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2nd Grade Exemplar Lesson - CCSD MSP

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NGSS Exemplar Lesson

Material Properties and Assembly

Essential Question: How can structure and function determine what material I use?

Unit Summary: The purpose of this unit is to expose students to the notion that materials have different properties and that these materials can be used to create a variety of different objects depending on the purpose of construction. This will be done by designing train car containers specific to a certain community member's resource needs using Legos and/or K-nex.

- **Lesson 1**: The unit begins with an exploration of different properties of materials.
- **Lesson 2**: Continued exploration focused on the different ways in which those materials can be used to construct objects.
- **Lesson 3:** The two explorations are connected to the idea of community partners by looking at what materials/design could be used to transport their needed resources.
- **Lesson 4-5:** Students will be given the role of a specific community partner and be tasked with designing a train car box that will effectively transport their resource. In small groups, they will draw a blueprint and then construct it with Legos and/or K-nex. The emphasis will be on students' ability to support their design and material selection with evidence and reasoning.
- **Lesson 6:** The unit will end with a student discussion comparing model designs and reasoning behind design and material selection. The unit should end with a review of big takeaways.

Lesson 1 of 6: Introduction to properties of matter & engineering

Standards

2-PS1: Matter and Its Interactions
K-2-ETS1: Engineering Design

Performance Expectations

The lesson outlined in this table is just one step toward reaching the performance expectations listed below

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.

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Dimension	Name and NGSS code/citation	Specific Connections to Classroom Activity
Science and Engineering Practices	**SEP 6: Constructing Explanations** • Make observations from several sources to construct an evidence-based account for natural phenomena (2-PS1-3) **SEP 1: Asking Questions** • Ask questions based on observations to find more information about the natural and/or designed world(s) (K-2-ETS1-1)	Given different classroom scenarios, students will identify what the problem is, make observations about the materials available to solve the problem, and ask further questions based on their observations.
Disciplinary Core Ideas	**Structure and Properties of Matter (2-PS1-2)** • Different properties are suited to different purposes **Defining and Delimiting Engineering Problems (K-2-ETS1-1)** • Asking questions, making observations, and	Students will discuss why they thought one material would work better than another to solve each problem based on the properties of the chosen material (rigid, flexible,

	gathering information are helpful in thinking about problems	hard, soft, and breathable).
Crosscutting Concepts	**CCC 6: Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function (K-2-ETS1-2)	Students will choose materials to address the problems they identify in each scenario based upon their structure and function.
Connections to Engineering, Technology, and Applications of Science: • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world (2-PS1-2)		*This was not addressed explicitly in this lesson, however the teacher could ask students to brainstorm how different materials, such as denim fabric or Velcro were derived from the natural world.

Connecting to the Common Core State Standards

CCSS.ELA-Literacy.W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

Students will gather information from the three classroom scenarios to identify each problem, make observations, and ask questions that could help solve the problems.

Suggested Procedure:

ACTIVITY 1 (targets SEP1/SEP6):

- **Review from previous lessons:** What is a property? What are some different properties we have learned about?

- Explain that when faced with a problem (any situation that people want to change or create) **engineers ask questions, make observations, and gather information**. Can you think of a time you asked questions, made observations, or gathered information? Have students share their ideas and write these on the board/anchor chart. (SEP 1)
  - → What did you do with that information? Did it help you solve a problem? (K-2-ETS1-1)
  - → If student provides applicable example, extend by asking if another material would have worked/not worked and why. (2-PS1-2)

- Explain that students will be given different scenarios and for each they will need to **identify what the problem is, make observations** about the materials available to solve the problem, and **ask further questions**.

  Make explicit that it is essential to **clearly understand the problem before beginning to design a solution.** Why might that be?

ACTIVITY 2 (targets SEP1, SEP6, K-2-ETS1-1):

- Pass out the data table worksheets and use the PowerPoint to model what you expect students to do for each scenario (have the data table under a document camera so that you can model filling this in and have students fill it in as well). Present the scenario with a picture, identify the problem, make observations about the materials available, and ask further questions.

Example: Hole in jeans (flexible material)

Scenario	Identify the Problem	Make Observations	What material would NOT work? Why?	Ask Questions
Holy Jeans	Ex: There is a hole in	Fabric and		How could you attach either

	my jeans	cheesecloth are both soft and flexible.		material to the jeans?
Difficult Door				
New Classroom Pet				

- Have students work in pairs on each of the two scenarios described below (you can project these or print them for student pairs). Have students spend around 8 minutes working on each scenario identifying the problems, making observations about the materials available, and asking further questions.

- Difficult door (hard, heavy material)
- Classroom pet lid (breathable material)

* You can come up with other scenarios and/or materials that would work for your classroom.

ACTIVITY 3 (targets SEP 6, CCC 6, 2-PS1-2, K-2-ETS1-1):

- After students have completed each scenario and filled out their data tables have them come back altogether as a class to **discuss the information they gathered**. Make sure you discuss these points:

- For each scenario ask why students thought one material would work better than another to solve the problem. **What property did the chosen material have**? Introduce the vocabulary: **rigid, flexible, hard, soft, and breathable** as students discuss each scenario. (SEP 6, CCC 6, 2-PS1-2, K-2-ETS1-1)
- When or why might you need a rigid material or soft material? (CCC6)
- Have students define these new vocabulary terms in their own words with their partners.

Exit Slip: Have students describe one of the new properties discussed in their own words.

*The formatting of this table is based off the format used in *The Science Teacher*.