

ROCKS, MINERALS AND INSIDE THE EARTH

Grade Level or Special Area: 1st Grade Science

Written by: Abby Rooks, Flagstaff Academy, Longmont, CO

Length of Unit: 4 Lessons (6 days of 30-45 minutes each)

I. ABSTRACT

A. Discover the world below our feet as the different layers of the Earth, different types of rocks, volcanoes, geysers, and minerals are explored in this hands-on geological unit.

II. OVERVIEW

A. Concept Objectives

1. Students will understand how to apply the processes of scientific investigation through design, investigation, experimentation, and communication. (Adapted from Colorado Science Standard 1.)
2. Students will understand the processes and interactions of Earth's systems through the study of the structure and dynamics of Earth and other objects. (Adapted from Colorado Science Standard 4.)

B. Content from the *Core Knowledge Sequence*

1. Science: Grade 1—The Earth (p. 39)
 - a. What's Inside the Earth
 - i. Inside the Earth
 - a. Layers: crust, mantle, core
 - b. High temperatures
 - ii. Volcanoes and geysers
 - iii. Rocks and minerals
 - a. Formation and characteristics of different kinds of rocks: metamorphic, igneous, sedimentary
 - b. Important minerals in the Earth (such as quartz, gold, sulfur, coal, diamond, iron ore)

C. Skill Objectives

1. Students will identify and locate the layers of the Earth by labeling a diagram of a cross section of the Earth.
2. Students will explain which layer we live on.
3. Students will explain the hottest layer of the Earth.
4. Students will observe a video of a geyser.
5. Students will choose one type of volcano that they learned about and build a model to demonstrate the different characteristics of their chosen volcano.
6. Students will use their background knowledge about how sedimentary rocks are formed to predict the outcome of the sedimentation experiment.
7. Students will demonstrate how sedimentary rocks change into metamorphic rocks.
8. Students will compare two igneous rocks by using a Venn diagram.
9. Students will predict, experiment, and observe if rocks will sink or not sink.
10. Students will show how minerals are valuable by mimicking mining minerals from rocks.
11. Students will identify one mineral and explain why minerals are important.

III. BACKGROUND KNOWLEDGE

A. For Teachers

1. Hirsch, Jr. E.D., *What Your First Grader Needs to Know*.
 2. Core Knowledge Foundation, *Core Knowledge Teacher Handbook, Grade 1*.
 3. AIMS Education Foundation, *Primarily Earth*.
- B. For Students**
1. Science: Taking care of the Earth (Kindergarten, p. 20)
 - a. Conservation: Some natural resources are limited, so people must be careful not to use too much of them (example: iron ore, diamond, coal)
 2. History and Geography: An Overview of the Seven Continents (Kindergarten, p. 11)
 - a. Asia
 - b. Europe
 - c. Africa
 - d. North America
 - e. South America
 - f. Antarctica
 - g. Australia
 3. Visual Arts: Elements of Art: Color (Kindergarten)
 - a. Observe how colors can create different feelings and how certain colors can seem “warm” (red, orange, yellow) or “cool” (blue, green, purple) (Kindergarten p. 14)

IV. RESOURCES

- A. *Core Knowledge Teacher Handbook, Grade 1*, by the Core Knowledge Foundation: Used in lessons 1 and 3
- B. *Danger! Volcanoes*, by Seymour Simon: Used in lesson 2
- C. *Rocks and Minerals: Igneous Rocks*, by Melissa Stewart: Used in lesson 3
- D. *Rocks and Minerals: Metamorphic Rocks*, by Melissa Stewart: Used in lesson 3
- E. *Rocks and Minerals: Sedimentary Rocks*, by Melissa Stewart: Used in lesson 3
- F. *What Your First Grader Needs to Know*, edited by E.D. Hirsch, Jr.: Used in lessons 2, 3, and 4

V. LESSONS

Lesson One: Layers of the Earth (1 day, 45 minutes)

A. Daily Objectives

1. Concept Objective(s)
 - a. Students will understand how to apply the processes of scientific investigation through design, investigation, experimentation, and communication. (Adapted from Colorado Science Standard 1.)
 - b. Students will understand the processes and interactions of Earth’s systems through the study of the structure and dynamics of Earth and other objects. (Adapted from Colorado Science Standard 4.)
2. Lesson Content
 - a. Layers: crust, mantle, core (p. 39)
 - b. High temperatures (p. 39)
3. Skill Objective(s)
 - a. Students will identify and locate the layers of the Earth by labeling a diagram of a cross section of the Earth.
 - b. Students will explain which layer we live on.
 - c. Students will explain the hottest layer of the Earth.

B. Materials

1. Globe
2. Appendix A (one per student)
3. Pencils for student use
4. One clipboard per student
5. Overhead projector
6. Overhead copy of Instructional Master 50 from the *Core Knowledge Teacher Handbook, Grade 1*
7. Overhead markers—preferably brown or green, red, and orange
8. A peach or an apple
9. Knife
10. Appendix B (one copy per student)
11. Crayons for student use—blue, brown, red, orange and green for each student
12. One copy per student of Instructional Master 50 from the *Core Knowledge Teacher Handbook, Grade 1* to use for the Assessment

C. Key Vocabulary

1. A **geologist** is a type of scientist that is an expert about rocks, minerals, and the Earth. They study the history, origin, and structure of the Earth, particularly the solid Earth and the rocks that compose it.
2. A **model** is an exact copy, or replica, of an object that is usually much smaller than the actual real life object.
3. The part of the Earth that our feet touch, that we build buildings on, that we drive on, is called the **crust**. In Geology, the outermost layer of the Earth. It overlies the mantle. The crust includes the continents and the ocean floors, and is generally estimated to be about five to twenty five miles thick.
4. The layer under the crust is called the **mantle**. The region of the interior of the Earth between the core and the crust. This layer accounts for more than three-quarters of the volume of the Earth.
5. In Geology, the **core** is the central region of the Earth. Scientists believe that the core is made primarily of iron and nickel, and has two parts—an inner solid core and an outer liquid core.

