

Think Like a Paleontologist

By Diane McBee

Concept:

Fossils are ancient life forms preserved in rock; they are records of the earth's past.

Alaska Science Education Standards:

- ✓ A7) Understand how the earth changes because of plate tectonics, earthquakes, volcanoes, erosion and deposition; and living things.
- ✓ A12) Distinguish the patterns of similarities and differences in the living world in order to understand the diversity of life and understand the theories that describe the importance of diversity for species and ecosystems.
- ✓ A14c) Understand that a small change in a portion of an environment may effect the entire environment.
- ✓ B1) Use the processes of science; these processes include observing, classifying, measuring, interpreting data, inferring, communicating, controlling variables, developing models and theories, hypothesizing, predicting and experimenting.
- ✓ B6) Employ strict adherence to safety procedures in conducting scientific investigations.
- ✓ C3) Understand that society, culture, history and environment affect the development of scientific knowledge.
- ✓ C4) Understand that some personal and societal beliefs accept non-scientific methods for validating knowledge.

For a description of Alaska Education Standards visit the State of Alaska Department of Education & Early Development Website: www.eed.state.ak.us

Standards in other curriculum areas: See Standards Appendix

Lesson 1

How Do We Know?

Materials:

- ✓ diary of a Capt. Cook seaman
- ✓ Bill Nye the Science Guy: Archaeology (film)
- ✓ chart paper and markers
- ✓ geology and paleontology tools:
 - a) shovel
 - b) rock hammer
 - c) chisel
 - d) leather gloves
 - e) newspaper

Materials list continued:

- ✓ archaeologists tools:
 - a) whisk brooms
 - b) small brushes
 - c) buckets
 - d) ice picks
 - e) trowels
 - f) small hand tools

Vocabulary:

Historian, Archeologist, Paleontologist, Geologist, Oral traditions specialist

Gear-Up:

The teacher will ask, “How do we know what happened in the past?” Students will discuss how we learn about things that happened in the past. The teacher will record their responses.

View the film Bill Nye the Science Guy: Archaeology. After the film explain that archaeology is one way of learning from the past and that the students also will be learning other ways.

Explore:

The teacher will share a diary written by a seaman who accompanied Captain Cook as he explored Cook Inlet. The teacher will introduce the word *historian* and describe what a historian is.

Generalize:

Ask the students these questions:

1. Can anyone think of someone or something you might have learned from a historian?
2. What things have happened in your past?
3. Why could you be considered a historian if you write about things that have happened to you?

Explore:

A member of the Kenaitze tribe will be asked to visit the classroom and share the oral traditions and stories of the Dena’ina Athabaskans that are indigenous to the Central Peninsula area.

Generalize:

Pose these questions:

1. What is an oral tradition?
2. Who else might share oral traditions and stories?
3. How is this method of telling about the past different from the historian’s method?

Explore:

Students will explore a variety of tools used by archaeologists, geologists and paleontologists to study the past.

Generalize:

Pose these questions:

1. Why do scientists use tools?
2. How are these tools similar?
3. How are they different?
4. Why does an archeologist use different tools than a geologist or paleontologist?
5. How are the scientists different from each other?
6. How are they different from the historian or oral traditionalist?

Students will revisit their chart and add new vocabulary words and concepts they have learned.

Apply:

Each student will have the choice of:

- a) making a time line of his/her life;
- b) writing about something that happened;
- c) making props for an oral story;
- d) constructing a chart that illustrates how we learn about the past.

Assessment:

Students will describe in their science journals how people learn about the past.

Lesson process skills:

Observing, Communicating, Questioning, Inferring

Lesson 2**What Is a Fossil?****Materials:**

Variety of fossils including:

- ✓ imprint fossils
- ✓ mineralized eggs/feces
- ✓ amber with and without insects
- ✓ trilobites
- ✓ plants
- ✓ invertebrates
- ✓ bones
- ✓ petrified wood
- ✓ shark and ray teeth
- ✓ magnifying glasses

Vocabulary:

Attributes, Surface texture, Mineralized, Imprint, Amber, Invertebrates, Petrified, Trilobites

Gear-up:

Using the Smart Board, students will visit two Web sites which illustrate how fossils are formed and show pictures of a fossil quarry:

- ✓ <http://www.rom.on.ca/quiz/fossil/>
- ✓ <http://web.syr.edu/~dbgoldma/pictures.html>

Ask the students, “What is a fossil?” Show samples of each type of fossil and explain how it was made (imprint, mineralized, fossilized bones, petrified wood, amber.)

Explore:

The second grade students in my multi-age class will go on a fieldtrip to gather fossils. When they return to school they will show their fossils to the other students and describe how they got them.

