

Young Scholars of Western Pennsylvania Charter School

3rd Grade Science

- Module

Earth Materials

Investigation

Mock Rocks

Part

Part 1: Investigating Mock Rocks

Part 2: Taking Rocks Apart

Part 3: Observing Crystals

Eligible Content

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, shape, size, color, texture, state).

S3.C.1.1.2: Classify matter using observable physical properties (e.g., weight, mass, shape, size, color, texture, state).

S3.D.1.1.1: Recognize that rock is composed of different kinds of materials.

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.3.3.A2: Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properties.

Essential Question(s)

Part 1: What are some of the properties we can use to describe individual rocks?

Part 2: How can we determine the ingredients of a rock? How can we separate the ingredients of a rock?

Part 3: What are the ingredients in mock rocks? What evidence do you have to support your conclusions?

Vocabulary

Part 1

- The scientific study of Earth's history and structure is called **geology**.
- A **geologist** is a person who studies the Earth and the materials of which it is made.
- A **property** is something you can observe, such as size, color, shape, or texture.
- **Circumference** is the distance around a circular object.
- **Diameter** is the distance across a circular object.
- **Depth** is how thick an object is from top to bottom.
- A **meter tape** measures linear dimensions.
- A **balance** measures mass.
- You **weigh** a mock rock using a balance to determine its mass.

Part 2

- A **rock** is an earth material made up of different ingredients called minerals.
- A **mineral** is an ingredient of rocks that cannot be broken down any further.
- When some substances mix with water, they break down into such small pieces that they seem to disappear into the water. We say the substance has **dissolved** in the water.

Part 3

- A **crystal** is the solid form of a material that can be identified by its shape or pattern.
- When water is left open to the air, it **evaporates** into the air.

Science Content

Part 1: Investigating Mock Rocks

- Rocks have many properties, including shape, size, color, and texture.
- Geologists use rock properties to help identify different rocks.
- Some dimensions of rocks can be measured and compared.

Part 2: Taking Rocks Apart

- Rocks are made of ingredients called minerals; minerals are made of only one ingredient.
- Some ingredients can be identified by breaking rocks apart.
- Water can be used to separate ingredients: some break into smaller pieces, and some dissolve.

Part 3: Observing Crystals

- Rocks are made of minerals.
- Evaporation is a way to separate liquid and solid ingredients.
- Mineral crystals have identifiable shapes.

Assessment(s)

Part 1: Teacher Observation

Measurement skills are assessed. Students should know which tool to use, the correct technique, and how to record a number and a unit.

Part 2: Response Sheet

Students interpret a statement made by another student comparing a chocolate chip cookie to a rock.

Part 3: Teacher Observation

Informal notes.

Duration

Part 1: 1 Day

Part 2: 1 Day

Part 3: 2 Days (20 minutes each day)

Interdisciplinary Connections

Language Extension

- Write rules for naming rocks for the class rock collection.

Math Extensions

- Problem of the Week.
- Find ranges of measurement.
- Weigh rocks before and after taking them apart.

Science Extensions

- Explore cookie rocks.
- Make a class rock collection.
- Describe properties of rocks.
- Invite a geologist to class.

- Module

Earth Materials

Investigation

Scratch Test

Part

Part 1: Observing Minerals

Part 2: Testing for Hardness

Eligible Content

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, shape, size, color, texture, state).

S3.C.1.1.2: Classify matter using observable physical properties (e.g., weight, mass, shape, size, color, texture, state).

S3.D.1.1.1: Recognize that rock is composed of different kinds of materials.

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.3.3.A2: Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properties.

Essential Question(s)

Part 1: What properties can we use to identify minerals?

Part 2: What properties can we use to identify minerals? How can your fingernail, a penny, and a paper clip help determine hardness?

Vocabulary

Part 1: There is no new vocabulary. Review the words already in the word bank and ask students for additional word suggestions.

Part 2: Add new words to the class word bank.