D. Procedures/Activities

1. Explain to your students that there are different types of scientists and during this unit of study we are going to be **geologists**. Geologists are scientists that are experts about rocks, minerals, and the Earth.
2. Show the students a globe and explain to them that this is a **model** of the Earth. A model is an exact copy of an object but usually it is much smaller than the actual object. Ask students if they have ever built a model car. A model car is much smaller than a real car but it looks exactly like a real car.
3. Quickly review the name of the large masses of land (continents) and bodies of water (oceans) that cover the Earth. Explain that there are still pieces of land underneath the water but that we just don't see them because the water is so deep and all we see is the surface of the water instead.
4. Give each student a copy of Appendix A, a clipboard, and a pencil. If the weather permits, take your students outside with their materials and have them stand on a piece of grass. Ask the students what they think is underneath their feet. Pose the question, "What do you think is inside the Earth?" Instruct them to draw themselves standing on the ground. What do they think is underneath their feet? What can't they

see? You may have to prompt them think about digging and what they might find below the grass and dirt.

5. After the students have had a few minutes to finish their drawings, bring them back inside to continue with the lesson. Once inside, explain that scientists have wondered, for many years, what exactly is inside of the Earth. Because we can't peek inside or dig a hole deep enough into the Earth, geologists have had to use different tools to determine what makes up the inside of the Earth.
6. Refer to the *Core Knowledge Teacher Handbook, Grade 1*, p. 376 for an idea on how to use a peach (also can be done with an apple) to represent the different layers of the Earth. Discuss the ways the Earth and the fruit are similar and different.
7. Put the overhead of Instructional Master 50 up and label the different layers of the Earth as you go through the comparison of the fruit to the Earth.
8. Explain that the part of the Earth that our feet touch, that we build buildings on, that we drive on, is called the **crust**. (Label the crust and darken the line up that represents the crust with brown or green). The continents are all part of the crust as is the land underneath oceans. (The peach or apple skin.) Water covers 70% of the Earth's crust. Give each student a copy of Appendix B and have them count the different pieces in the "pie". 70% is just like saying 7 pieces out of 10 are colored. Have them color 7 pieces blue and the remaining three brown or green. The skin of the fruit is very thin compared to the rest of the piece of fruit, just like the Earth's crust is thin compared to what is below it. Even though it is relatively thin, it is still so thick that scientists cannot drill all the way through the crust to reach the next layer.
9. The layer under the crust is called the **mantle**. (Label the mantle and darken the line up that represents the crust with orange). Remind them that orange is a warm color and that is why you are coloring the mantle orange—because it's warm, but not the hottest layer of the Earth. The mantle is very warm and located directly underneath the crust. It is made up of a mixture of solid and melted rock. (The fleshy part that you eat of the fruit.) This layer is so far down that we usually do not need to worry about it harming us. Sometimes, however, this melted rock will make its way to the surface of the Earth. Ask if anyone has an idea of what happens when melted rock comes to the surface. What is that called? We will talk more about this when we study volcanoes.
10. The middle of the Earth is called the **core**. (Label the core and darken the line up that represents the crust with red). Red is a color that represents a very hot temperature. The core is the hottest part of the Earth and in spots can be hotter than the surface of the sun and that is why we will color the core red.
11. Review with your students what layer we live on (crust), which layer is the hottest (core), and show them the three layers on the diagram on the overhead and ask students orally for the definition of each layer.

E. Assessment/Evaluation

1. After you have examined, defined, and reviewed all the layers of the Earth, provide each student with a copy of the Instruction Master 50 from the *Core Knowledge Teacher Handbook, Grade 1*. Explain to the students that they will circle the name of the layer that we live on, label all three layers, and color the hottest layer of the earth red.

Lesson Two: Geysers and Volcanoes (1 day, 30 minutes)

A. Daily Objectives

1. Concept Objective(s)

- a. Students will understand how to apply the processes of scientific investigation through design, investigation, experimentation, and communication. (Adapted from Colorado Science Standard 1.)
 - b. Students will understand the processes and interactions of Earth's systems through the study of the structure and dynamics of Earth and other objects. (Adapted from Colorado Science Standard 4.)
2. Lesson Content
 - a. Volcanoes and geysers (p. 39)
 3. Skill Objective(s)
 - a. Students will observe a video of a geyser.
 - b. Students will choose one type of volcano that they learned about and build a model to demonstrate the different characteristics of their chosen volcano.

B. Materials

1. *What Your First Grader Needs to Know*, edited by E.D. Hirsch, Jr.
2. Computer with internet access
3. http://encarta.msn.com/media_461529255/geyser.html
4. Projector to hook to computer (if possible)
5. *Danger! Volcanoes*, by Seymour Simon
6. Small container of modeling clay for each student

C. Key Vocabulary

1. A **geyser** is a spring that shoots out hot water and steam.
2. A **volcano** is a vent in the Earth's crust where melted or hot rock and steam come out.
3. A fine particle of mineral matter from a volcanic vent is called **ash**.
4. **Lava** is melted rock that has come from a volcano.
5. **Magma** is melted rock within the Earth (before it comes out of a volcano).
6. **Mount St. Helens** is an active volcano located in the state of Washington.
7. The **Ring of Fire** is an area surrounding the Pacific Ocean where there is frequent volcanic activity and earthquakes.

D. Procedures/Activities

1. Review the layers of the Earth from the previous day and then begin reading from *What Your First Grader Needs to Know* on p. 311 starting with the paragraph, "Sometimes holes open in the earth's crust."
2. Stop after reading two paragraphs and show your students the video located at http://encarta.msn.com/media_461529255_0_-1_1_BB/media.html to show them what a geyser looks like.
3. Read *Danger! Volcanoes*, to your students, but before you begin, introduce the vocabulary words volcano, ash, lava, magma, Mount St. Helen's, and Ring of Fire.
4. After reading about the Ring of Fire, make sure you show them the picture and discuss on which continents we can find volcanoes.
5. Continue the story but make sure you pay close attention to the different types of volcanoes and describe to them which volcanoes are which. At the end of the story, they will build a model of a volcano and tell you which kind of volcano they created.
6. After the story hand out the containers of modeling clay to each student and ask them to each construct a model of a volcano.

