9-2008

GSI: Geo Scene Investigation! On-site Programming (Grade 7)

Discover Mojave: Forever Earth

GRADE 7

GSI

Geo Scene Investigation!

ON-SITE PROGRAMMING

2008/2009 Edition

GSI
Geo Scene Investigation!

OVERVIEW

Geologists are scientitsts who study the structure and history of the Earth and its processes. Like detectives, geologists work to unravel the mysteries of the landscapes we see today using clues left behind by the geologic events that formed them. Through Forever Earth, students can get close to fascinating geological features and landforms to better understand the geologic processes that have shaped the Mojave Desert.

GSI: Geo Scene Investigation! introduces students to the differences between observations and interpretations and to some of the fundamental principles of geology. Students identify specific geologic processes and landforms in the landscape surrounding them at Lake Mead National Recreation Area (NRA) by solving mysteries with a set of geology-related clues.

OUTLINE

On-Site Programming

On-site programming includes activities that take place aboard Forever Earth and activities that take place on shore (typically the Callville Bay picnic area). For a large group, it is convenient to split the students into two or more groups. One or more groups can participate in the shore-based activities while one group is aboard Forever Earth; student groups switch when the Forever Earth group returns to the marina.

Forever Earth

Part 1 ▸ Welcome, Introductions, and Safety Talk

Part 2 ▸ Introduction: CSI? and GSI!

Part 3 ▸ Geology of Lake Mead (Overview)

Part 4 ▸ a. Gathering Knowledge

b. Interpreting the Landscape

Part 5 ▸ Synthesis: Applying Our Knowledge Beyond Lake Mead

Shore

Walk the Line – Lake Mead Geology

The Rock Cycle – Rock and Role

Corresponding Pre-Visit Lessons

- Topographic and Geologic Maps
- Lake Mead Geologic WebQuest

Corresponding Post-Visit Lesson

- Geologic Art Activity

THEME

The landscape reveals its story in the features and formations you see today.

KEY QUESTIONS

What geologic forces and processes created the landscape in Lake Mead National Recreation Area?
What forces and processes are still at work today?

GOAL

Students will demonstrate understanding of the geologic forces and processes that created the landscape in Lake Mead NRA and the forces and processes that continue to impact and shape today's landscape.

OBJECTIVES

Students will:

- explain how observations and interpretations are different;
- recognize different geologic landforms and processes on the Lake Mead landscape;
- identify common rocks and minerals of the Lake Mead area; and
- apply their knowledge of geologic landforms and processes to other areas in Southern Nevada and in the Southwest.

NEVADA SCIENCE CONTENT STANDARDS

N.8.A.3. Students know different explanations can be given for the same evidence.

N.8.A.6. Students know scientific inquiry includes evaluating results of scientific investigations, experiments, observations, theoretical and mathematical models and explanations proposed by other scientists.

N.8.B.2. Students know scientific knowledge is revised through a process of incorporating new evidence gained through on-going investigation and collaborative discussion.

E.8.C.1. Students know sedimentary rocks and fossils provide evidence for changing environments and the constancy of geologic processes.

E.8.C.2. Students know how rocks at the Earth's surface weather, forming sediments that are buried, then compacted, heated and often re-crystallized into new rock.

E.8.C.5. Students know how geologic processes account for state and regional topography.

CLARK COUNTY SCHOOL DISTRICT OBJECTIVES (GRADE 7)

Students will:

- give examples of how different explanations can be given for the same evidence;

- distinguish between sedimentary, igneous, and metamorphic rocks;
- describe how water can exert forces (physical weathering) on landforms;
- describe how water, wind, glaciers, and gravity contribute to erosion;
- describe how landforms are the result of a combination of constructive and destructive processes; and
- describe the geologic processes that are responsible for the Great Basin region, Lake Tahoe, the Sierra Nevada Mountains, earthquakes in Nevada, Spring Mountain Range, Red Rock Canyon, and Valley of Fire.

SNAP CONSERVATION EDUCATION AND INTERPRETATION THEME CORRELATIONS

The on-site grade 7 activities support the following theme statement developed by Clark County-based educators:

- Sub theme 2. We share the intriguing stories of Southern Nevada's diverse, interconnected natural world.

This sub theme is derived from the guiding theme statement: Increasing human activity on highly sensitive and easily damaged lands has profoundly altered the natural environment of Southern Nevada, affecting native biota including threatened and endangered species and requiring active management of native and non-native species.