- quartz
- gypsum
- calcite
- fluorite

Science Content

Part 1: Observing Minerals

- A mineral is a basic earth material that cannot be physically broken down any further.
- Minerals are the ingredients that make up rocks.
- It is usually necessary to know several properties of a mineral in order to identify it.

Part 2: Testing for Hardness

- Hardness, a mineral property, is the resistance of a mineral to being scratched.
- Minerals can be seriated by hardness.
- When comparing the hardness of any two objects, the harder one will scratch the softer one.

Assessment(s)

Part 1: Student Sheet

Students study a set of mineral pictures and sort them first by one property, then by two properties at a time.

Part 2: Response Sheet

Students respond to another student who describes rubbing two rocks together to determine their relative hardness.

Duration

Part 1: 1 Day

Part 2: 1 Day

Interdisciplinary Connections

Language Extension

- Find out more about Mohs' hardness scale. Check the library for resources.

Math Extensions

- Problem of the Week.
- Make a class bar graph to show birthdays in each month, based on birthstones.
- Seriate a set of earth materials based on a chosen property.

Science Extension

- Get a rock tumbler and use it to polish rocks and minerals.

• Module

Earth Materials

Investigation

Calcite Quest

Part

Part 1: Detecting Calcite

Part 2: Looking for More Evidence

Eligible Content

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, shape, size, color, texture, state).

S3.C.1.1.2: Classify matter using observable physical properties (e.g., weight, mass, shape, size, color, texture, state).

S3.D.1.1.1: Recognize that rock is composed of different kinds of materials.

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that amke up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.3.3.A2: Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properites.

Essential Question(s)

Part 1: How can we tell if one of the ingredients in a rock is the mineral calcite?

Part 2: Is there another test we can do to know for sure which rocks contain calcite?

Vocabulary

Part 1

- Rocks used in this investigation are **basalt, limestone, marble, and sandstone**.
- **Vinegar** is an **acid** that can be used to test for calcite.

Part 2

- Signs or facts on which a conclusion can be based are called **evidence**.

Science Content

Part 1: Detecting Calcite

- Rocks are made of minerals.
- Calcite is one of the most common minerals on Earth.
- Putting acid on a rock is a tool geologists use to identify calcite.

Part 2: Look for More Evidence

- Sometimes more than one test is needed to provide conclusive evidence.
- Evaporation is a technique used to separate liquid from solid parts of a mixture or solution.
- Crystal patterns can help us identify certain minerals.
- Limestone and marble are two rocks that contain calcite.

Assessment(s)

Part 1: Teacher Observation

Assess students' ability to make detailed observation notes.

Part 2: Response Sheet

Students respond to other students' conclusions about whether a rock contains calcite.

Duration

Part 1: 1 Day

Part 2: 2 Days (Two 20 minute sessions)

Interdisciplinary Connections

Language Extensions

- Students write legends about how earth materials came to be.
- Research rocks and minerals in the library.
- List idioms and metaphors about rocks.

Math Extensions

- Problem of the Week.
- Work in groups to solve logic problems on rock lineup clue cards.

Science Extensions

- Identify mechanical weather in rocks.
- Detect calcite in rocks, using vinegar as the test acid.
- Find out how limestone and its product are use in farming.
- Research uses of Portland cement.

- Module

Earth Materials

Investigation

Take It For Granite

Part

Part 1: Identifying Minerals in Granite

Part 2: Choosing Your Own Investigation

Eligible Content

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, shape, size, color, texture, state).

S3.C.1.1.2: Classify matter using observable physical properties (e.g., weight, mass, shape, size, color, texture, state).

S3.D.1.1.1: Recognize that rock is composed of different kinds of materials.

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.3.3.A2: Identify the physical properties of minerals and demonstrate how minerals can be tested for these different physical properties.

3.3.3.A7: Distinguish between scientific fact and opinion. Ask questions about objects, organisms and events. Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known. Plan and conduct a simple investigation and understand that different questions require different kinds of investigations. Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their sense to gather information. Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge. Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

Essential Question(s)

Part 1: What are the mineral ingredients in granite?

Part 2: Students ask their own questions and plan investigations or research to answer them.

Vocabulary

Part 1

- **granite**
- **feldspar**
- **hornblende**
- **mica**

Part 2

There is no new vocabulary for this portion. Review previous word additions.

Science Content

Part 1: Identifying Minerals in Granite

- Rocks are made of ingredients called minerals.
- Rocks and minerals have identifiable characteristics.
- The minerals that make up a rock can be identified by observing certain characteristics.

Part 2

- Application of earth materials concepts regarding rocks and minerals.

Assessment(s)

Part 1: Teacher Observation, Student Sheet

Students use their knowledge about rocks and minerals to look for minerals in granite.

Part 2: Performance Assessment

Students can be assessed on the process they use to conduct investigations and to research information for the presentation and on development of their presentation skills.

Duration

Part 1: 1 Day

Part 2: 2-4 Days (4-6 Sessions)

Interdisciplinary Connections

Language Extensions

- o Students match rock and mineral words to descriptors.
- o Student research the use of stones as tools in early times.

Math Extension

- o Problem of the Week.

Art Extensions

- o Student research the use of earth materials for decorative purposes.
- o Student spractice the Japanese art of rock arranging, called bon-seki.

• Module

Investigation

Part

Eligible Content

Common Core Standards/ OCDEL

Essential Question(s)

What are the predictable patterns caused by different objects in the solar system?

How do objects in the universe appear and behave?

Vocabulary

Science Content

Assessment(s)

Duration

Interdisciplinary Connections

• Module

Physics of Sound

Investigation

Dropping In

Part

Part 1: Drop Challenge

Part 2: Drop Codes

Part 3: Sound and Vibrations

Eligible Content

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, mass, shape, size, color, texture, state.)

S3.C.3.1.1: Identify and describe an object's motion (e.g., start/stop, up/down, left/right, faster/slower, spinning.)

S3.C.2.1.1: Identify basic forms and sources of energy (e.g., Sun, heat, light, sound).

S3.C.2.1.3: Identify characteristics of sound (i.e. pitch and loudness).

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.2.3.B1: Explain how movement can be described in many ways.

3.2.3.B2: Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound, and heat.

Essential Question(s)

Part 1: What are the properties of sounds that make them identifiable?

Part 2: Can you use the discrimination of sounds to make a code for sending messages?

Part 3: How are sounds made?

Vocabulary

Part 1

- Identifying sounds as different from one another is **sound discrimination**.
- An object's look, feel, sound, taste, and smells are its **properties**.

Part 2

- Signals used to represent letters or numbers are **codes**.

Part 3

- A shaking, back-and-forth movement is a **vibration**.
- Anything that vibrates in a way that makes a sound, like a voice, is a **sound source**.
- Something that detects, responds to, or hears a sound is a **sound receiver**.

- **Volume** is how loud a sound is.

Science Content

Part 1: Drop Challenge

- Sounds have identifiable characteristics.
- Objects can be identified by the sound they make when dropped.

Part 2: Drop Codes

- The identifiable properties of sounds can be used to make a code.
- Sounds can convey information.

Part 3: Sound and Vibrations

- Sound is caused by vibrations.
- A sound source is an object that is vibrating.
- A sound receiver detects sound vibrations.
- The intensity of the vibration determines the volume.

Assessment(s)

Part 1: Teacher Observation

Check for careful observation sound discrimination.

Part 2: Response Sheet

Students respond to a disagreement between two students who are developing a new code.

Part 3: Teacher Observation

Check to see if students understand that sound is caused by vibrations.

Duration

Part 1: 1 Day

Part 2: 1 Day (2 Class Periods)

Part 3: 1 Day (2 Class Periods)

Interdisciplinary Connections

Language Extensions

- Drop multiple letter objects.
- Send mystery letters.
- Create whole-word codes.
- Drop in other languages.
- Write sound stories with feeling.
- Explore onomatopoeia.

Math Extensions

- Problem of the Week.
- Create a number drop.