7. Travel around the classroom and ask each student individually which type of volcano they created from the story. Turn to the page in *Danger! Volcanoes* and check with the student to make sure that is what they were referring to.

E. Assessment/Evaluation

1. Give each student modeling clay to build their model of a volcano. Travel around the classroom and ask each student individually which type of volcano they created from the story. Turn to the page in *Danger! Volcanoes* and check with the student to make sure that is what they were referring to. Ask the student what comes out of volcanoes (lava).

Lesson Three: Rocks (3 days, 45 minutes each)

A. Daily Objectives

1. Concept Objective(s)
 - a. Students will understand how to apply the processes of scientific investigation through design, investigation, experimentation, and communication. (Adapted from Colorado Science Standard 1.)
 - b. Students will understand the processes and interactions of Earth's systems through the study of the structure and dynamics of Earth and other objects. (Adapted from Colorado Science Standard 4.)
2. Lesson Content
 - a. Rocks and minerals
 - i. Formation and characteristics of different kinds of rocks: metamorphic, igneous, sedimentary
3. Skill Objective(s)
 - a. Students will use their background knowledge about how sedimentary rocks are formed to predict what a water bottle will look like after 48 hours have passed.
 - b. Students will demonstrate how sedimentary rocks change into metamorphic rocks.
 - c. Students will compare two igneous rocks by using a Venn diagram.
 - d. Students will predict, experiment, and observe if all rocks sink or not.

B. Materials

1. Butcher paper
2. Markers
3. *What Your First Grader Needs to Know*, edited by E.D. Hirsch Jr.
4. Pictures or examples of Sedimentary rocks (sandstone)
5. *Rocks and Minerals: Sedimentary Rocks*, by Melissa Stewart
6. Pencils for student use
7. One copy per student of Appendix C
8. Empty clear, plastic, disposable 20 oz. water bottle
9. Sand, soil, grass, pebbles, clay, leaves, etc. to fill water bottle with
10. Water
11. One small box of Willy Wonka Candy Brand Nerds™ for each child
12. One General Mills Fruit by the Foot™ for each child
13. Black permanent marker
14. One baggie for each student with their name on it ahead of time
15. Pictures or examples of Metamorphic rocks (marble)
16. *Rocks and Minerals: Metamorphic Rocks*, by Melissa Stewart
17. Sticky notes

18. *Core Knowledge Teacher Handbook, Grade 1*, by the Core Knowledge Foundation
19. Pictures or examples of Igneous rocks
20. Granite (one for every four students, and one for the teacher)
21. Obsidian (one for every four students, and one for the teacher)
22. Pumice (one for every four students, and one for the teacher)
23. One copy per student of Appendix D
24. Overhead projector
25. Overhead copy of Appendix E to fill out as a class
26. One pen per student
27. Clear container filled with water (one for every four students, and one for the teacher)
28. One copy per student of Appendix F1 and F2 (Rocks Assessment)

C. Key Vocabulary

1. *Rocks* are solid substances of the Earth’s crust. Rocks are made up of one or more minerals and have a definite composition and shape.
2. *Sedimentary* means “made by settling down.” A *sedimentary rock* is formed from debris and other rocks. They may contain fossils and are sometimes found under the sea or in a riverbed. Lots of little rocks “settle” down on top of one another and over many years—thousands, they press down to form one big rock. An example of a sedimentary rock is sandstone.
3. *Metamorphic rocks* are formed by heat and pressure. Deep inside the Earth, pressure and heat cause rocks to change. *Metamorphic* means “made through change.” An example of a metamorphic rock is marble.
4. *Igneous* means “made by fire.” *Igneous rocks* made up most of the Earth’s crust. They are made up of crystals that have joined together. Depending on how quickly they cool will determine how they appear. They are usually shiny and grainy in appearance. They compare in appearance to a chocolate chip cookie when they cool slowly below the ground. An example of a slowly cooled igneous rock is granite. Obsidian, a type of igneous rock has a glassy appearance and no grain in their appearance because it was formed because it cooled very quickly.

D. Procedures/Activities

Lesson Three: Day One - Sedimentary Rocks

1. Place a large KWL chart made from butcher paper on the board and fill out with your students what they know about rocks and what they want to know about rocks. If it hasn’t been brought up, make sure that the question, “Do all rocks sink?” is listed in the “W” section.
2. Read the section to your students about Sedimentary Rocks on p. 312 in *What Your First Grader Needs to Know*. If possible, show them a piece of sandstone or the picture in the book. A great reference for pictures of sedimentary rocks can be found in *Rocks and Minerals: Sedimentary Rocks*, by Melissa Stewart.
3. Explain to your students that you usually recognize sedimentary rocks by their distinct layers that can be seen or large pieces of sediment like in conglomerate rocks. Conglomerate rocks are formed when pieces of sedimentary rock become stuck in materials like calcite. It almost acts like glue to hold all the pieces together. If possible, show a picture or example of a conglomerate.
4. Say, “Today we are going to do an experiment to see how sedimentary rocks are formed.” Show them the bottle and put all of the materials into the bottle (grass, pebbles, leaves, clay, soil, etc.). When all the materials are in the bottle, add the water and set in a location where everyone can see the bottle. Shake the bottle so all

materials are mixed. Talk about how sedimentary rocks are usually formed under some type of water. This bottle will act as a fast moving river when you shake the bottle and then the rock will form underneath the water once it has had time to settle.

