

Delaware Science Coalition



Grade 3 Earth Materials Unit Template



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Preface: This unit has been created as a model for teachers in their designing or redesigning of course curricula. It is by no means intended to be inclusive; rather it is meant to be a springboard for teacher thought and creativity. The information we have included represents one possibility for developing a unit based on the Delaware content standards and the Understanding by Design framework and philosophy.

Brief Summary of Unit

Students investigate the physical properties of rocks and minerals. They observe and sketch rocks and minerals and begin to understand how rocks and minerals are different. Tests are conducted to determine the physical properties of minerals including hardness, luster, color, and reaction to acid. Using the acid test to determine if calcite is present, students examine rocks that may contain the mineral calcite. Lastly, students observe a rock and attempt to determine the component minerals. Students transfer knowledge and skills learned in the final assessment in deciding upon a good rock or mineral choice for an outside statue.

Stage 1: Desired Results **Delaware Science Content Standards**

Delaware Science Content Standards

This course focuses on the Delaware Science Content Standards and Grade Level Expectations in Standards 1 and 5 found on the following web site: http://www.doe.k12.de.us/programs/ci/content_areas/science.shtml

Standard 1- Nature and Application of Science and Technology

Understanding and Abilities of Scientific Inquiry

Students should know and be able to:

1. Understand that: Scientific investigations, whether conducted by students or scientists, involve asking a question about the natural world.
 - Be able to: Generate questions and predictions using observations and exploration about the natural world.
3. Understand that: The purpose of accurate observations and data collection is to provide evidence. Scientists use tools to enhance their senses in order to obtain more evidence.
 - Be able to: Collect data using observations, simple tools and equipment. Record data in tables, charts, and bar graphs. Compare data with others to examine and question results.
4. Understand that: Scientists use observations from investigations and knowledge that is already known to develop an explanation.
 - Be able to: Construct a simple explanation by analyzing observational data. Revise the explanation when given new evidence or information gained from other resources or from further investigation.
5. Understand that: The purpose of communicating with others is to share evidence and conclusions. Scientists communicate the results

of their investigations to others.

- Be able to: Share simple plans, data, and explanations with an audience and justify the results using the evidence from the investigation.

6. Understand that: The use of mathematics, reading, writing, and technology are important in conducting scientific inquiries.

- Be able to: Use mathematics, reading, writing, and technology when conducting an investigation and communicating the results.

Science, Technology, and Society

Students should know that:

1. People have invented new technologies to solve problems.

Students should be able to:

- Identify rocks and minerals as natural resources and list ways that humans use these resources to meet needs and wants (i.e., fluorite for toothpaste, marble for statues).

Students should know that:

2. Tools are useful in science to help gather data for observations and measurements and provide a safe means of conducting an investigation.

Students should be able to:

- Describe the changes to the environment that result from humans obtaining rock and mineral resources (e.g., strip mining).

Standard 5: Earth's Dynamic Systems

Components of Earth

Students should know that:

1. Components of Earth's system include minerals, rocks, soil, water and air. These materials can be observed, sorted and/or classified based on their physical properties.

Students should be able to:

- Examine rocks in order to observe their composition and describe the many components found in rocks.
- Identify minerals as materials that cannot be physically broken apart any further and may be a rock component.
- Sort and group an assortment of minerals based on similarities and differences in their physical properties.

Students should know that:

6. Rocks are natural combinations of minerals. Minerals can be classified according to their physical properties (i.e., luster, color and hardness).

Students should be able to:

- Sort and group minerals based on the physical properties of hardness, color, luster, and reaction to vinegar (weak acid). Use

these properties to identify common minerals (quartz, fluorite, calcite, and gypsum).

Technology Applications

Students should know that:

1. Earth materials can be observed and described using simple tools (e.g., hand lens and balances).

Students should be able to:

- Examine an assortment of rocks and use appropriate measuring tools (balances, meter tapes, syringes) to gather data about the rocks' physical properties (length, circumference, weight).
- Identify rocks and minerals as natural resources and list ways that humans use these resources to meet needs and wants (i.e., fluorite for toothpaste, marble for statues).

Big Ideas

Observation and evidence (students observe rock and mineral samples and collect evidence to identify each)

Properties and function (physical properties of rocks and minerals determine their function)

Investigations (scientifically investigating rocks and minerals will lead to more information about each)

Unit Enduring Understandings

Students will understand that...

Rocks and minerals have observable properties. These properties can be used to compare, sort, and classify the rocks and minerals.

Simple tools are used to determine the physical properties of rocks and minerals.

People use rocks and minerals to meet their wants and needs. Often the use of the rock or minerals is determined by its physical properties.

Unit Essential Question(s)

How are properties used to identify, sort, and classify rocks and minerals?

What kind of simple tools are used to help determine the properties and how are the tools used?

How does acid rain affect rocks that contain calcite? What kinds of rocks would be a good choice for building material? Why?

Knowledge & Skills

Students will know....