PREREQUISITE CLASSROOM EXPERIENCES

Classroom Visit. A pre-visit classroom trip will be made by Forever Earth or National Park Service staff to introduce students to the Forever Earth program and what to expect during their field trip. Students learn and agree to the "conduct rules" of Forever Earth, understand basic water safety concepts, and observe how and when to put on a Personal Flotation Device (PFD) during their time aboard Forever Earth.

VOCABULARY

- constructive processes
- cross-bedding
- destructive processes
- erosion
- igneous
- interpretation
- lava flow
- mass wasting
- metamorphic
- observation
- relative aging
- sedimentary
- tilting
- wash
- weathering

ON-SITE ACTIVITIES: Forever Earth

Part 1 ▸ Welcome, Introductions, and Safety Talk

TIME 15-20 minutes

MATERIALS

Color-coded badges (colors indicate teams) attached to lanyards

Forever Earth staff greets students, welcomes them to Lake Mead National Recreation Area and Forever Earth and introduces the concept of National Parks and public lands, emphasizing that the field trip is taking place on public lands. **Facilitator Reference: Lake Mead**

NRA Fast Facts contains information to answer common questions about Lake Mead. The Captain or facilitator leads the safety presentation (see **Facilitator Reference: Safety Talk Outline**).

Facilitator Reference: Lake Mead NRA Fast Facts
Facilitator Reference: Safety Talk Outline

Part 2 ▸ Introduction: CSI? and GSI!

This activity introduces students to the differences between observations and interpretations and to some of the fundamental principles of geology.

TIME 20 minutes
MATERIALS
Laptop computer
Television Monitor
Mystery drawing
Flip chart paper
Markers

The facilitator displays the mystery drawing on the television monitor. After giving the students time to view the drawing, the students are asked for their observations. The observations are listed on chart paper.

Students are then asked to volunteer their interpretations about the sequence of events that happened. Time is allowed for debate and arguing competing hypotheses. The discussions are used to highlight the difference between observation and interpretation.

Geologic images from the powerpoint presentation (**Demonstration: Interpreting What You See**) are used to show how geologists use observation skills to gather evidence before making interpretations of what they've seen. The students' interpretations of the mystery drawing are used to draw parallels to geologic principles. (See **Facilitator Reference: Notes for Interpreting What You See**.)

Demonstration: Interpreting What You See

Facilitator Reference: Notes for Interpreting What You See

Part 3 ▸ Geology of Lake Mead (Overview)

A brief overview of Lake Mead's geology is provided using the surrounding landscape or Lake Mead Geology Time Lapse DVD (**Facilitator Reference: Overview of Lake Mead Geology**).

TIME 10 minutes
MATERIALS
DVD – Time Lapse of Lake Mead Geology
Facilitator Reference: Overview of Lake Mead Geology
Visual aids – act numbers and names

The major stages of Lake Mead's geologic history are represented as acts of a play. Use visual aids representing the act numbers and descriptive act titles. After describing the events that took place during an act, randomly distribute the title and act number to students. After all the acts have been described, have the students place the titles in correct sequential order.

Part 4a ▸ Gathering Knowledge

Students learn about some of the area's common rocks and minerals while earning geo-points to be used in the next part of this activity.

TIME 60 minutes
MATERIALS
Laboratory Kit of Rock and

Students are divided into two groups and within these groups, subdivided into smaller groups of 2-3 students each. For this activity, the subgroups are "competing" against each other, but are also working together in competition against the other large group.

Each subgroup is given a laboratory specimen kit containing rocks and minerals common to the Lake Mead area. Using provided reference books, field guides, and other information, students acquire knowledge about each of the specimens and share that knowledge with the facilitators. Geo-points are earned based on the knowledge gained; the points are needed for the next part of the activity.

Mineral Specimens
Dichotomous Keys for Identifying Rocks and Mineral Specimens
Reference Materials
Geo-points

Part 4b ▸ Interpreting the Landscape

In this part of the activity, students identify specific geologic processes and landforms in the surrounding landscape by solving a set of clues.

The two large groups are separated physically by having one group use the upper deck and by having the other group use the main cabin. (The groups switch areas before the boat arrives at the next pre-determined location.)

