

Maxfield

Rebecca Maxfield

Fossil Inquiry Cycle Lesson 2

Concept Statement:

A fossil is the remains or evidence of an ancient organism.

“Fossils are evidence of living organisms from the past and are usually preserved in sedimentary rocks. A fossil may be an impression left in sediments, the preserved remains of an organism, or a trace mark showing that an organism once existed. Fossils are usually made from the hard parts of an organism because soft parts decay quickly. Fossils provide clues to Earth's history. They provide evidence that can be used to make inferences about past environments. Fossils can be compared to one another, to living organisms, and to organisms that lived long ago” (Utah State Office of Education).

Utah State Core Curriculum Science Standard and Objective:

STANDARD IV: Students will understand how fossils are formed, where they may be found in Utah, and how they can be used to make inferences.

Objective 1: Describe Utah fossils and explain how they were formed.

- a. Identify features of fossils that can be used to compare them to living organisms that are familiar (e.g., shape, size and structure of skeleton, patterns of leaves).
- b. Describe three ways fossils are formed in sedimentary rock (i.e., preserved organisms, mineral replacement of organisms, impressions or tracks).
- c. Research locations where fossils are found in Utah and construct a simple fossil map.

Objective 2: Explain how fossils can be used to make inferences about past life, climate, geology, and environments.

- a. Explain why fossils are usually found in sedimentary rock.
- b. Based on the fossils found in various locations, infer how Utah environments have changed over time (e.g., trilobite fossils indicate that Millard County was once covered by a large shallow ocean; dinosaur fossils and coal indicate that Emery and Uintah County were once tropical and swampy).
- c. Research information on two scientific explanations for the extinction of dinosaurs and other prehistoric organisms.
- d. Formulate questions that can be answered using information gathered on the extinction of dinosaurs.

Maxfield

Objective:

In groups, students will use scientific tools and resources to make qualitative and quantitative observations of different objects and information. They will use their observations to help them review our fossil unit.

Introduction (Engage):

Ask: What have we been learning about in science? (Fossils).

Today we are going to do some fun activities to help us review and learn new things about fossils and how they relate to Utah's past.

Have written on board the rules and team leaders and then discuss with the class before starting.

Write on Board:

- *Team Leader will read all background information and directions
- *Work together as a team to get answers
- *You are responsible for your own assignment to turn in for a grade
- *Use a 6-inch voice while working in groups
- *Everyone must be working

Team Leader
 Rotation #1 – 3
 Rotation #2 – 7
 Rotation #3 – 4
 Rotation #4 – 5

Say: We are going to have 4 different rotations today. At each new rotation the team leader will read all the background information and instructions. You must all work together to get answers. Even though you are working together, you are each responsible for your own assignment that will be turned in for a grade. While you are working in groups you need to remember to use a 6-inch voice. Also I will be walking around while you are working. Everyone must be working the entire time.

For each rotation you will have 8 minutes to work. The timer will go off at 5 minutes to let you know that you only have 3 minutes left to work.

We will have a different team leader for each rotation. Rotation #1 will be person 3, Rotation #2 will be person 7, Rotation #3 will be person 4, and Rotation #4 will be person 5.

Don't forget to follow all the rules of group work. Look on the board if you forget any of this information we have discussed.

You may now go to your first rotation and start working.

Maxfield

Questioning & Theorizing, Forming Hypotheses, Investigating Hypotheses, Analyzing Data (Explore):

Possible questions and comments to ask students while the groups are working:

Fossil or Not a Fossil Rotation:

1. How do you know which of these objects are fossils and which are not?
2. What is a fossil?
3. Which objects match together?
4. What type of fossilization occurred with this fossil?
5. How do you know?
6. Nice job identifying our favorite coprolite☺

Utah's Past Rotation:

1. How do you know where Utah is on the Mesozoic map?
2. Why do you think the animals couldn't interact?
3. Where did trilobites live?
4. So, would a trilobite been able to live in Davis County during the Paleozoic Era?
5. Do you remember what a Hadrosaur is?
6. Why do you think a Mammoth would or would not survive in Davis County?
7. Are you learning anything new about Utah's past?
8. Has Utah's climate changed over the years?

Extinction Rotation:

1. What did cause the dinosaurs to become extinct?
2. How do you know this?
3. What made you come up with that answer?
4. Where did you come up with that information?
5. Why do you think the different books have different theories about the dinosaurs' extinction?
6. So, do we know anything for certain about what caused them to become extinct?

Fossil Facts Rotation:

1. What are some other things you know about horses?
2. Do you know about horses' behavior?
3. Do you know what they ate?
4. If horses were extinct would you be able to tell what they ate?
5. How?
6. So, what kind of things can we tell about a Stegosaurus from his fossil?
7. What helps you tell these things?

[Each time the timer goes off (5 minutes) remind the students they have 3 more minutes to work. Then after the 8 minute rotations give them clean up their rotation, and 30 more seconds to switch rotations again. Remind them to do this quickly and quietly.]

Maxfield

[After students have gone through all the rotations, remind them that we need to discuss what they have learned. But that we will not have time today to do it. Let them take their assignments home with them to finish and bring back tomorrow for a grade. Then we will discuss them.]

Synthesizing Data (Explain):

Say: I noticed while I walked around today that there was a lot of learning going on. You worked well together. This was a great review, but I also hope you all learned something new. Because we are out of time today for science, I am going to let you take your papers back to your class with you to finish up anything you need to do. Please make sure you bring these back tomorrow for our discussion and your grade. You did a great job. We will discuss your findings tomorrow.

Extending Theories (Elaborate):

This part will be done during each individual activity as the teacher walks around and helps the students understand and extend their thinking with each activity.

A more extensive elaboration will take place the next day during science time to help the students understand what they did at each rotation during the activity. Since they all will get to do each activity we should be able to have a great discussion about the new things they learned and review everything we learned throughout the unit to help them prepare for the test.

Effective Use of Assessment Strategies (Evaluate):

Formative assessment strategies:

1. Anecdotal observations – Teacher circulates among the groups while the students are working, notes statements made by students, and helps redirect and extend thinking by making comments and asking inquiring questions.
2. The next day, we will discuss findings found at each rotation. Teacher will use responses from students to evaluate how much they learned.
3. During Explain section, teacher extends and clarifies the students' answers by asking questions and interjecting comments where needed.
4. Formative information is used to re-teach and extend ideas during the Explain and/or Elaborate sections.

Summative assessment strategies:

1. The assignment papers will be turned in for a grade. The teacher will grade the papers based on the information students write down as their answers and observations. The students who put more thought into their answers will receive more points on the assignments.

Maxfield

2. Items on the end of unit test will assess understanding and connections to the entire four week unit on fossils.

Analysis of work samples:

As I walked around during the activity, I was able to talk to the different groups and lead them in their observations and findings. This was a review of our fossil unit, so it was fun to see what they remembered, and to see them apply their knowledge with new information, and in different ways.

I took their observation sheets and looked at the different ways that they groups recorded their information. Some students put more thinking into their answers and related what they were doing in their rotations to what we had learned throughout the unit. An example is during the “extinction” rotation, some of the students took what they read in one book and decided that the reason listed in their book for the dinosaurs’ extinction was the only reason for their extinction. Other students took what they read, compared it to what other students in their group read, and remembered what they had learned previously in class and came up with a more in depth reason of what caused the dinosaurs to become extinct.

I was impressed with how well the students worked in their groups in the different rotations. Even though we only had a limited amount of time for each activity, I think they learned some new things and took what they previously learned and linked it to the new activities they worked on. I think it ended up being a great review to our fossil unit. It got their minds engaged, and they were excited to even learn more about fossils when we finished the unit.

Materials needed for rotations besides pencils and the worksheets provided:

Utah’s Past Rotation:

- Trilobite
- Hadrosaur toe and long bone
- Woolly Mammoth tooth
- Map “Utah: A Geologic History” (optional since copies are on paper)

Fossil Facts Rotation:

- Picture of horse skeleton
- Picture of Stegosaurus skeleton

Extinction Rotation:

- Various books about dinosaurs (look in references section for ideas)

Maxfield

Fossil or Not a Fossil Rotation:

- Hand lenses
- Fossils needed:
 -
 - Petrified wood
 - Fossilized shells
 - Fossilized leaves
 - Insects in amber
 - Coprolite
 - Gastroliths
- Non fossils needed:
 - Wood (tree ring)
 - Shells
 - Pressed leaves (fresh or dried leaves may work too)
 - Insect
 - Feathers
 - Scat
 - Bird feather

References:

- Arato, R. (2005). *Fossils: Clues to ancient life*, New York, NY: Crabtree Publishing Company.
- Davis, K. (2004). *Don't know much about dinosaurs*, China: South China Printing Company.
- Hadrosaurid. (2008). *Wikipedia, the free encyclopedia*. Retrieved November 17, 2008, from: <http://en.wikipedia.org/wiki/Hadrosaur>
- Hylland, R. L. (2008). Trilobites and the Cambrian environment of Utah. *Utah Geological Survey*. Retrieved October 22, 2008, from <http://geology.utah.gov/surveynotes/gladasked/trilobites.htm>
- Lessem, D. (2005). *The deadliest dinosaurs*, Minneapolis, MN: Lerner Publishing Group.
- Lessem, D. (2005). *The fastest dinosaurs*, Minneapolis, MN: Lerner Publishing Group.
- Lessem, D. (2005). *Feathered dinosaurs*, Minneapolis, MN: Lerner Publishing Group.
- Lessem, D. (2005). *Flying giants of dinosaur time*, Minneapolis, MN: Lerner Publishing Group.

Maxfield

Lessem, D. (2005). *Horned dinosaurs*, Minneapolis, MN: Lerner Publishing Group.

Lessem, D. (2005). *Sea giants of dinosaur time*, Minneapolis, MN: Lerner Publishing Group.

Lessem, D. (2005). *The smartest dinosaurs*, Minneapolis, MN: Lerner Publishing Group.

Taplin, S. (2004). *Usborne Internet-linked first encyclopedia of dinosaurs and prehistoric life*, London, England: Usborne Publishing Company.

trilobite. (n.d.). *The American Heritage® Dictionary of the English Language, Fourth Edition*. Retrieved July 29, 2008, from Dictionary.com website:
<http://dictionary.reference.com/browse/trilobite>

Utah Museum of Natural History (2008). Ancient Ecosystems Teaching Toolbox.
Available for check out at the museum: 1390 E. Presidents Circle, Salt Lake City,
Utah 84112

Utah State Office of Education. (2002). *Elementary core curriculum: Science grade 4*.
Retrieved October 22, 2008 from
<http://www.schools.utah.gov/curr/sci/elem/documents/4thGradeCore.pdf>

This inquiry-based lesson on the properties of gases spans two-days and contains 10 demonstrations/activities. The Gas Law Activity demonstrations allow students to witness first-hand the relationships between temperature, pressure, and volume of a gas. If certain required materials for a demo are not available in the classroom, videos are embedded in the Gas Laws Activity PowerPoint showing the results from each demonstration. Lesson 4: There is a student worksheet that accompanies this PowerPoint lesson. Currently, the presentation is setup so that prompts appear throughout the slides to inform students when to answer certain worksheet questions. Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle. 7b.