5. Give students Appendix C and have them draw a picture of what the bottle looks like immediately after it has been shaken.
6. Have the students predict what the bottle will look like in 24 hours, or one day, and record their drawings on Appendix C. Put the bottle somewhere visible but out of the reach of your students so that there aren't any accidental bumps so the mixture gets mixed again. Talk to your students about why some of them predicted the way that they did. You are looking for them to talk about layering within the bottle. Collect their Appendix B sheet to be returned the next day for recording of their observations.
7. Give each child a small box of Nerds™ and Fruit by the Foot™. Have each child layer the Fruit by the Foot™ back and forth in two inch sections. Each layer should have a few Nerds™ placed on the Fruit by the Foot™ to represent large rocks or pieces of debris that have settled onto the layers. All of the Nerds™ do not have to be used but each layer must contain some. Tell the students that they just made a model of a sedimentary rock. Ask them to look for the layers. Tell them that the nerds are representing the different large pieces that we might find in a river like a rock or piece of bark.
8. Write each students name on a baggie with a black permanent marker and have them place their "sedimentary rock" into their bag. We will come back to this model when we look at metamorphic rocks.
9. In 24 hours, come back to the bottle and have them draw what the bottle actually looked like. Discuss how the material inside of the bottle looks like it is layered and how it was similar or different from their prediction pictures.

Lesson Three: Day Two - Metamorphic Rocks

1. Start your lesson by asking the students if there are any things that can be filled in from the previous day on your KWL chart. If they want to add any questions to the KWL chart, this would be an appropriate time to do so as well.
2. Hold up a piece of sandstone from yesterday's lesson. Review that this type of rock is called a sedimentary rock and is formed by settling down and usually we can see the layers within the rock.
3. Bring the bottle out from yesterday's demonstration, hand back Appendix C and have them record their observations on what happened after the water settled. Explain to them that it is not a sedimentary rock yet because it would need lots of time in order to become "cemented" together and the pressure from layers on top of them will help to develop it into a sedimentary rock.
4. Tell your students that today we are going to examine another type of rock called a metamorphic rock. A metamorphic rock is a rock that is formed when heat and pressure is added to material deep within the earth.
5. Read the metamorphic paragraph on p. 312 and 313 in *What Your First Grader Needs to Know*.
6. Refer back to the sandstone from earlier and show the students that, again, this is a sedimentary rock. Ask them what they think will happen when heat and pressure is applied to this rock. You are looking for them to say that this will become a new kind of rock (metamorphic).
7. Pass out the baggies of the students' "sedimentary rocks" from yesterday (the Fruit by the Foot™ and Nerd™ combination). Ask the students what needs to happen in

order to change these sedimentary rocks into metamorphic rocks. (Heat and pressure)

8. Have the students take their sedimentary rocks out of their baggies and tell them that their hands are going to act like the Earth. The tops of their hands will act like the crust of the earth and when they interlock their fingers, the palms of their hands will be the inside of the Earth. Ask them which two layers are inside of the Earth. (mantle and core)
9. Have them place their “sedimentary rock” inside of their hands and start adding heat and pressure to their “rock”. By squeezing and blowing into their hands, this should add enough “heat and pressure” to their “rock” to begin the change. The material is soft enough for this demonstration but you may want to talk to your students about how much harder a rock is and that a significant amount of heat and pressure is needed in order to change a sedimentary rock into a metamorphic rock.
10. Tell the students that the rock does not completely melt because if it did, it will become an igneous rock, which will be examined next.
11. At this time, if you choose, you can allow your students to eat their metamorphic rock. While they are enjoying their rock, show them pictures of different types of metamorphic rocks, specifically marble, from *Rocks and Minerals: Metamorphic Rocks*, by Melissa Stewart. Talk about how marble is used to make statues and buildings because of the unique and beautiful look that it has.
12. It is fun to attach a sticky note to your students that says “ask me about the metamorphic rock I ate today” to start a discussion with their family.

Lesson Three: Day Three - Igneous Rocks

1. Start your last lesson on rocks by asking the students if there are any things that can be filled in from the previous day on your KWL chart. If they want to add any questions to the KWL chart, this would be an appropriate time to do so as well.
2. Review what metamorphic and sedimentary rocks are and an example of each. Discuss how they are formed.
3. Begin by reading the paragraph on igneous rocks found on p. 378 from your *Core Knowledge Teacher Handbook, Grade 1*.
4. If possible, show an example of a piece of granite and obsidian. Talk about the difference between the two and use the Venn Diagram, labeled Appendix D, showing the differences.
5. As the students are discussing the two different igneous rocks, point out that the granite rock has a coarse texture and you can see the large “chunks” within the rock. This was caused because of the slow cooling underground. Relate this appearance to a chocolate chip cookie. The large chunks within the rock are just like the chocolate chips within the cookie.
6. Number off your students so there are four students in a group and assign a location for them to work.
7. Pass out three sticky notes to each group of students that are working together. One sticky note should be labeled “Granite”, one should say “Obsidian”, and the last one should be marked “Pumice”. When passing out the rocks, make sure that the students know not to touch the rocks until you give them permission. Whenever a rock is picked up, it must be put right back onto the sticky note that they removed it from. Next, pass out a set of granite, obsidian, and pumice so every four students has a set to work with. Instruct them to smell, touch, look and listen to every rock. Make sure every student has had a chance to use four of their five senses.

8. Take the large clear container filled with water and place in a location where all of your students can see. Tell the students that they will be predicting, examining and explaining what happened to each of the three rocks as they are placed in the water.
9. Pass out a pen and Appendix E to each student. Tell them that they will make predictions about each rock on whether or not they will float or sink. Make sure that all students have made their predictions in pen on Appendix E. Using a pen holds them accountable for their predictions since we don't change our predictions. If our predictions are incorrect, that is fine. We will just record what the observed into the observational section on the chart.
10. After all students are finished with their experiment, have them help you fill in your Appendix E on the overhead.
11. Talk about why the pumice didn't sink. Pumice is the lightest rock on Earth and contains holes that are filled with air that was trapped when lava cooled very quickly.
12. After your discussion about pumice. Go back to the KWL chart and answer any questions that haven't been answered up until this point.
13. Distribute Rocks Assessment labeled Appendix F1 and F2 at your convenience.