Generalize:

Students discuss the kinds of fossils collected on the fieldtrip and name their attributes (shape, size, color, etc.)

1. Are any of the fossils exactly the same?
2. Why do you think they are the same?
3. How do you think these fossils were made?
4. Why are they different colors?

Explore:

Students will be given a variety of other fossils (not from the fieldtrip) to examine.

Generalize:

Students discuss the different kinds of fossils and how they are different.

1. What words would you use to describe a specific fossil?
2. Fossils in general?
3. Pick two fossils and tell me what is different about them.
4. How are these the same of different from the ones we got on the field trip?

Explore:

Ask students to choose an attribute and to examine the fossils for that attribute.

Generalize:

Ask the students the following questions:

1. What attribute did you choose and why did you choose it?
2. Does that attribute effect how the fossil feels in your hand?
3. How are the fossils the same of different when comparing only that attribute?
4. Are the surface textures, size, weight, color, etc. of the fossils the same or different?
5. Why are they the same or different?

Explore:

Ask students to examine the fossils and sort and classify them into groups that have similar attributes.

Generalize:

Ask the students the following questions:

1. How are the fossils in this group similar?
2. How does one group of fossils differ from another group?
3. Are there any fossils that belong in more than one group?
4. Why or why not?

Apply:

Each student will tell two other students about three things s/he learned about fossils.

Assessment:

Students will write (or draw) a letter to a parent or friend that explains what a fossil is and where fossils come from.

Lesson process skills:

Classifying, Communicating, Observing

Lesson 3**Think Like a Paleontologist****Note:**

After the gear-up activity, this is a set of six centers that the students work at in small groups. They rotate to a different center each day. The order of the activities is flexible, and does not have to be sequential. Process skills are listed after each activity.

Materials:

- ✓ For Gear-up: Variety of bones
- ✓ All stations: Recording journal
- ✓ For Explore 1: Chocolate chip cookies and toothpicks

Materials list continued:

- ✓ For Explore 2: Envelopes with picture clues about animals
- ✓ For Explore 3: Scales, fossils, measuring tools and weights
- ✓ For Explore 4: Fossils, magnifying glasses
- ✓ For Explore 5: Fossils
- ✓ For Explore 6: Variety of small fossils that would fit in a jar such as shark teeth, small bones and amber

Gear-up:

Show the students a bucket of miscellaneous bones (two or three bones from chickens will do if you have nothing else.) Invite the students to choose some bones and see if they can put them together. After the students have worked awhile, explain that a paleontologist is like a detective. S/he has to work with the clues from the past and try to determine what happened in the earth's past. Explain to the students that the series of *centers* they will be doing are activities that a paleontologist would do when working with fossils.

Explore 1:

Each student is given a multi-colored chocolate chip cookie and a toothpick. Ask the students to pretend their chocolate chips are fossils and the cookies are rocks and that they are paleontologists. They are to dig their chips out of the rock without breaking the chips and record how many different types of fossils (colored chocolate chips) they recover.

Generalize:

Pose the following questions:

1. How did you dig your fossil out of your rock?
2. How easy or difficult was it?
3. How easy or difficult do you think it would be using a hammer and chisel on real rocks?

Lesson process skills:

Experimenting, Recording data.

Explore 2:

Put out a set of six envelopes with picture clues for specific animals; e.g. pictures of the sky, an eaglet, a claw and mountains for an eagle. Each student is to look at the pictures and guess what animal is represented. Each student should record two reasons for each of their choices.

Generalize:

Ask:

1. Why did you think this animal fit these clues?
2. How is this activity similar to what a paleontologist would do?

Lesson process skills:

Observing, Questioning, Inferring, Interpreting, Recording data.

Explore 3:

Each student will choose two fossils to measure and the tools they will use to measure them with. They will measure the length, width and weight. They will record their data.

Generalize:

Ask:

1. What would happen if you used a different tool to measure your fossils?
2. How are the measurements the same or different?
3. Why is measuring fossils important to a paleontologist?
4. Why would a paleontologist record measurements?

Lesson process skills:

Measuring, Recording data, Inferring.

Explore 4:

Each student will pick two fossils. They will examine the fossils, illustrate them and describe them in words.

Generalize:

Ask:

1. How were your fossils the same?
2. How were they different?
3. Why is it important for a paleontologist to illustrate and describe fossils?

Lesson process skills:

Observing, Recording data.

Explore 5:

Each student will graph a small bag of fossils a variety of ways according to attribute such as size, shape, color, texture, etc.

Generalize:

Pose the following questions:

1. How many ways could you graph your fossils?
2. What attributes did you use?
3. How would a paleontologist use this kind of data?

