Unit 2- Structure & Properties of Matter

Content Area: **Science**
Course(s): **Science 2**
Time Period: **MP2-3**
Length: **MP 2**
Status: **Published**

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Lesson 1: Anchoring Phenomenon- How do we play with toys?

- Phenomenon- Observing and building toys can inform engineering for a new toy.
    - Read a book about different toys around the world.
    - Discuss how the toys can be played with and discuss the materials the toys are made of.
    - Start to build a toy for our classroom.
    - Recognize we need to figure out more about other objects we could possibly build with.

Lesson 2: Investigation- What do we notice about different objects and the materials they are made of?

- Phenomenon- Materials can be similar and different in many ways.
    - Observe objects we can use in our toy designs.
    - Investigate the properties of materials.
    - Identify if the properties of the materials are similar or different.
    - Use infographics to find out more about other properties.

Lesson 3: Investigation-How can we use the properties of materials to decide what we need for our toy?

- Phenomenon- Properties of a material are suited for different purposes.
    - Organize data collected from testing objects of various materials.
    - Analyze data to identify the similar and different properties of objects.
    - Read about combining different materials in different ways to make something new.
    - Identify properties needed for our toy.

Lesson 4: Investigation- How can we change objects and materials so we can better use them to build our toys?

- Phenomenon- Materials can be changed in different ways.
    - Use our design sketches to build our toys.
    - Read a book about changes caused by heating and cooling to begin to distinguish different changes to materials.
    - Describe how we disassembled and reassembled materials or objects.

- Discuss how the properties of materials stay the same when we disassemble them.

Lesson 5: Investigation- What happens to materials when they are heated or cooled?

- Phenomenon- When materials are heated or cooled they change in different ways.
    - Read a book about changes caused by heating and cooling.
    - Record observations about reversible and irreversible changes.
    - Argue from evidence that a reversible or irreversible change took place.

Lesson 6: Putting Pieces Together- How can we choose which materials to use for our toys?

- Phenomenon- Engineers use argumentation to figure things out and to explain their thinking.
    - Read a book about argumentation.
    - Write an argument about how a hot glue gun heating glue is a reversible change.
    - Participate in a Consensus Discussion about using argumentation to choose materials.
    - Write an argument about the materials to use in the toy design solution.

Lesson 7: Investigation- How can we use kindergartners' interests to design toys?

- Phenomenon- Kindergartners want new toys.
    - Interview kindergarten students.
    - Develop a new toy design based on kindergartners' interests.

Lesson 8: Investigation- How can we use our design sketches to build a toy?

- Phenomenon- Toy designers use plans to build design solutions.
    - Build toys.
    - Read a book about how toy designers build, test, and share their toy designs.

Lesson 9: Investigation- How can we finalize our toy designs?

- Phenomenon- Designs can be improved.
    - Share toys with peers to test and give feedback.
    - Use peer feedback to revise our designs to improve the toys.

Essential Questions

- What are the different properties of matter?
- What are the differences between a solid, a liquid and a gas?

- How can a substance change?

Big Ideas

At the beginning of the unit, students learn that they have the opportunity to add new toys to their classroom. In this unit, 2nd graders use the engineering design process to design and build a new toy for their classroom as well as for a kindergarten classroom. In Lesson 1, they begin by exploring toys and what it means to use engineering to solve problems and make things better. To inform their toy designs, in Lessons 2-6, students plan and carry out investigations to determine the properties of different materials, the purpose of those properties, and how materials can change when disassembling, reassembling, heating, or cooling. In Lesson 7 students find out that kindergartners are wanting new toys for their classroom too! They continue their engineering design by interviewing kindergartners to determine the needs for the toy design. In Lessons 7-9, students build on what they figured out about materials, properties, and how materials can change, to build, test, gather peer feedback, and revise the toys they are making for the kindergartners. Finally, in Lesson 10, students give their toys to the kindergarteners to enjoy!

Cross Curricular Integration

Integration Area: Math

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems using information presented in a bar graph.

Activity: Students will explore various objects from each state of matter and sort them accordingly. Students will then analyze the data and graph to match.

CSDT Technology Integration

8.1.2.DA.1: Collect and present data, including climate change data, in various visual formats.

8.1.2.DA.4: Make predictions based on data using charts or graphs.

Activity:

Mystery Science lesson Why Do We Wear Clothes? This is a lab. The students will complete a lab using the

guided video process to explore the mystery.

Science and Engineering Practices

Asking Questions and Defining Problems:

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.

Planning and Carrying Out Investigations:

- With guidance, plan and conduct an investigation in collaboration with peers (for K).
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences..

Analyzing and Interpreting Data:

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.

Engaging in Argument from Evidence:

- Construct an argument with evidence to support a claim.

Science and Society

Susan Hendrickson

Paleontologist who has a Tyrannosaurus Rex named after her.

Enduring Understandings

Next Generation Standards

2:PS1: Matter and Its Interactions

- 2-PS1-1- Plan and conduct an investigation to describe and classify different kinds of materials by their

observable properties.

    - 2-PS1.A: Structure and Properties of Matter
        - Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.
        - Different properties are suited to different purposes.
        - A great variety of objects can be built up from a small set of pieces.

- 2-PS1-2- Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- 2-PS1-3- Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
- 2-PS1-4- Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot
    - 2-PS1.B: Chemical Reactions
        - Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.
- K-2-ETS1-1- Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool.
    - 2-ETS1.A: Defining and Delimiting Engineering Problems:
        - A situation that people want to change or create can be approached as a problem to be solved through engineering.
        - Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool.
        - Before beginning to design a solution, it is important to clearly understand the problem.
- K-2-ETS1-2- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- Developing Possible Solutions:
    - 2-ETS1.B: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.
- K-2-ETS1-3-Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
    - Optimizing the Design Solution:

- 2-ETS1.C: Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

Focus Areas

Knowledge

- Properties of matter such as strength, hardness, flexibility and texture.
- What materials are best suited for different purposes.
- An object built out of a small set of pieces can be deconstructed and built into a different object.
- Properties of solids, liquids, and gas.
- Some substances can experience reversible changes and some cannot.

Skills

- Determine different properties of objects.
- Group objects according to their properties.
- Construct an object out of a small set of pieces.
- Conduct experiments to change the state of liquids and solids.

Understandings

- Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
- Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

Climate Change

Technology: Cross-Curricular

8.1.2.DA.1: Collect and present data, including climate change data, in various visual formats.

- Activity: Mystery Science lesson Why Do We Wear Clothes? This is a lab. The students will complete a lab using the guided video process to explore the mystery.

Resources

Primary Resources

- Mystery Science

Supplemental Resources

Scott Foresman Science, Pearson, 2008

- Chapter 8, Properties of Matter

Leveled Reader

- Matter

Scientific Inquiry

Core

- Why do we wear clothes? Lab
- Can you really fry an egg on a hot sidewalk? Lab
- Why are so many toys made out of plastic? Lab
- Oobleck Activity

Supplemental

- BrainPop Jr. Video and Activity
- Scholastic Science Spin Magazines
- Discovery Education Videos
- Matter Interactive Notebook Pages
- States of Matter QR Codes