E. Assessment/Evaluation

1. Rocks Assessment labeled Appendix F1 and F2.

Lesson Four: Minerals (1 day, 45 minutes)

A. Daily Objectives

1. Concept Objective(s)
 - a. Students will understand how to apply the processes of scientific investigation through design, investigation, experimentation, and communication. (Adapted from Colorado Science Standard 1.)
 - b. Students will understand the processes and interactions of Earth's systems through the study of the structure and dynamics of Earth and other objects. (Adapted from Colorado Science Standard 4.)
2. Lesson Content
 - a. Rocks and minerals
 - i. Important minerals in the earth (quartz, gold, sulfur, coal, diamond, iron ore)
3. Skill Objective(s)
 - a. Students will show how minerals are valuable by mimicking mining minerals from rocks.
 - b. Students will identify one mineral and why minerals are important.

B. Materials

1. A collection of a variety of minerals (gold, diamond, quartz, copper, etc.)
2. *What Your First Grader Needs to Know*, edited by E.D. Hirsch, Jr.
3. A box of toothpicks (at least so every student has two and extras in case they break)
4. A marker for every student
5. Nabisco Chips Ahoy™ chocolate chip cookies (2 for each student)
6. Pencils for student use
7. Half of Appendix G for each student to be used for the assessment

C. Key Vocabulary

1. A **mineral** is a naturally occurring solid with specific characteristics. Earth's rocks are made up of minerals.

D. Procedures/Activities

1. Ahead of time, gather as many different examples of minerals that you can and begin your lesson by showing this collection to your students. Tell them what each material is and then ask them what they all have in common.
2. Read to your students the section on The Earth’s Important Minerals on p. 313-314 in *What Your First Grader Needs to Know*, edited by E.D. Hirsch, Jr. Go back to this collection and ask them again if they know what they all have in common. (They are all minerals!)
3. Tell your students that there are about 3,000 different kinds of minerals. Only a few of them are common and can easily be found. We use minerals to make table salt, windows, matches, glass, and minerals and they can be found in lots of different pieces of jewelry—sapphires, diamonds, rubies, etc.
4. Minerals are valuable because of how useful and/or how rare they are.
5. Tell your students that today we are going to do an activity in which they will be in charge of mining out valuable minerals from igneous rocks. Explain to them that when people mine materials from the Earth, they have to do their best to keep the Earth as intact as possible. If they are mining and completely destroy the surrounding Earth, then that area can’t be accessed and used again.
6. Today their goal will be to take as many minerals, or chocolate chips, that we will refer to as diamonds, out of their cookies, now know as igneous rocks, by using toothpicks as their rock picks and a marker as their hammer.
7. Talk about ways to get the minerals out while doing their best to keep their cookies as whole as possible. (toothpick placement and how hard they hit their toothpick with their marker is key) Demonstrate for them a good technique and a poor one.
8. Students will receive “money” for every diamond that is successfully mined, but whole, large diamonds are worth more “money”. This can be whatever you would like to make it. In the past, I have given them paper money that they can then go to the class store to buy items with. Each person will get paid for their diamonds at the end of ten minutes.
9. Quickly review the different minerals that were mentioned in the read aloud and why minerals are important, and then pass out Appendix G to be used as a quick assessment.

E. Assessment/Evaluation

1. On Appendix G have the students summarize why minerals are important and one example of a mineral.

VI. CULMINATING ACTIVITY

- A.** Appendix H—Cupcake Core Sampling

VII. HANDOUTS/WORKSHEETS

- A.** Appendix A: What is inside the Earth?
B. Appendix B: How much of the Earth’s crust is covered by water?
C. Appendix C: Sedimentary Bottle Prediction
D. Appendix D: Comparing Igneous Rocks
E. Appendix E: Do rocks sink or float?
F. Appendix F1: Rocks Assessment p. 1
G. Appendix F2: Rocks Assessment p. 2
H. Appendix F3: Rocks Assessment Answer Key p. 1
I. Appendix F4: Rocks Assessment Answer Key p. 2
J. Appendix G: Minerals

