

Environmental Evolution-Understanding Environmental Change

A lesson for Fossil Finders Investigation

Fossil Finders Curriculum, University of Georgia- Spring 2013

Lesson Description

This lesson follows the Paleoreconstruction lesson and builds on students' previous findings by having them compare information about the horizon that they already studied with additional horizons so they can track changes in organisms and environments over time. Students will work in pairs or small groups.

Time Estimate: Three 50 minute class periods

Essential Questions: How did diversity of life change during the Devonian periods? How can information about changes in life forms tell us what an environment was like?

Learning Outcomes: The students will...

- Identify data that can be used to make claims based on the evidence
- Construct and evaluate arguments using data
- Illustrate how fossil evidence can be used to determine information about past environments

Next Generation Science Standards

Performance Expectations for K-12 Science Classroom

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

Scientific and Engineering Practices

2. developing and using models
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Crosscutting Concepts

1. Patterns
2. Cause and effect
4. Systems and system models
7. Stability and change

NGSS Nature of Science

Scientific Knowledge is Based on Empirical Evidence

Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science Addresses Questions About the Natural and Material World

Vocabulary

Data- Facts, figures, or other pieces of information that can be used to learn about something.

Cause- something that makes a thing or event happen.

Correlation- a relationship or correspondence between two or more things.

Uniformitarianism- Often thought of as the “present is the key to the past.” The idea that the natural laws and processes that are happening in the universe now are the same as those that have happened in the past. (ex: sedimentary rocks are formed the same ways today as they were throughout geologic history)

Paleoreconstruction- Using data and evidence about the past to reconstruct what the environment was like during that time period.

Inferring- The process of making an inference, an interpretation based on observations and prior knowledge

Materials

- Computer with internet access
- Environmental Evolution student sheet

Safety

- This lesson has very minimal safety concerns. If students are working with computers make sure they do not have liquid near equipment.

Preparation

Students will need computers each day with internet access and a print copy of the Environmental evolution student sheet.

Engage (5-10 minutes)

Start the class by showing students a picture of the state fossil for your state.

Pictures and videos are available at the website:

http://www.statesymbolsusa.org/Lists/fossils_bones.html. If your state is one that does not have an official state fossil you could choose to look at the fossil of a neighboring state or pick one of your choice. Have students either look at the picture or watch the video (if available) and have them answer two questions: 1. What other organisms do you think would have lived during this time period? 2. How do you think the environment then was different from the environment in the state today? Allow students to share answers and discuss how this is similar to what students will do with this lesson where they will compare how diversity of organisms changed over time in the Devonian.

Gathering Data (30-40 minutes)

Students will complete the Environmental Evolution student sheet while using a computer and work in groups of two to try to answer the research questions:

1. What changes do you see in life forms in the Devonian? (this can be abundance, size, color etc.)
2. Based on the data, what conclusions can you make about the environmental changes?

Students will compare the horizon that they studied in the Paleoreconstruction activity with other horizons of their choice. Possible horizons to study include: 4.1, 4, 3.9, 3.2, 3.1, 3, 2.9, 2.8, 2.2, 2.1, 2, 1.

Direct students to the Fossil Finders website at <http://fossilfinder.coe.uga.edu/>.

Menu Bar > [**Student Scientists**] tab > [**Paleoreconstruction**] ___ > [**Devonian Data**] page

Using the **Data for Each Horizon** table as well as the **Biodiversity for Each Horizon** charts, have students identify the data from the horizon they first studied. Students are to label the Horizon Number the data is coming from, then organize data from the website and record in the Data Found column.

Students will construct inferences about the Devonian environment based on what can be observed about the fossils found in the data for the particular layer observed. Remind students that inferences should be based on the observations collected in the Data Found column. You may want to share some examples with the whole class or have student groups discuss these inferences with each other.

Have students select three more horizons of their choice to collect data and construct inferences. While monitoring groups, talk to students about what trends they see happening over time in the inferences column. Ask groups which of these trends is most interesting to them.

Displaying data (30-40 minutes)

You may choose how to have students display their findings to the research questions or allow students to choose. Possible ways to have students display data include, but are not limited to creating a poster, PowerPoint, Prezi, brochure, or written essay. This display should include their argument which will answer the four research questions. It should also provide evidence to justify their argument.

Presentations (50 minutes)

Student groups of two will present their findings. It may be a good idea to assign a number to each group, so that they will know what order to present in. You may choose to do presentations more formally with students coming up to the front of the class or more informally by creating small groups and having students present their findings to the rest of their group. You should encourage students to have visual aids to show the class. Minimally, students should tell the class what horizons they studied, what similarities or differences they saw in the organisms and how they think the environment changed. The presenter will tell the group their conclusions and explain what evidence was used for their justification. The rest of the students should be allowed time to ask questions and to critique the argument by deciding if the argument was sufficient and coherent and if the reasoning used by the presenters made sense. If students are not familiar with how to participate in a science argument and give constructive criticism, you may choose to spend some time preparing students.

Concluding Discussion (10-20 minutes)

Have a large class discussion about what evidence students found for how the organisms in the Devonian changed over time and what that meant for the environment.

Assessment

There are multiple opportunities for assessment during this lesson. The Environmental Evolution student sheet can be used to look at whether students were making reasonable conclusions based on the evidence. Student data displays and/or presentations can also be assessed individually or as a whole.