- Properties of rocks include shape, size, color and texture. These properties can help identify, sort, and classify rocks.
- Rocks are made of minerals and other things.
- Minerals are a basic building block of rocks. Minerals cannot be broken down any further.
- Water can break rocks apart and dissolve some minerals. Evaporation is a process used to separate the minerals from the water.
- Minerals have properties that are used in identification. These include crystal shape and size, hardness, luster, color, and reaction to acid.
- A particular property of the mineral calcite is that it fizzes when in acid. This property is used to identify rocks that contain calcite.
- Fizzing evidence shows that marble and limestone contain calcite.

Skills:

- Observe and compare rocks and minerals.
- Use tools to collect data on rocks and minerals.
- Investigate the hardness of minerals and place minerals in order according to their hardness.
- Investigate the color, luster, texture, and crystal shape of minerals. Use the data to compare minerals.
- Identify rocks and minerals according to their physical properties.
- Investigate rocks to determine if they contain calcite.
- Investigate rocks to determine their mineral composition.
- Justify the identification of rocks and minerals using evidence.
- Share and compare data.
- Communicate the results of investigations.

Stage 2: Assessment Evidence
(Design Assessments To Guide Instruction)

Suggested Performance Task(s)

Earth Materials assessment for grade three can be found at:

http://www.doe.k12.de.us/programs/sci_assess/default.shtml

Key Transfer Ideas:

- Rocks are made of many ingredients, including minerals. Minerals are made of just one ingredient.
- Rocks and minerals can be sorted by using their physical properties.
- Color, luster, texture, and hardness, and reaction to acid are properties of minerals.
- Tools such as a hammer, nail, water, and evaporating dish can be used to help identify the ingredients in rocks.
- Acid is used to identify the presence of calcite.

Expectations of students:

- Explain the difference between a rock and a mineral.
- Separate rocks from minerals according to their appearance.
- Identify tools and describe how the tools are used to identify the ingredients in rocks.
- Observe and describe the color, luster, texture, hardness, and reaction to acid of minerals.
- Conduct the scratch test.
- Record data in a table or chart.
- Perform the vinegar test. Identify rocks that contain calcite.
- Determine which rock sample would make a good outside statue.

Rubrics/checklists for Performance Tasks

Earth Materials assessment rubrics for grade three can be found at:

http://www.doe.k12.de.us/programs/sci_assess/default.shtml

Other Evidence

Formative assessment:

Rubric to use with the student notebook:

4: Student work is above and beyond the expectations.

3: Student work is complete and correct.

2: Student work is incomplete.

1: Student work is incorrect.

0: There is no student response.

Investigation #1:

- Teacher observation of Earth Materials student notebook page 2: Student drawing should be the correct size, shape, color, and contain surface detail. The magnified view should match the detailed drawing, only larger.
- Teacher observation of Earth Materials student notebook page 3: Student measurements should be correct, using the correct metric units (centimeters, grams). Other measurements should include mass in grams.
- Teacher observation of Earth Materials student notebook page 4: Student observations should include the materials or “evidence” found within the mock rock including red and green pieces, shells, and a dough-like mixture.
- Teacher observation of Earth Materials student notebook page 5: Student observations of the vials before and after settling should include color, particle size, and details. It should note the mixture as a cloudy mass before settling and as distinct layers after settling.
- Teacher observation of Earth Materials student notebook page 6: Student drawing of the evaporating dish should look similar to the actual dish including color, particle size, shape, and surface detail. Explanation for what is seen should include evidence.
- Teacher observation of Earth Materials student notebook page 7: Student explanation of how a mock rock is like a real rock should refer to the fact that rocks are made of many different ingredients. The mock rock had many different ingredients including red and green gravel, shells, and dough.

Investigation #2:

- Teacher observation of Earth Materials student notebook page 8: Student observations of each mineral should be detailed. Written observations should include color, luster (metallic or non-metallic- shiny, oily, earthy, dull), texture (rough, smooth), and other interesting observations such as edges.
- Teacher observation of Earth Materials student notebook page 9: Student data should be accurate for the scratch test.

Investigation #3:

- Teacher observation of Earth Materials student notebook page 10: Written observations of basalt, limestone, marble, and sandstone should include color, size, shape, texture, luster, and details such as grain size.
- Teacher observation of Earth Materials student notebook page 11: Student observations should include whether the rock fizzed when vinegar was placed on the rock or did not fizz. A check should be next to the limestone and marble. NOTE: Sometimes the sandstone may fizz as well, depending upon whether the sand grains are held together by a matrix that has calcite in it not.
- Teacher observation of Earth Materials student notebook page 12: Student drawings should be accurate including detail. Evidence from the evaporation of calcite should be used to compare with each sample and determine that limestone and marble contain calcite. (See note above as to sandstone).

Investigation #4:

- Teacher observation of Earth Materials student notebook pages 13, 14, 15: Student should correctly conduct the scratch test and record color and other observations.

Other formative assessment guides are included in the assessment portion of the teacher guide.

Stage 3: Learning Plan

(Design Learning Activities To Align with Goals and Assessments)

Key learning events needed to achieve unit goals

Resource: The Regents of the University of California. FOSS Earth Materials. Delta Education. 2000.

Investigation #1: Mock Rocks.

