FINDING BARNEY?: TEACHER GUIDE

Subject: Earth Science
Grade Level: Middle School
Last Updated: August 24, 2009

Case Summary

PBS is hosting "Finding Barney" contest. Middle school students will create a puppet show based on an archeological dig that found human bones and dinosaur fossils in proximity of each other. Students will present their winning puppet show to a local Kindergarten class.

Credits

This case was adapted by Yasmine M. McKenzie (teacher, Bethune Middle School, Atlanta, GA) and Jennifer J. Pokorny (PhD student, Psychology, Emory University, Atlanta, GA) fellows of the Emory University PRISM program (http://www.prism.emory.edu). Authors may be contacted at jpokorn@emory.edu.

This case was adapted from:

Ford, A. L., & Sheehan, E. (2008). *Who let the bones out?* Retrieved July 14, 2009 from Emory University, CASES Online Web site: http://www.cse.emory.edu/cases/casedisplay.cfm?case_id=904

This case includes a PowerPoint presentation that was created by Darby Proctor, reprinted with permission.

Learning Objectives

At the end of the case, students will be able to:

1. Examine and interpret primary data, examining the validity of their own and others' interpretations and formulating a scientific argument.
2. Describe the principles of uniformitarianism and relate them to stratigraphic layering and geological age.
3. Distinguish relative from absolute dating.
4. Describe the process of radioactive decay and how it permits radiocarbon dating and potassium-argon dating of fossil material.
5. Describe the process of radioactive decay and radioisotope dating.
6. Construct stratigraphic models showing how fossils of different ages can be near each other but in different stratigraphic layers.
7. Accurately diagram and label artifacts as they are observed

Georgia Performance Standards

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science. (NSES Content Standard A)

S6E5. Students will investigate the scientific view of how the Earth's surface is formed. (NSES Content Standard D)

c. Describe processes that change rocks and the surface of the Earth

f. Describe how fossils show evidence of the changing surface and climate of the Earth

g. Describe soil as consisting of weathered rocks and decomposed organic material.

Assessment

At the end of the case, each group must turn in a completed box chart, a typed group report incorporating all of their researched learning issues, a self/peer evaluation form, website evaluation form and present their puppet show for their final assessment. See attached rubric for box chart and final assessment.

In addition, the students will participate in a constructed "dig" lab. Each group is given a small replica of a dig site. The replica will be constructed in a shoebox-sized bin and include small toys buried under different rock types, dirt, and sand. The students will need to grid off the area using string and conduct an excavation. They are given tools (plastic spoons and forks) and toothbrushes to help them on their "dig." They will need to follow the techniques given from the worksheet with tips for their dig (see Student Materials). Soil, screen, and string can be purchased at the hardware store. Students will create a grid by taping the string to the sides of the bin. Toys (skeletons, bones) were purchased from the dollar store. Students will diagram and label the artifacts they find in their excavation dig, and turn in the diagram of their observations. The groups will also complete a typed group report incorporating the learning issues they researched.

Implementation Strategy

Day 1 (120 minutes total)

- presentation from Darby Proctor (60 minutes), a select group of students met during morning ELT time to hear the presentation (other students received a print out of the PowerPoint in class)
- Sponge (10 minutes)
- Break into groups (5 minutes)
- Read Scene 1 (5 minutes)
- Read written transcript/slides from earlier presentation (10 minutes) – each group reads a pre-selected 3 pages of the slide handout (contains the slides and written notes by Darby)
- Each group completes the facts and learning issues sections of their box chart for the pages assigned (15 minutes)
- Share and discuss as a class, write the facts and learning issues on large sheets of paper (15 minutes)

Day 2 (60 minutes total)
- Sponge (10 minutes)
- Pass out list of 27 learning issues generated from day before, divide them evenly among group members (10 minutes)
- Media center – library research (40 minutes)

Day 3 (60 minutes total)
- Media center – complete any remaining research on scene 1 learning issues (60 minutes)
- If finished, begin working on group written report

Day 4 (60 minutes total)
- Summarize what they have learned thus far, discuss as a group (10 minutes)
- Work on group written report putting together all learning issues, to complete over the weekend as homework (40 minutes)
- If finished, begin working on a script and creating puppet characters

Day 5 (60 minutes total)
- Activity – The mock archaeological dig
- Read through handout (5 minutes)
- Give out dig "sites" and tools, brief explanation; assign roles: digger, sifter, artist, notetaker (10 minutes)
- Students properly set up, uncover, describe, measure and diagram each "artifact" that they find (40 minutes)
- Clean up (5 minutes)

Day 6 (60 minutes total)
- Work on creating a script and create puppet characters (30 minutes)
- Finalize dialogue for puppet show and hand out lines for memorization (30 minutes)
- Homework: Memorize lines for show and bring in props needed