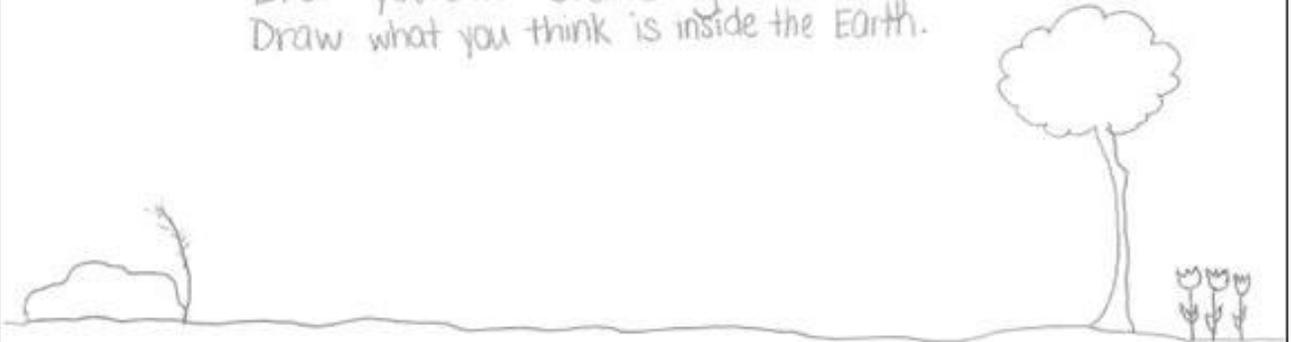
K. Appendix H: Cupcake Core Sampling

VIII. BIBLIOGRAPHY

- A. Cole, Joanna. *The Magic School Bus Inside the Earth*. New York: Scholastic Inc., 1987. ISBN 0-590-40760-0
- B. Colorado Department of Education. *Colorado State Science Standards*. Retrieved from <http://www.cde.state.co.us/>
- C. Cordel, Betty; Hillen, Judith. *Primarily Earth Gr. K-3*. Fresno, CA:AIMS Education Foundation. 1996, 1881431630.
- D. Core Knowledge Foundation. *Core Knowledge Sequence*. Charlottesville, VA: Core Knowledge Foundation, 1999, ISBN 978-1-890517-20-5
- E. Core Knowledge Foundation. *Core Knowledge Teacher Handbook, Grade 1*. Charlottesville, VA: Core Knowledge Foundation, 2004. ISBN 1-890517-70-4
- F. Farndon, John. *E. guides Rock and Mineral*. New York, NY: DK Publishing, Inc., 2005. ISBN 0-7566-1140-7
- G. Florida Center for Instructional Technology, College of Education, University of South Florida. *Clipart ETC*. Retrieved from http://etc.usf.edu/clipart/40600/40610/Pie_01-10a_40610.htm
- H. Hirsch, Jr. E.D. *What Your First Grader Needs to Know*. New York, NY: Dell Publishing, 1997, ISBN 0-385-31987-8
- I. Hirsch, Jr. E.D., Kett, Joseph F., Trefil, James. *The Dictionary of Cultural Literacy What Every American Needs to Know*. Boston, MA: Houghton Mifflin Company, 1993. ISBN 0-395-65597-8
- J. Louisiana Division of Arts. *Louisiana Voices Homepage*. Retrieved from http://www.louisianavoices.org/images/edu_venn_diagram_blank.gif
- K. Merriam-Webster, Inc. *Merriam-Webster's Word Central*. Retrieved from <http://www.wordcentral.com/>
- L. Microsoft Encarta. *Geyser-Video-MSN Encarta*. http://encarta.msn.com/media_461529255_0_-1_1_BB/media.html
- M. Nevada Mining Association. *CupcakeCore_20060320*, Retrieved from http://www.nevadamining.org/education/workshops/activities/docs/CupcakeCore_20060320.pdf
- N. Simon, Seymour. *Danger! Volcanoes*. San Francisco, CA: Chronicle Books LLC, 2002. ISBN: 1-58717-182-1
- O. Stewart, Melissa. *Rocks and Minerals: Igneous Rocks*. Chicago, IL: Heinemann Library, 2002. ISBN: 1-58810-256-4
- P. Stewart, Melissa. *Rocks and Minerals: Metamorphic Rocks*. Chicago, IL: Heinemann Library, 2002. ISBN: 1-58810-257-2
- Q. Stewart, Melissa. *Rocks and Minerals: Sedimentary Rocks*. Chicago, IL: Heinemann Library, 2002. ISBN: 1-58810-259-2

What is inside the Earth?

Draw yourself standing on the ground.
Draw what you think is inside the Earth.



Adapted from Primarily Earth.
1996 AIMS Education Foundation.

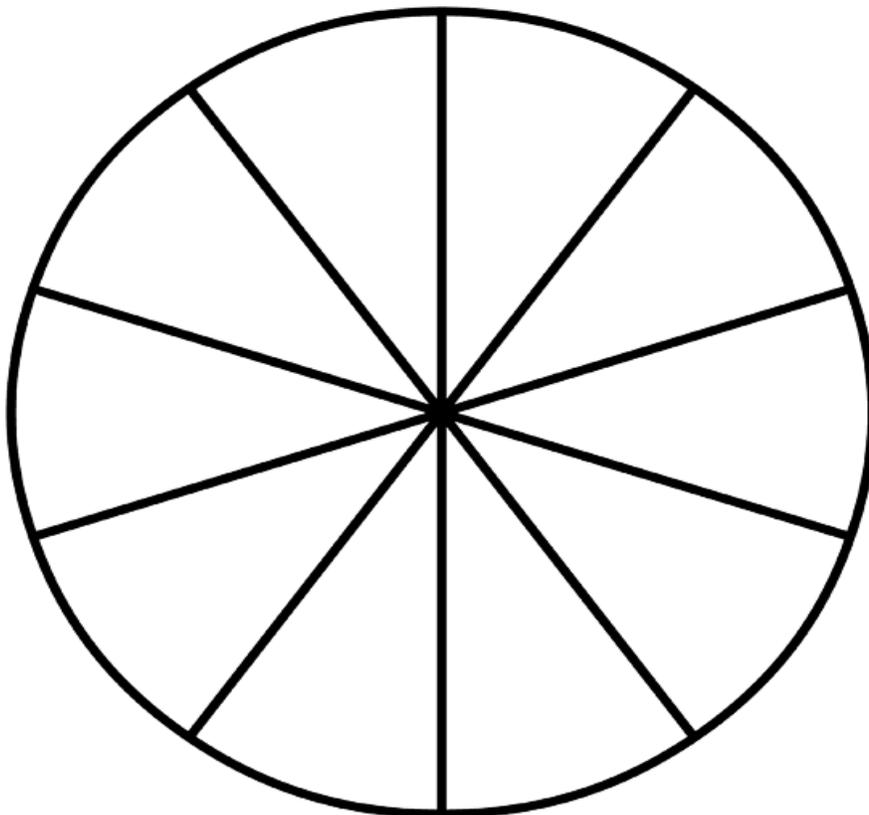
Appendix B

How much of the Earth's crust is covered by water?

Geologist _____

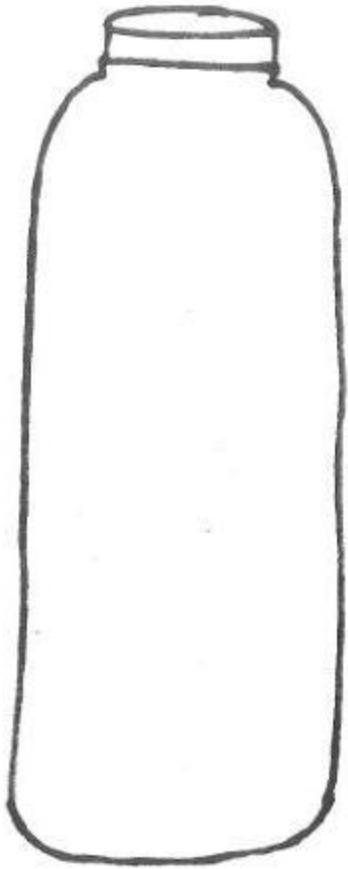
Color 7 pieces blue. What does this represent? _____