At a pre-arranged location on the lake, each subgroup of students is given a clue (**Student Activity Material: Clue Cards**) that may or may not be enough information to find a certain geologic feature. All sub-groups are looking for the feature. If a sub-group cannot solve the mystery, it can "buy" another sub-group's clue, using the geo-points earned earlier. The facilitator has an obvious clue that gives away the answer if a sub-group is unable to solve the mystery after buying all the other available clues (**Facilitator Reference: Clue Card Text**).

Student Activity Material: Clue Cards

Facilitator Reference: Clue Card Text
PDAs

When a sub-group solves a mystery, students use their PDA to take a digital photo of the feature. The photo is shown to the facilitator for verification.

The procedure is repeated until all the mysteries have been solved at that particular location. In route to the next location, groups return to their laboratory kits to earn additional geo-points.

Part 5 ▸ Applying Our Knowledge Beyond Lake Mead

TIME 30 minutes
MATERIALS
Student Activity Material:

Students apply what they have learned about interpreting geologic processes and identifying geologic features to other landscapes in

Southern Nevada and in the Southwest.

A set of cards is given to each group of students. Each card has either: 1) A photo of a regional landscape or geologic feature; and 2) A term or phrase that describes the geologic process or feature highlighted or pinpointed in the photo. Each photo card has one matching descriptor card.

Students are asked to match the descriptor card to the photo card that provides the BEST match. When complete, the groups compare their matches and defend their choices when differences arise.

Closure for the field trip focuses on what students have learned about how geologists interpret the landscape, the major events in Lake Mead's geologic history, and what geologic forces and processes are still at work today at Lake Mead.

(NOTE: Digital photos taken during the treasure hunt activity are downloaded onto a CD and given to the teacher for use in a post-trip activity. See the post-trip lesson, The Story in Art Project.)

Card set with photos of regional landscapes and geologic features and descriptor cards

ON-SITE ACTIVITIES: Shore

WALK THE LINE – LAKE MEAD GEOLOGY

In this activity, students take up positions along a trail to represent a specific time period and, subsequently, create a geologic timeline.

Students will:

- understand the immensity of geologic time.

TIME 60 minutes

MATERIALS

Facilitator Reference: Lake Mead NRA Fast Facts

Part 1 ▸ Welcome and Introductions

Forever Earth staff greet students. Students are divided into groups and given team lanyards. Facilitator welcomes students to Lake Mead National Recreation Area and Forever Earth and introduces the concept of National Parks and public lands, emphasizing that the field trip is taking place on public lands. **Facilitator Reference: Lake Mead NRA Fast Facts** contains information to answer common questions about Lake Mead.

Part 2 ▸ Introduction to Lake Mead Geology

The spectacular rock formations in the Lake Mead area tell the story of almost two billion years of geologic time. Evidence of past climates/environments and geologic processes are hidden in the multicolored rocks. How can you tell how old a rock is? How can you tell how old a person is?

Chart paper and markers

Facilitator Reference: Overview of Lake Mead Geology

Using material from **Facilitator Reference: Overview of Lake Mead Geology**, the facilitator leads a discussion about observational skills in the field and how geologists use positioning along with research to create a timeline for rocks. Landforms, rock types, geologic timescale, and geologic time are discussed. Facilitator records discussion on chart paper. Students are told that they will represent points in time along a geologic timeline.

A Guide to Geology Lake Mead National Recreation accompanied by the Geologic Time Scale – Rock Formations of Lake Mead NRA

Graph paper, clip board, sketching materials, measuring tape, binoculars, hand lenses

Student Reference: Geologic Time Scale

Each student (or pair of students) is given a time period card for a specific geologic time period within the range of 1.7 billion years ago (BYA) to 5 million years ago (MYA); each time period card includes a description of the geologic time period it represents. Students use **Student Reference: Geologic Time Scale** to orient themselves in time.

Part 3 ▸ Walking the Line

Students review their time period cards as they walk together from the picnic area to the trailhead. Once at the trailhead, students order themselves by date in a timeline that begins with 5MYA and ends at 1.7 BYA.

At the trailhead, the student with the most recent time period will read his or her card aloud, explaining what was happening 5 MYA. Students continue to hike, stopping at 71-foot intervals stopping to read time period cards in order, until the end of the trail is reached and the last card representing the oldest point on our timeline, 1.7 BYA, is read.

