

### **3.C.6 Making a Rock and Mineral Collection**

*A hands-on introduction to building an organized rock and mineral collection*

<b>Grade Level</b>	3
<b>Sessions</b>	(1): 1 at 60 minutes
<b>Seasonality</b>	None
<b>Instructional Mode(s)</b>	Whole Class, Small Groups
<b>Team Size</b>	2-4 students
<b>WPS Benchmarks</b>	03.SC.TE.01, 03.SC.TE.03, 03.SC.TE.04, 03.SC.IS.01, 03.SC.IS.02, 03.SC.ES.03, 03.SC.ES.04, 03.SC.ES.05
<b>MA Frameworks</b>	3-5.TE.1.1, 3-5.TE.2.1, 3-5.ES.0.1, 3-5.ES.0.2, 3-5.ES.0.3
<b>Key Words</b>	Collection, Mineral, Rock

### **Summary**

This lesson will extend students' understanding of rocks and minerals; students will create a rock collection and design an enclosure for these rocks using classroom materials.

### **Learning Objectives**

*2002 Worcester Public Schools (WPS) Benchmarks for Grade 3*

1. 03.SC.TE.01 Identify materials used to accomplish a design task based on a specific property, e.g., weight, strength, hardness, and flexibility.
2. 03.SC.TE.03 Identify a problem that reflects the need for shelter, storage, or convenience.
3. 03.SC.TE.04 Describe different ways in which a problem can be represented, e.g., sketches, diagrams, graphic organizers, and lists.
4. 03.SC.IS.01 Ask questions and make predictions that can be tested.
5. 03.SC.IS.02 Select and use appropriate tools and technology (e.g., calculators, computers, balances, scales, meter sticks, graduated cylinders) in order to extend observations.
6. 03.SC.ES.03 Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties.
7. 03.SC.ES.04 Acquire a collection of minerals that includes a) duplicates of the same mineral, somewhat different in appearance (size, shape, exact color) and b) samples of minerals that look similar but are actually different. Examine minerals using a hand lens. Look for and record similarities and differences such as heaviness, color, texture,

crystal shapes, luster, surface patterns, etc. Sort as accurately as possible. Report total number of different minerals present, and how many duplicates, if any, of each type.

8. 03.SC.ES.05 Examine rocks collected from the schoolyard or a field trip location, or brought in from home. Sort rocks into igneous, metamorphic, or sedimentary based on their physical properties.

### *2001 Massachusetts Frameworks for Grade 3*

1. 3-5.TE.1.1 Identify Materials used to accomplish a design task based on a specific property, i.e. weight, strength, hardness, and flexibility.
2. 3-5.TE.2.1 Identify a problem that reflects the need for shelter, storage, or convenience.
3. 3.5.ES.0.1 Give a simple explanation of what a mineral is and some examples, e.g., quartz, mica.
4. 3-5.ES.0.2 Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties.
5. 3-5.ES.0.3 Identify the three categories of rocks (metamorphic, igneous, and sedimentary) based on how they are formed, and explain the natural and physical processes that create these rocks.

### **Additional Learning Objectives**

1. Students will improve organizational skills by creating and arranging a rock and mineral collection.

### **Required Background Knowledge**

1. A solid understanding of rocks and minerals, and their respective identification (see lessons 3.C.4 Minerals: Observe and Identify and 3.C.5 Rocks: Observing Properties).

### **Essential Questions**

1. What are some properties of rocks?
2. What are some properties of minerals?
3. What are the differences between rocks and minerals?

4. How can various rocks and minerals be organized?

### **Introduction / Motivation**

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The instructor may explain to students that they will create collections of rocks and minerals and will design an enclosure to organize these rocks and minerals. Students may wish to share ideas about why the creation of an organized rock collection is important and how they might approach this task.

### **Procedure**

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The instructor will:

1. *Ask students to bring to class three to five rocks from home for homework.*
2. Divide students into pairs or small groups.
3. Remind students of the simplified Engineering Design Process (see Appendix A: The Engineering Design Process and the worksheet, Rock and Mineral Collection) and encourage them to use it as they think about how to organize and store their rock and mineral collections.
2. Ask students to organize the three to five rocks that they have brought from home, drawing on their knowledge from previous lessons (ex. color, hardness, luster, cleavage, streak, texture, etc.).
4. After students have organized their rocks, ask them to design a container to store their rocks in an organized fashion using cardboard boxes or egg cartons (see worksheet, Rock and Mineral Collection).
5. Provide students with adequate time to build their containers.

### **Materials List**

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<b>Materials per Class</b>	<b>Amount</b>	<b>Location</b>
Stapler	One	Classroom
Tape	One	Classroom
Small/Large Lightweight Cardboard Boxes	Assorted	Recycle bin
Popsicle Sticks	Large Quantity	Craft Store
Egg Cartons	Assorted	Recycle bin

<b>Materials per Student</b>	<b>Amount</b>	<b>Location</b>
Rocks	Three to five	Student's home
Glue	One per Group	Classroom
Magnifying Glass	One per Group	Classroom

### **Vocabulary with Definitions**

1. *Cleavage* – the pattern that results when a mineral is broken.
2. *Hardness* – the ability of a mineral to scratch another material or be scratched by another material.
3. *Igneous* – rocks formed from magma that has solidified beneath the Earth's surface.
4. *Luster* – describes the way light reflects off the surface of a mineral (ex. dull, waxy, greasy, oily, pearly, silky, glassy, resinous, metallic).
5. *Magma* – molten rock.
6. *Metamorphic* – rock formed when igneous or sedimentary rocks have been subjected to heat and pressure usually from the Earth's crust.
7. *Mineral* – a naturally occurring, inorganic substance that has specific identifiable characteristics (ex. coal, calcite, diamond, quartz, gold, carbon, salt).
8. *Rock* – a lump or mass of hard consolidated mineral matter (ex. granite, limestone, slate).
9. *Sedimentary* – rock formed from layers of material that have accumulated and hardened over time.
10. *Streak* – the color of a mineral's powder tested by scratching it across a streaking plate.
11. *Streak Plate*: a porcelain plate used to test the streak of a mineral.

### **Assessment / Evaluation of Students**

The instructor may assess the students in any/all of the following manners:

1. Observe student groups at work and ask students why they chose the materials that they did.
2. Collect students' rock and mineral collections and evaluate the organization of the collection and the durability of the container.
3. Ask students to present their designs to the class and to describe their collections.
4. Ask students to demonstrate their container's durability.

### **Lesson Extensions**

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1. Consider teaching lessons [3.C.7 Soil: Water Retention](#) and [3.C.8 Soil Composition](#).

### **Attachments**

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1. [Appendix A: The Engineering Design Process](#)
2. [Rock and Mineral Collection](#)

### **Troubleshooting Tips**

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1. To be determined

### **Safety Issues**

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None

### **Additional Resources**

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1. Good background on the differences between rocks and minerals <http://www.rocks-and-minerals.com/> (accessed 5 January 2006).

# Rock and Mineral Collection

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## The Engineering Design Process



The Engineering Design Process for Children: <http://www.mos.org/doc/1559> (accessed 7 February 2006)

### 1. Ask –

What do I want to build? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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**2. Imagine –**

Imagine that you are exploring your backyard for different kinds of rocks and minerals. How would you store them safely as you move around your yard?

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How would you organize your rocks and minerals in your container? (Hint: Think of some of the properties you used to identify your rocks and minerals.)

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Read the list of materials below. Think about which materials you would like to use to construct your container. Beside the materials that you **will** use, write **why** you will use them. If you wish, space is provided for you to choose two additional materials that are not listed on this chart and that you have in your classroom.

<b>Material</b>	<b>Why will you use the material to construct your rock and mineral container?</b>
Cardboard Box	
Egg Carton	
Clear Tape	
Popsicle Sticks	
Glue	


**3. Plan –**

On a separate sheet of paper, draw a picture of the rock and mineral container you would like to build. Beside each part, write which material you will use to make that part of the model. Use the chart of materials above when you plan. Be sure to indicate where you will put your rocks and minerals.

**4. Create –**

Collect the materials that you need and then construct your model.

Are there any problems with your design? If so, what are they?

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## Appendix A: The Engineering Design Process

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“The Engineering Design Process for Children” and associated text comes directly from: <http://www.mos.org/doc/1559> (accessed 7 February 2006).

### The Engineering Design Process



“The Engineering Design Process is a series of steps that engineers use to guide them as they solve problems. Many variations of the model exist. While having a guide is useful for novices who are learning about engineering, it is important to note that practicing engineers do not adhere to a rigid step-by-step interpretation of the process. Rather there are as many variations of the model as there are engineers. Because our curriculum project focuses on young children, we have created a simple process that depicts fewer steps than other renditions and that uses terminology that children can understand. The engineering design process is cyclical and can begin at any step. In real life, engineers often work on just one or two steps and then pass along their work to another team.”

“A few questions can guide students through each of the steps:

“ASK

- What do I want to do?
- What is the problem?
- What have others done?

“IMAGINE

- What could be some solutions?

- Brainstorm ideas.
- Pick one to start with that you think will work the best.

#### “PLAN

- Draw a diagram of your idea.
- Make lists of materials you will need to make it.
- Decide how it works. How will you test it?

#### “CREATE

- Build a prototype.
- Test it.
- Talk about what works, what doesn't, and what could work better.

#### “IMPROVE

- Talk about how you could improve your product.
- Draw new designs.
- Make your product the best it can be!”