Day 7 (60 minutes total)
- Puppet show presentations, videotape presentations (55 minutes)
- Self/peer evaluations (5 minutes)

Case Notes:

Sponge from Day 1: – Finding a fossil of a palm tree in Alaska could be explained if the climate of Alaska: A-was once colder than it is now, **B**-was once warmer than it is now, c-has always been the same

Sponge from Day 2: – If you found a fossil of a freshwater animal in a desert, what could you conclude? A-an ocean once covered the desert, B-the desert rose from the ocean, **C**-a river once flowed though the desert

What went well:

1. The students enjoyed the presentation by Darby Proctor. They asked lots of questions at the end, which suggests that they were paying attention and engaged.

2. Students did very well coming up with facts and learning issues. It was easier to have them only be responsible for 3 pages from the transcript because there is a lot of reading on each page. However, this means that for the students who did not attend the presentation, they missed the information on the other slides/pages (see *What could be improved #1*)

3. All the students enjoyed the mock dig. We assigned roles to each group member, which made the activity go more smoothly. Every single student participated in this activity, even if they didn't like the role they were assigned, which is a very good sign.

4. Overall, the students seemed to like doing the skits for the class (we videotaped them). Only 2-3 students were too shy to participate.

What could be improved:

1. When the students are sharing the learning issues from the 3 pages that they read, they need to be listening to all the other groups present, which they have a difficult time with. Need to find a way to have them listen to others as well so that they get the information since they may not have read those pages themselves.

2. The students should receive the grading rubric earlier so that they are aware of all the components to the case/project.

3. It wasn't necessarily clear that the students needed to have a written report in addition to a puppet show. Also, Scene 1 indicated that they were to discuss finding human and dinosaur bones together and how that could happen. However, the presentations ended up being about fossils and paleontology, essentially putting together the information from the learning issues sheet. This is fine, but Scene 1 should be changed to clarify that and to also indicate that a written report will be needed. Otherwise, facilitation can be changed to guide students back to the overall goal of the case. Clearer guidelines could be given that stress the overall goal as well as their learning issues.

4. With the mock dig, we ended up keeping the grid on each box so that the groups did not have to do that part. The first class needed to grid the box, but some groups took almost the entire class time to put on the grid. Therefore, we put grids on all the boxes and left them on for the other classes.

5. There may want to be another day added to let the students work on their presentations in class since the students don't really have a way to work together out of school (if it is possible time-wise to add another day to the case).

6. It would be beneficial if at the start of each class time could be spent briefly reviewing what was done the day before so that the students are aware of how each step in the case is related to one another and not just several random activities.

7. The evaluation sheet should break down the components of the case so students can evaluate the components (putting together the written report, doing the dig, creating and performing the puppet show, etc).

Learning Issues sheet distributed to the students (compiled from all the LI generated by all 4 classes):

Learning Issues

Below is a list of learning issues collected from the Finding Barney case. As a group you are to research ALL of the following learning issues. Put the person's (or 2 people's) initials who is responsible for researching the learning issue on the line next to the learning issue. Every learning issue must have at least one person's initials and this learning issue must be copied over to your individual learning issues handout and researched. There are 2 sides to this sheet, make sure to flip the page over.

_____ _____ What are fossils?

_____ _____ How do fossils form?

_____ _____ What do fossils look like?

_____ _____ What types of sediments are necessary for fossils to form?

_____ _____ What types of things can become fossilized?

_____ _____ Are fossils always of extinct animals?

_____ _____ What information can you get from a fossil?

_____ _____ Who finds fossils?

_____ _____ Who are paleontologists?

_____ _____ What is paleontology?

_____ _____ How do we find fossils?

_____ _____ Where is the best place to find fossils?

_____ _____ Why are fossils typically found in dry climates?

_____ _____ How long does it take for an organism to be fossilized?

_____ _____ What do we do when we find a fossil?

_____ _____ Why are teeth the most common fossil found?

_____ _____ What can teeth tell us about the organism?

_____ _____ What are the types of dating methods used to determine the age of a fossil?

_____ _____ What is stratigraphy?

_____ _____ Why do paleontologists sift dirt through a screen?

_____ _____ Why is it important to go through layer-by-layer when digging for fossils?

_____ _____ Why do paleontologists mark a grid on the site when digging for fossils?

_____ _____ How long does it take to find fossils?

_____ _____ Why are some fossils found in caves?

_____ _____ What is different about finding fossils in a cave when you want to date the fossil?

_____ _____ Are fossils always found in the same place where the organism died?

_____ _____ How can we figure out the behavior of an organism from just fossils?

Resources:

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