Science Extensions

- Create a sound matching game.
- Start a learning center.
- Play *Where's That Sound?*

Module

Physics of Sound

Investigation

Good Vibrations

Part

Part 1: Vibration and Pitch

Part 2: Length and Pitch

Part 3: Tension and Pitch

Eligible Content

S3.C.2.1.3: Identify characteristics of sound (i.e. pitch and loudness).

S3.C.2.1.1: Identify basic forms and sources of energy (e.g., Sun, heat, light, sound).

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, mass, shape, size, color, texture, state.)

S3.C.3.1.1: Identify and describe an object's motion (e.g., start/stop, up/down, left/right, faster/slower, spinning.)

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that amke up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.2.3.B1: Explain how movement can be described in many ways.

3.2.3.B2: Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound, and heat.

Essential Question(s)

Part 1: How are high and low sounds made?

Part 2: How does length affect the rate of vibration, and therefore the pitch?

Part 3: How does tension affect the rate of vibration, and therefore the pitch?

Vocabulary

Part 1

- **Pitch** describes how high or low a sound is.
- A fast vibration is called a high **frequency**.

Part 2

- A **kalimba** is an African thumb instrument.
- A musical instrument made from a set of bars or tubes of different lengths is called a **xylophone**.

Part 3

- **Tension** is a force applied to an object trying to pull it apart.

Science Content

Part 1: Vibration and Pitch

- Sound originates from vibrating sources.
- Pitch is how high or low a sound is.
- Differences in pitch are caused by differences in the rate at which objects vibrate.

Part 2: Length and Pitch

- Long objects vibrate slowly and have a low pitch.
- Short objects vibrate quickly and have a high pitch.

Part 3: Tension and Pitch

- With more tension, vibrations are faster and the pitch is higher.
- With less tension, vibrations are slower and the pitch is lower.

Assessment(s)

Part 1: Teacher Observation

Information observation.

Part 2: Student Sheets

Students demonstrate their understanding of the role length plays in the modification of pitch.

- *The Waterphone*
- *The Xylophone*
- *The Kalimba*
- *The String Beam*

Part 3: Response Sheet

Students respond to another student's thoughts about pitch and how pitch can be changed.

Duration

Part 1: 1 Day

Part 2: 1 Day (2 Class Periods)

Part 3: 1 Day

Interdisciplinary Connections

Language Extensions

- Research animal sounds.
- Investigate the Adam's apple.

Math Extensions

- Problem of the Week.
- Notable string-beam music.

Music Extensions

- Sing!
- Show and tell about musical instruments.
- Discuss noise and music.

Science Extensions

- Make a duck flute.
- Record sound effects.
- Explore rubber band guitars.

- Module

Physics of Sound

Investigation

How Sound Travels

Part

Part 1: Sounds Through Air and Water

Part 2: Sounds Through Solids

Eligible Content

S3.C.2.1.3: Identify characteristics of sound (i.e. pitch and loudness).

S3.C.2.1.1: Identify basic forms and sources of energy (e.g., Sun, heat, light, sound).

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, mass, shape, size, color, texture, state.)

S3.C.3.1.1: Identify and describe an object's motion (e.g., start/stop, up/down, left/right, faster/slower, spinning.)

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.2.3.B1: Explain how movement can be described in many ways.

3.2.3.B2: Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound, and heat.

Essential Question(s)

Part 1: Can sounds travel through liquids? Can sounds travel through air? How is sound different when heard through air or water?

Part 2: Can sound travel through solids? How is sound different when heard through solids?

Vocabulary

Part 1

A doctor uses a **stethoscope** to **amplify** sounds produced inside the body.

Megaphones can collect and focus sound energy to amplify it at the source or receiver.

The **outer ear** is the flap of flesh and cartilage that directs sound vibrations to the **inner ear**, where nerves transmit messages to the brain.

Part 2

No new vocabulary.

Review current words and ask for student additions.

Science Content

Part 1: Sounds Through Air and Water

- Sound vibrations need a medium to travel.
- Sound travels through water.
- Sound travels through air.
- Sound that is directed travels better through air.
- Our outer ears are designed to receive, focus, and amplify sounds.