Students observe a homemade rock and learn about rock properties of color, size, shape, texture, and mass. Students take the Mock Rock apart and separate the ingredients learning that a rock is composed of many different minerals and other things. Lastly, students use an evaporation test to identify the minerals that were in the rock.

Investigation #2: Scratch Test.

Students learn that minerals make up rocks and that minerals have properties that can be used for identification. Students conduct tests for hardness (Scratch test) and for calcite (Fizz test) and observe the color, luster, and texture. This is recorded in table form.

Investigation #3: Calcite Quest.

Students learn that calcite is a mineral that can be identified by using the fizz test and watching for the reaction. Students then test other

rocks to see if the rocks contain calcite.

Investigation #4: take It For Granite

Granite is a rock that contains many minerals. In this investigation, students observe the granite and conduct tests to identify the minerals.

Resources & Teaching Tips (Consider the two questions below when completing this section.)

- **What text/print/media/kit/web resources best support this unit?**

Bibliography for Earth Materials

| Name of book | Author | ISBN | Other info |
|--|--------------------|-------------|--|
| **Planet Earth Inside Out | Gibbons, Gail | 0688096808 | Morrow, 1995. Single colored photographs detail the concepts of Pangaea, continents, magnetic field, inner and outer core, and more. New topics are added visually and factually one page at a time. Good analogies and definitions help children understand the complex concepts. Excellent illustrations utilizing bold colors invite closer identification of concepts. |
| **The Magic School Bus Inside The Earth | Cole, Joanna | 0590407597 | Students take an adventure through the center of the earth. |
| 1000 Facts About The Earth | Butterfield, Moira | 1856978087 | Examines volcanoes, rivers, deserts, rainforests, weather and other facts about the earth. |
| Caves | Kramer, Stephen | 0613772008 | Carolrhoda, 1995. Caves are explained to emergent readers in an interesting and informative manner. The reader is taken into various caves and much explanation follows, giving a solid understanding of caves and cave life. The author describes how to dress to go into a cave and how to prepare for cave exploration. |
| Earth | Leutscher, Alfred | 0803721099 | Describes the clay, chalk, sand and humus which make up various kinds of soil and describes the way plants and animals depend upon the earth for life. |
| Everybody Needs A Rock | Baylor, Byrd | 0689710518 | MacMillan Publishing Company or Aladdin paperbacks, Simon and Schuster, 1974. This book offers ten rules for collecting rocks. |
| Eyewitness Books, Rocks And Minerals | Symes, Dr. R. F. | 0756607191 | Alfred A. Knopf, Inc. This resource book may be difficult reading for third graders, but it has hundreds of wonderful color photos that will satisfy all readers. |
| Gemstones | Hall, Cally | 0789489856 | Easy identification book. |
| How To Dig A Hole To The Other Side Of The Earth | McNulty, Faith | 0590435027 | Whimsical and adventurous |
| Let's Go Rock Collecting | Gans, Roma | 0064451704 | This book goes on to discuss the formation, hardness, types and uses of rocks. |

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|---|----------------------------------|------------|--|
| Rocks Are Everywhere | Rice, Cheryl | 1557349274 | Written for beginner readers |
| Secrets In Stone | Wylor, Rose and Ames | | Scholastic, 1970. |
| Stone Soup | Brown, Marcia | 0689711034 | F Scribner, 1975. An old French tale about soldiers who trick miserly villages into making them a feast. |
| Sylvester And The Magic Pebble | Steig, William | 0671662694 | Simon and Schuster, 1969. Sylvester finds a magic pebble that can make wishes come true. |
| The Big Rock | Hiscock, Bruce | 0689829582 | Tells the story of a very old rock and the history of the earth. |
| The Missing Fossil Mystery | Herman, Emily | 0786810912 | Fiction. A story about two siblings. The younger sibling takes the older brother's trilobite to school and loses it in the classroom. |
| The Pebble In My Pocket; A History Of Our Earth | Hooper, Meredith and Chris Coady | 0670862592 | This book traces one pebble's history as the face of the earth changes. |
| The Practical Geologist | Dixon, Dougal | 0671746979 | Good teacher reference book. |
| The Village Of Round And Square Houses | Grifaconi, Ann | 0316328626 | A multicultural book about a central African village, Tos. The book tells how the houses were designated in the aftermath of the volcano releasing its full fury on the village. |
| This Is Our Earth | Benson, Laura Lee | 0881064475 | |

Resources:

Iron Hill Museum, Newark DE. You can take one class at a time. Business hours 12 – 3; contact person – Laura

- **What tips to teachers of the unit can you offer about likely rough spots/student misunderstandings and performance weaknesses, and how to troubleshoot those issues?**

1. Mock Rocks. When making the mock rocks, be sure to allow time for the rocks to completely dry. Baking them in an oven at 200 degrees for 3 hours will help.

Accommodation/Differentiation ideas and tips

All investigations:

- Vocabulary: As you chronologically go through each investigation, have students keep a record of the vocabulary words and their definitions. Students can then refer to these words to use in their notebooks.
- Journals: You may want to keep a marble composition book as a student journal. In this book, students can practice their writing skills by copying down reflection questions at the end of each investigation and then answering these questions. This will formatively assess student understanding.