property, chemical property, substance, solid, liquid, gas, color, texture, shape, hardness, magnetic forces, heat properties, vinegar (acid), iodine (color), electrical properties, solubility, reflectivity

Essential Question(s)

1. How can you make accurate predictions about unknown substances based on your knowledge of the properties of matter?
2. Why do you think investigating properties of matter might be useful in the real world?

Stage 2: Evidence/Assess

Know

- Properties describe things (matter).
- Matter can be described by its characteristics or properties.
- Properties of matter can be physical or chemical.
- Physical properties can be measured or observed without changing the matter into something else (without changing its identity). Examples include: state of matter, color, shape, texture, solubility (what happens when it is mixed with water).
- Chemical properties describe the ability of matter to react or combine with other matter to form a new substance (other types of matter). These can be hard to observe. For example...What happens when tested with: vinegar – does it bubble and/or fizz? What happens when tested with: iodine – does it produce a color change?
- Certain properties are unique (or special) to specific things.
- Physical and Chemical Properties can be used to identify matter and substances.

Do

Students will investigate properties of solid substances. Students will learn about properties of liquids and gases. Students will apply their knowledge of substance properties to identify unknown substances.

Stage 3: Learning Plan

How

Engage: Review the definition of matter. Review the states of matter. Have student write down the essential questions in their notebooks and let them discuss in their groups the questions and write down their thoughts. Have a quick class discussion on the questions as well as what they have already learned about the states of matter. Watch the Discovery Education video, “Matter: Forms and Substance in the Universe”

Explore: In small Groups of 2:

Groups will receive small bags containing images of different shoes. Groups will be asked to sort or classify the shoes. (MATERIALS – small bags, laminated set of cards with shoe images, record sheet) Whole Group – following small group activity discuss the different ways that groups classified or sorted their shoes. Create a cumulative list. (MATERIALS – chart paper, whiteboards) Return to Small Groups. Have student groups sort their shoes in a new way. (MATERIALS – (same as before) small bags, laminated set of cards with shoe images, record sheet) Whole Group – following 2nd round of small groups Discuss if groups were able to sort by using the new categories. Discuss the idea that shoes could be sorted using more than one classification. Ask students to think of a scientific name that describes all the different categories/classifications that were used. Lead them to the vocabulary word of PROPERTY. (MATERIALS – chart paper, whiteboards)

Explain: Have students write down the vocabulary in their notebooks. Give them time in groups to discuss the words. Use the following books from Science A to Z; Anchor text: Mixing Matter, Focus books: The Chemistry of Art, The Science of Baking, The Science of Lemonade, Dmitri’s Table, and Curious Marie Curie. Let groups (4 to 5) rotate to each book. Have them read the book and together discuss and answer the focus questions. Groups will then move to the next book and do the same thing. During this time, students should have their vocabulary list out and when they find the definition or figure out what the word means write it in their notebook. Students also can use the short articles in Science A to Z Investigation Pack. They can use the Symbaloo page to help them answer any questions they still have.

Elaborate: In groups students will perform the following experiment: Students will use their observation skills to identify properties of a variety of materials. Mystery Powder Investigation:

Materials: Mystery Matter student record sheet, Safety Goggles, Small clear cups, Post-it notes, Wooden stir sticks, toothpicks, Dropper bottles, Wooden clothespin, Hand lenses, Spoons, Newspaper, Sponges, Paper towels, chemistry reaction plates, Iodine, Water, Vinegar Heat source: hot plate, candles, or Sterno

Substances: salt, sugar, baking soda, cornstarch, plaster of paris, aluminum (tin foil), iron (nails), copper (pennies), granite (rock), lead (fishing line weights), limestone (rock), styrofoam (cup), wood

Procedure:

1. Review previous information on properties of matter by showing the following video clips from Discovery Education. a. Discovery Education website – Video segments #2 and #3 –

<http://app.discoveryeducation.com/search?Ntt=chemical+and+physical+properties+of+matter>

2. Introduce Mystery Powders by telling students that over the course of the next few days they will become detectives. Explain

Students will be developing experiments in order to crack the case of “Mystery Matter”. Show students the unknown substances and let them speculate what they think they might be. Warn students of the dangers of tasting unknown substances.

3. Property of Color: Students record the color that the matter resembles.
4. Testing with Magnet: Students put a small sample of the powder in a testing container. They use a magnet to test for attraction.
5. Testing with Heat: Now that students have become familiar with the powders, they can try a few more tests. To complete the heat tests I would set-up one teacher station, and students will record the results they observe on their recording sheet. I will use a hot plate, candles, or cans of Sterno. Put the powder in a little cup made from aluminum foil and hold it over the heat source with a wooden clothespin. Heat the powders for a few minutes, or until no more changes occur. If you like, you can demonstrate how caramel is made by melting sugar in a pan. When it turns brown pour it into cups to harden and the students can enjoy a candy treat! There will be no change for the baking soda and plaster of paris. The cornstarch will turn brown and smell like burnt toast. Sugar will melt, bubble, smoke, caramelize, turn black, and finally harden. The heat test is a good one to detect sugar.
6. Mixing with Water: Students will mix each of the mystery powders with water to discover what happens. They will record their observations on the recording sheet. Encourage students to try different amounts of water to see the difference in results. Share results of water tests. Results should include: baking soda turns a milky color and gets sticky, sugar dissolves, cornstarch turns to a soft solid, salt dissolves, and plaster absorbs water and hardens.
7. Testing with Vinegar: Just like with the iodine tests, distribute little cups with each of the powders. Have students add a few drops of vinegar to each cup and record their observations on the recording sheet. The results include: cornstarch thickens like glue, then hardens, baking soda fizzes, foams, bubbles, and makes noise, sugar partially dissolves, plaster bubbles, melts, hardens, and salt shows no change.
8. Testing with Iodine: For the iodine tests, have students cover their desks with newspaper for easier clean-up. Have students put a little of each powder, some diluted iodine in a dropper bottle, and toothpicks for mixing. Students (in pairs) will then drop iodine on each of the mystery powders. They will record their reactions on the recording sheet. The results for the iodine testing include plaster turning a mustard yellow color, baking soda turns brown, cornstarch starts out red, then ends black, sugar turns purple, and salt turns multi-colored. There may be some disagreement about which powders change since only a small amount of starch is necessary to give a black color, some contamination may occur from mixing up the mixing sticks.

Let groups discuss their results and how it relates to scale, proportion, and quantity. How does this investigation relate back to the first module about the States of Matter? How does scale, proportion, and quantity relate to Matter's properties?

Evaluate: In their groups have students create an explanatory model (poster) documenting the process of their investigation. Their model should explain their findings and answer the essential questions. Their model should include a title, labels, and some form of chart, graph, table, or diagram. When done, each group will switch models with another group for evaluation and critiquing. Students can use stickies to add suggestions, comments, and questions to the other group's model. Then groups will switch back and evaluate the feedback. Give time for groups to revise their posters before sharing out.

Stage 4: Transfer

Knowledge Transfer

Crosscutting Concept:

Scale Proportion, and Quantity: Standard units are used to measure and describe physical quantities such as weight, time, temperature and volume.

Challenge students to identify where else scale, proportion, and quantity are important in other domains. For example: In the first module, solids can be broken into smaller particles. How could that scale and proportion be significant to us in our everyday life? Does the quantity change when particles change size? How does this change at different scales?