Color 3 pieces brown or green. What does this represent? _____

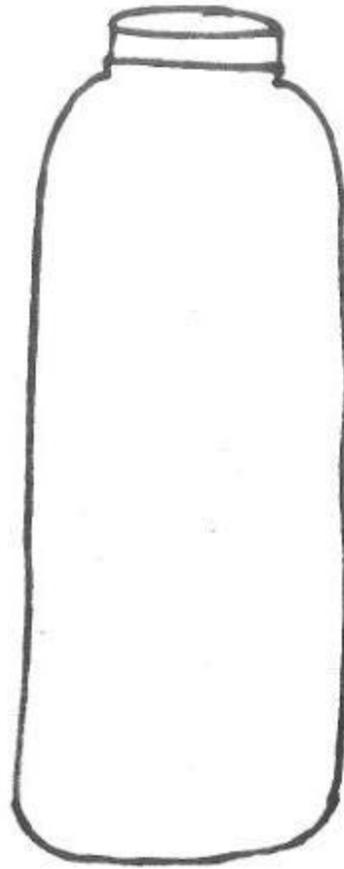


Appendix C

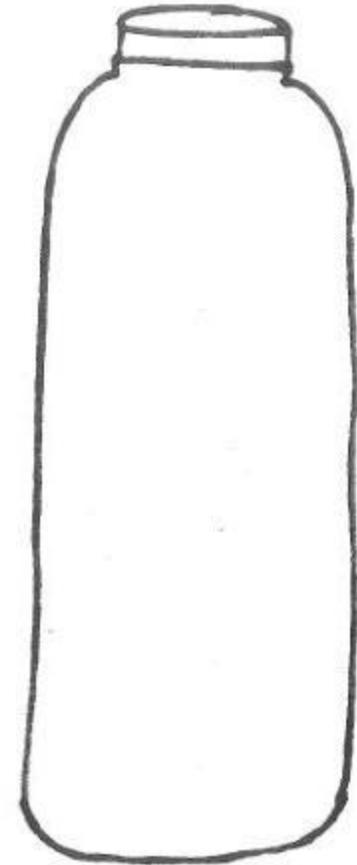
Geologist _____



Draw what the bottle looks like now.

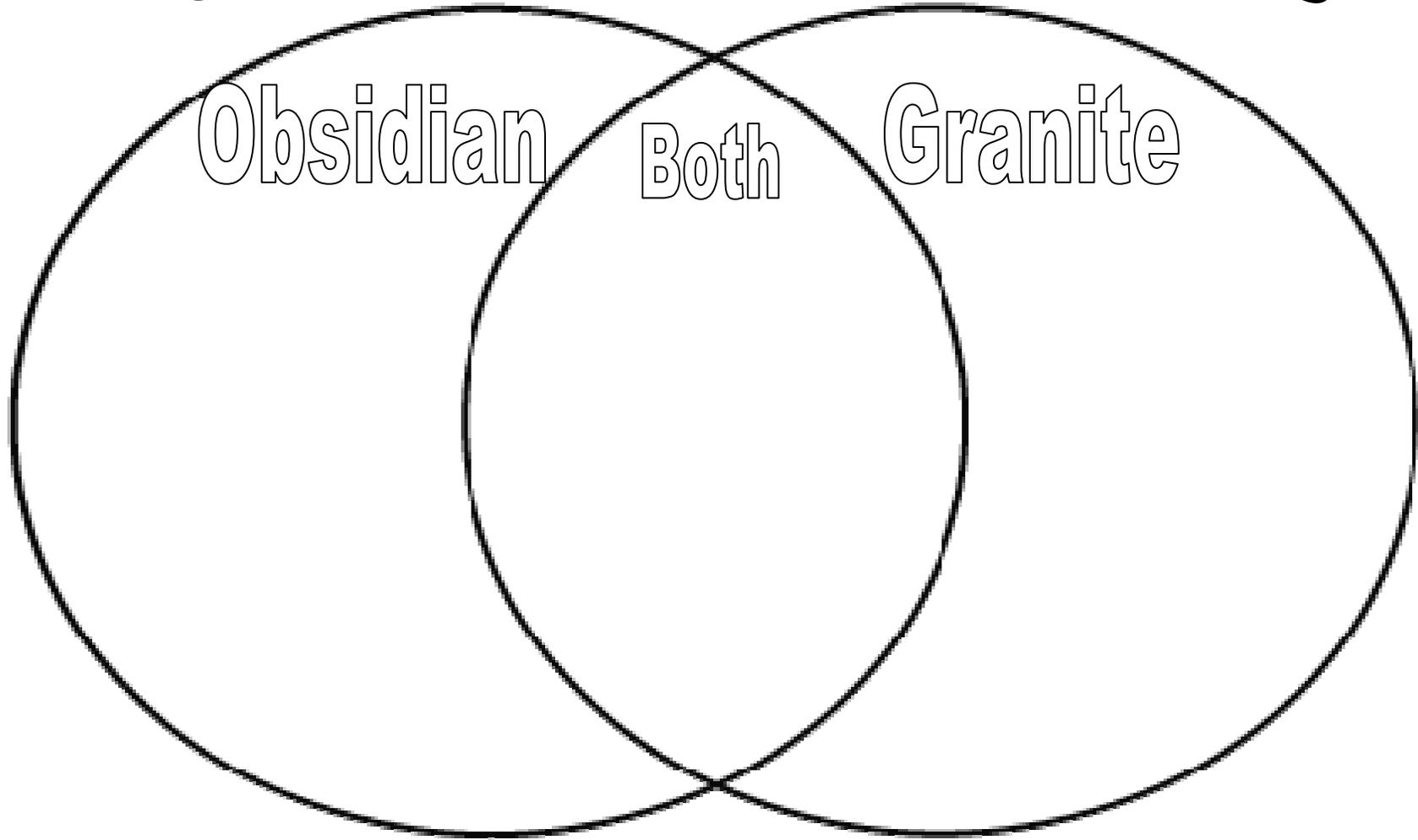


Prediction Picture:
Draw what you think the bottle will
look like tomorrow.