Part 2: Sounds Through Solids

- Sound travels through solids.

Assessment(s)

Part 1: Response Sheet

Students debate whether sounds can be heard in space.

Part 2: Teacher Observation

Check students' ability to describe how sound travels from source to a receiver through several different mediums.

Duration

Part 1: 1 Day

Part 2: 1 Day

Interdisciplinary Connections

Language Extensions

- Research whale and dolphin communication.
- Research bat navigation.
- Compare animal ears.
- Imagine life in an airless world.

Math Extension

- Problem of the Week.

Art Extension

- Hold a fabulous ear contest.

Science Extensions

- Observe the speed of sound through air.
- Make a garden-hose listening tube.
- Investigate string telephones.
- Compare sound mufflers.
- Make an air cannon.

- Module

Physics of Sound

Investigation

Sound Challenges

Part

Part 1: Sound Challenges

Part 2: Choosing Your Own Investigation

Eligible Content

S3.C.2.1.3: Identify characteristics of sound (i.e. pitch and loudness).

S3.C.2.1.1: Identify basic forms and sources of energy (e.g., Sun, heat, light, sound).

S3.C.1.1.1: Describe matter in terms of its observable properties (e.g., weight, mass, shape, size, color, texture, state.)

S3.C.3.1.1: Identify and describe an object's motion (e.g., start/stop, up/down, left/right, faster/slower, spinning.)

Common Core Standards/ OCDEL

3.2.3.A1: Differentiate between properties of objects such as size, shape, and weight and properties of materials that make up the objects such as color, texture, and hardness. Differentiate between the three states of matter, classifying a substance as a solid, liquid, or gas.

3.2.3.B1: Explain how movement can be described in many ways.

3.2.3.B2: Explore energy's ability to cause motion or create change. Explore how energy can be found in moving objects, light, sound, and heat.

3.2.3.A6: Distinguish between scientific fact and opinion. Ask questions about objects, organisms and events. Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known. Plan and conduct a simple investigation and understand that different questions require different kinds of investigations. Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their sense to gather information. Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge. Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

3.2.3.B7: Distinguish between scientific fact and opinion. Ask questions about objects, organisms and events. Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known. Plan and conduct a simple investigation and understand that different questions require different kinds of investigations. Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their sense to gather information. Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge. Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

Essential Question(s)

Part 1: How can pitch, volume, and the distance a sound can travel be modified or enhanced?

Part 2: Students ask their own questions (or select from the pool of class questions) about how sound is generated, transmitted, or modified.

Vocabulary

Part 1

This part introduces no new vocabulary. Review the words already in the word bank and ask students for other suggestions.

Part 2

This part introduces no new vocabulary. Review the words already in the word bank and ask students for other suggestions.

Science Content

Part 1: Sound Challenges

- Several variables affect pitch, including size (length) and tension of the source material.
- Sound can be directed through air, water, or solids to the sound receivers.
- The medium that sound passes through affects its volume and the distance at which it can be heard.

Part 2: Choosing Your Own Investigation

- Apply content introduced in previous parts.

Assessment(s)

Part 1: Student Sheets

Review the sound-challenge sheets to see if the students can use information about sound to find and express solutions to the challenges.

The FOSS-u-lele Challenge, The Kalimba Challenge, The Long-Gong Challenge, The Minigutbucket Challenge, The String-Beam Challenge, The Tuning-Fork Challenge, The Waterphone and Xylophone Challenge, The Whisper Challenge

Part 2: Performance Assessment

Students can be assessed on the process they use to conduct investigations and to research information for the presentation and on the development of their presentation skills.

Duration

Part 1: 1 Day (2 Class Periods)

Part 2: 2-4 Days (4-6 Class Periods)

Interdisciplinary Connections

Language Extensions

- Research hearing aids.
- Describe the group experience.

Math Extensions

- Problem of the Week.
- Measure sound's path.

Social Studies Extension

- Imagine life without telephones or stereos.

Science Extensions

- Discuss disability awareness.
- Investigate sound-making toys.
- Make animal quackers.