Now the hike will be reversed, with each student dropping out at his or her "point" along the geologic timeline (the trail is the timeline and each student represents a point on the timeline). Once positioned at their individual points, students examine the landscape and try to imagine how their surroundings appeared during their period as described on the time period cards. They spend some time sketching the geologic footprint (as they imagine it) that was made during the period they represent. Once the last person (5 MYA) has stopped at his or her point to sketch, students are asked to look up and down the trail and observe themselves as points along a geologic timeline. The first person (1.7 BYA) may now return to the trailhead, with younger and younger time points joining in the return hike as they are reached.

At the picnic area, students tape together the geologic footprint sketches in order, from oldest to youngest, to create an illustrated geologic timeline of Lake Mead.

Part 4 ▸ Conclusion

The facilitator engages students in a discussion of what elements and features they included in their time period sketches and why. *What was hard to imagine? What tools and skills do geologists use to re-create geologic processes back in time? How is geology different than other scientific fields like biology and chemistry?*

THE ROCK CYCLE – ROCK AND ROLE

Students assume the role of one of the three different rock types and create a representation of the rock cycle.

Students will:

- distinguish between sedimentary, igneous, and metamorphic rocks;
- describe the rock cycle and processes that transform rocks; and
- discuss the implications of the rock cycle on the landscape.

TIME 60 minutes

MATERIALS

Color-coded badges (colors indicate teams) attached to lanyards

Facilitator Reference: Lake Mead NRA Fast Facts

Part 1 ▸ Welcome and Introductions

Forever Earth staff greet students. Students are divided into groups and given team lanyards. Facilitator welcomes students to Lake Mead National Recreation Area and Forever Earth and introduces the concept of National Parks and public lands, emphasizing that the field trip is taking place on public lands. **Facilitator Reference: Lake Mead NRA Fast Facts** contains information to answer common questions about Lake Mead. (Note: this part should be skipped if students have already been introduced and welcomed as part of another activity.)

Part 2 ▸ Introduction to Lake Mead Geology

The facilitator asks students about cycles on earth (life cycle, photosynthesis, water cycle, etc.) leading into a discussion of the rock cycle:

There are three major types of rocks: igneous, metamorphic, and sedimentary. Rocks change from one type to another over geologic time, and they are always on the move through the rock cycle. Different processes (such as heat and pressure) act on a rock to convert it into another rock type. When looking at a rock, how can we tell what rock type it might be? The facilitator leads a detailed discussion of major rock types, the rock cycle, and the processes at work in the rock cycle with information from **Facilitator Reference: Rock Cycle**.

Facilitator Reference: Rock Cycle

Part 3 ▸ Rocking and "Role"-ing

Each student is assigned a rock and a role. The facilitator tapes a card with a rock type printed on it on to each student's back. The students are then given a clipboard with student reference sheets attached. Students take turns showing each other their backs and asking each

Rock-type cards, tape, blank paper, sketching materials

other yes and no questions (**Student Reference: Rock Classification Chart**) to determine what type of rock they represent. Once they have correctly determined their rock types, they will draw their life/rock cycle, using **Student Reference: Rock Cycle Diagram** for reference.

Students will then act out the rock cycle as a group skit. Some students retain their previous rock type roles and others are newly assigned the various processes acting on rocks in the rock cycle (e.g, heat and pressure, melting, cooling, weathering and erosion, and compaction). Students are encouraged to assemble themselves into a large rock cycle by looking at the **Student Reference: Rock Cycle Diagram**.

If time allows, the facilitator takes students on a short hike around the area looking for rocks and rock formations representing the various stages of the rock cycle. During the hike, the facilitator points out small rock examples and large landscape-level examples of rocks at various stages in the rock cycle. Students are encouraged to discuss the rock cycle in terms of its impact on the landscape.

Part 4 ▸ Conclusion

Once the hike is completed, students recap the rock cycle. Students take turns describing portions of the rock cycle in the style of a travelogue, travel brochure, or commercial.

Student Reference: Rock Classification Chart

Student Reference: Rock Cycle Diagram

ADAPTATIONS FOR DIVERSE LEARNERS

- Consult with teachers prior to field trip to determine specific needs of the class or individuals; decide which aspects of the program content or delivery to appropriately alter for culturally/linguistically, behaviorally, and cognitively diverse learners and for the gifted and talented.
- Implement peer assistance by involving teachers in the process of creating color teams.
- Provide diagrams, photos, or other visual organizers as appropriate for processes and techniques.