Observation Picture:
Draw what the bottle
looked like today.

Comparing Igneous Rocks



Do rocks sink or float?

PREDICTION	OBSERVATION
<p>I think that OBSIDIAN will...</p> <p style="text-align: center;">float sink</p>	<hr/> <hr/> <hr/> <hr/>
<p>I think that PUMICE will...</p> <p style="text-align: center;">float sink</p>	<hr/> <hr/> <hr/> <hr/>
<p>I think that GRANITE will...</p> <p style="text-align: center;">float sink</p>	<hr/> <hr/> <hr/> <hr/>

Appendix F2

Rocks Assessment

Geologist _____

7. Finish the sentence.
Igneous rocks are made by _____.

Change settling down fire

8. Draw a line from the name of the rock to the kind of rock that it is.

Obsidian

Igneous

Pumice

Sedimentary

Sandstone

Igneous

Marble

Igneous

Granite

Metamorphic

Rocks Assessment Answer Key

Geologist Answer Key

1. Finish the sentence.

Metamorphic rocks are made by change.

Change

settling down

fire

2. A person who studies rocks, minerals and soil is called a Geologist.

- a. Biologist
- b. Geologist**
- c. Nurse

3. An igneous rock looks like a chocolate chip cookie.

- a. Crazy mess
- b. Chocolate chip cookie**
- c. Layered cake

4. A sedimentary rock has layers.

- a. Layers**
- b. Big chunks of minerals
- c. Zig-zags

5. Circle the three types of rocks we learned about.

- a. Igneous**
- b. Mantle
- c. Metamorphic**
- d. Soil
- e. Sedimentary**

6. Finish the sentence.

Sedimentary rocks are made by settling down.

Change

settling down

fire

Rocks Assessment Answer Key

Geologist Answer Key

7. Finish the sentence.

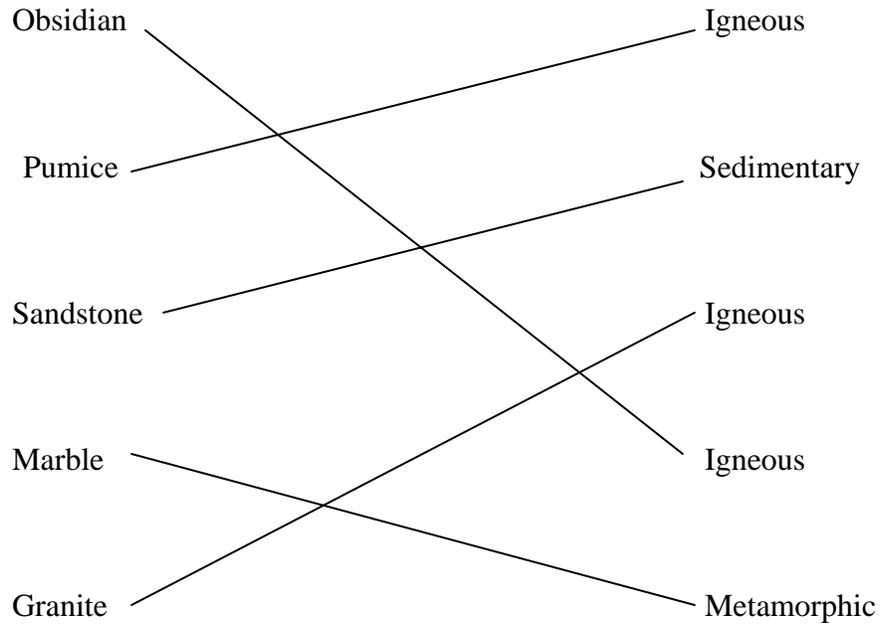
Igneous rocks are made by fire.

Change

settling down

fire

8. Draw a line from the name of the rock to the kind of rock that it is.



Appendix G

Minerals

Geologist _____

Name one mineral that you learned about.

Why are minerals important?

Minerals

Geologist: _____

Name one mineral that you learned about.

Why are minerals important?

Appendix H

Cupcake Core Sampling

Adapted from the Project MINE

http://www.nevadamining.org/education/workshops/activities/docs/CupcakeCore_20060320.pdf

Trying to “see” what is beneath the surface of the Earth is one of the jobs of a geologist. Rather than digging up significant amounts of land to expose what lies beneath our feet, samples can be taken and analyzed to determine the likely composition, or make up, of the Earth’s interior. In this activity, students will model core sampling techniques to find out what sort of layers are in a cupcake.

Materials needed:

White cupcake mix (enough to make 3 different colors, one cupcake per student)	
Foil baking cups	Plastic knives (one per student)
Drawing paper	Food Coloring (red—core, yellow—mantle, blue—crust)
Chocolate cupcake mix to use as topping	Plastic transparent straws (cut into thirds)
Blank drawing paper	pencils
Crayons that match the interior color of the cupcake	

Directions:

Make cupcakes with at least three layers of colored batter. Dying white cupcake mix primary colors works the best. Foil baking cups and dark colored cupcake mix to top the cupcake are used so the students can’t see what is on the inside of the cupcake, just like how we cannot see what is underneath the crust of the Earth. If you use frosting, the straws won’t slide as easily and makes a mess when trying to take samples. Provide each student with a cupcake, clear straw cut into thirds, toothpick, and drawing paper. Tell the students to leave all items on their working space and to not touch anything until they are told to do so. They will not be eating anything until the activity and discussion are complete. Ask the students to fold a piece of drawing paper into four sections and, in one of the sections, draw what they think the inside of the cupcake would look like. Ask the students how they might get more information about the cupcake without peeling the foil or cutting it open with a knife. Someone may suggest using the straw to take a core sample. If not, show them how to push the straw into the cupcake and pull out a sample. The students should make a second drawing of the cross section of their cupcake based on the information from the three core samples. Each new drawing should be carefully labeled and placed in a different section of the recording paper. Finally, the students should cut open the cupcakes with a knife to compare them to the drawings. Keep relating what they students are doing to what real life geologists do.