Lesson process skills:

Graphing, Classifying, Inferring.

Explore 6:

Each student will sort a jar of small fossils using a dichotomous key. They will record the attribute for sorting and the number of fossils with that attribute(s).

Generalize:

Ask:

1. What happens to the number of fossils as you classify by attribute?
2. Do you think a paleontologist would sort fossils this way?
3. Why or why not?
4. What does this type of sorting help you to learn?

Lesson process skills:

Classifying, Recording data, Measuring.

Assessment:

Completion of all activities and data entry in the recording journal.

Extended Lesson Activities:

- ✓ Make samples of each type of fossil using, clay, plaster of Paris and chicken bones or shells.
- ✓ Map locations of fossil finds locally, nationally or internationally.
- ✓ Research to check if Alaska has a state fossil.

Class Assessment:

As a class, students will create a bulletin board and display case exhibit of what fossils are, how to collect them, what a paleontologist does, and examples of the different types.

Individually each student must contribute to the display. They may:

- a) write a book;
- b) create their own fossil;
- c) create a poster, collage, or diorama;
- d) illustrate and describe a specific fossil or group of fossils;
- e) create a map of fossil sites;
- f) come up with their own idea, with teacher approval.

Individually, students have a choice of creating a poster or slide show, or doing a report on a specific fossil. (See next page for individual performance assessment event.)

Individual Assessment:

Assessment Idea -- Each student will examine a fossil and report on his/her findings.

Materials:

- ✓ a fossil for each student
- ✓ magnifying glasses
- ✓ measuring tools

Assessment Procedures:

1. Each student will observe and measure a fossil using appropriate tools, recording the data.
2. Each student will have the choice of creating a poster, slide show or report on their fossil, which will include the following:
 - a) two illustrations of the fossil from two different viewpoints;
 - b) written description of the fossil's size, shape, color, type and texture.

References:

Christian, Spencer (1998): Is There a Dinosaur in Your Backyard?
John Wiley and Sons, Inc., New York, N.Y.

Olson, Donald (1996): Exploring Earth's Treasures
Kidsbooks, Inc., Chicago, Illinois.

Palmer, Douglas (1996): Fossils (Pockets)
DK Publishing, New York, New York.

Parker, Steve (1997): Rocks and Minerals
DK Publishing, New York, New York.

Pellant, Chris (1994): Fossils of the World
Thunder Bay Press, San Diego, California.

Ricciuti, Edward (1998): First Field Guide to Rocks and Minerals
Scholastic, Inc., New York, New York.

Taylor, Paul D. (1990): Fossil
Alfred A. Knopf, New York, New York.

Ranger Rick's Naturescope -- Digging into Dinosaurs (1984):
National Wildlife Federation, Washington, D.C., Vol. 1, Number 2.

Ranger Rick's Naturescope -- Geology: The Active Earth (1987):
National Wildlife Federation, Washington, D.C., Vol. 3, Number 2.

Think Like A Paleontologist -- Appendix A

Content Standards Addressed In Other Curriculum Areas:

Language Arts:

- ✓ A4) Write and speak well to inform, describe, to entertain, to persuade and to clarify thinking in a variety of formats, including technological communication.
- ✓ B1) Comprehend meaning from written text and oral and visual information by applying a variety of reading, listening and viewing strategies; these strategies include phonic, context, vocabulary cues in reading, critical viewing and active listening.
- ✓ B2) Reflect on, analyze and evaluate a variety of oral, written and visual information and experiences, including discussions, lectures, art, movies, television, technical materials and ad literature.

Math:

- ✓ A2) Select and use appropriate systems, units, ad tools of measurement, including estimation.
- ✓ A3) Perform basic arithmetic functions, make reasoned estimates, and select and use appropriate methods or tools for computation or estimation including mental arithmetic, paper and pencil, a calculator, and a computer.
- ✓ E3) Use mathematics in other curriculum areas.

History:

- ✓ A5) Understand that history is a narrative told in many voices and expresses various perspectives of historical experience.
- ✓ A6) Know that cultural elements, including language, literature, the arts, customs and belief systems, reflect the ideas and attitudes of a specific time and now how the cultural elements influence human interaction.
- ✓ C2) Use historical data from a variety of primary resources, including letters, diaries, oral accounts, archeological sites and artifacts, art, maps, photos, historical sites, documents and secondary research materials including almanacs, books indices and newspapers.

Technology:

- ✓ A2) Use technological tools for learning, communications and productivity.

Culture:

- ✓ (E) Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them.
- ✓ (E4) Students who meet this cultural standard are able to determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems.