**Title of lesson:** Fossils

**Authors’ Names:** Melissa Williams and Rachel Shapiro

**Teaching Date and Time:** February 22nd , 2010 at 12:50PM

**Length of Lesson:** 50 minutes

**Grade/Topic:** 7th grade/ Fossils

**Source of the lesson:** Melissa Williams & Rachel Shapiro, and some ideas from Life Science, Florida Edition, pg. 133-148, published by McDougal Littel.

**Appropriateness for Middle School Students:**

Students will be presented the material through a variety of media, including visual, auditory, and hands-on activities. The pre-test, post-test, and all assignment hand-outs all share the same font for the heading, allowing the students to better organize these things as related. Instructional pages with all steps of the activity will be provided for the students, which will help them to see the bigger picture by breaking it down one step at a time.

**Concepts**

 The fossil record contains information about how life evolved over billions of years. But the fossil record is not complete. Most fossils come from sedimentary rock layers. Many organisms did not die in the right place at the right time to be able to become fossilized. Some fossils that did form could have been destroyed by geologic processes. The fossil record is biased towards organisms that were abundant in their time period, existed for a long time, and had hard shells or bones. Some fossils have not been discovered yet. Some fossils will not be discovered because of the presence of cities and roads. As more fossils are unearthed, however, more information can be added to the record. Fossils provide valuable information about the history of life. The order of the fossils in rock strata describe the relative ages of fossils, and carbon (and radioactive isotope) dating provides data for the absolute ages of the fossils. The magnetism in rocks can also be used to date fossils. Fossils can illustrate how and how long it takes for new features to show up in an organism. The study of fossils has also helped to establish the geologic record of earth’s history. (Above sourced from: Mastering Biology, eighth edition, pg. 510-514, Authored by Campbell, Reece, Urry, *et al*., published by Pearson Benjamin Cummings)

 Fossils are the imprints or remains of once-living things. Fossils can form when minerals replace the remains of organisms. The place where a fossil is unearthed provides information about the relative age of the fossil. When sand and mud settle to the bottom of a body of water, the layers harden, and that can trap shells and other remains. Newer fossils are found in the top layers of rock; older fossils are found in lower layers. The fossil record has been used by scientists to develop an outline of Earth’s history. Along with geographic information, fossils can provide evidence that species with common ancestors are able to develop differently in different environments. There have been several ‘mass extinctions’ in Earth’s history, as shown by the fossil record. A mass extinction is when a huge number of species die or become extinct in a very short period of time. The Permian extinction, which occurred about 250 million years ago, wiped out 90% of the ocean species and many land species. The Cretaceous extinction, which occurred about 65 million years ago, wiped out more than half of the species on earth. Scientists do not fully know the causes of these mass extinctions. There may be a connection between the extinction of one species and the development of another.

(Above sourced from: Life Science, Florida Edition, pg. 133-148, published by McDougal Littel)

**Performance Objectives**

 Students will be able to:

1. List at least two reasons why fossils are important.
2. List at least two reasons why the fossil record is incomplete.

**Florida State Standards:**

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| **Science Process** |  |
| **Benchmark Number** | SC.7.L.15.1 |
| **Benchmark Description** | Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species. |
| **Subject Area** | Science |
| **Grade Level** | 7 |
| **BODY OF KNOWLEDGE** | Life Science |
| **Big Idea** | A. diversity and evolution of Living theory of evolution is the organizing principle of life science.B. The scientific theory of evolution is supported by multiple forms of evidence.C. Natural selection is a primary mechanism leading to change over time in organisms. |

**Materials List:**

Paper bags (8)

Fossil models (4 of the kits)

Clean sand

Sand trays/shoebox-sized plastic containers

Pre-test (22) – ‘What do you know’ on the second to last page

Post-test (22) – ‘What did you learn’ on the last page

Student Worksheets (22)

Student instructions (10)

Fossils in geologic time sheet (10)

22 sticky name tags

Digital camera & usb connection cord

**Advance Preparations**

All ten stations need to be set-up around the classroom. Each will have a plastic bin with sand and a predetermined set of fossils ‘hidden’ inside. Also, the paper bags need to be labeled “mystery bag of science” and have a fossil model placed in them. The pre-tests need to be on the student’s desks when they arrive.

**Safety**

There aren’t really safety issues. There are more issues with the students making a mess with the sand. The students need to be told to keep the sand in the box, and wipe their hands over the box before moving to the next station.

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| **Engagement** | **Time: 5 minutes** |
| **What the Teacher Will Do** | **Probing Questions** | **Student Responses and Potential Misconceptions** |
| Mystery Bags. (There will be multiple bags with different types of fossils in it given to each row of students. As one student in the row feels what’s in the bag they try and describe it the best they can to the rest of the students.)WARNING: the fossil models are breakable, so be SURE TO TELL THE STUDENTS BEFORE THEY HANDLE THE BAGS to be careful with them. | What does it feel like?Is it smooth?Is it rough?Can you describe it well enough that your group members can guess it?Can you guess what it is without having to look at it? | Responses will vary depending on what fossil the student has.Students should be able to give a clear enough description so that their group members can guess what is in the bag. |
| Ask the students to carefully take out what is in the mystery bag. | What is that?What does it look like?Is it similar to anything that you’ve seen before? | [A fossil.](Students may also say other things, such as “a gray blob” but guiding questions will be used to come to the correct answer.) |
| Tell the students that science requires good observers, and that in the activity today, they will all need to be good observers. |  |  |

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| **Exploration** | **Time: 20 minutes** |
| **What the Teacher Will Do** | **Probing Questions** | **Student Responses and Potential Misconceptions** |
| Explain how they will be doing the activity in the PowerPoint (PPT).Note: directions for the activity will be also found at each station. |  |  |
| In the PPT:Explain that we’re going to be ‘hunting’ for fossils.Explain that there are ten stations.Explain that, ultimately, the students will make a timeline by matching fossils with the proper time period using the chart provided. |  |  |
| Explain that index fossils come from creatures that were plentiful in a very specific time period. | While doing this activity, try and think about how that knowledge (that a particular kind of fossil is present only in one specific time period) can be helpful. |  |
| Activity:Each student will be given a worksheet (other attached file called “Fossil Hunt”) |  |  |
| Students will count off (#1-10) to determine which station they will go to. |  |  |
| Stations will be set up in a somewhat circular shape around the room, and labeled by number as well as by terminology that will be used throughout the explanation. (These terms can also be found in their textbook.) |  |  |
| Students will be given approximately 2 minutes per station.(Note: a stopwatch/count-down clock should be displayed on the board so the students can be aware of the time. Also, the teacher will give a half-time warning.) |  |  |
| After two minutes is up, the students will rotate clockwise to the next station. |  |  |
| Remember to tell the students that they DO NOT HAVE TO MEMORIZE the names of the fossils or the time periods. |  |  |

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| **Explanation** | **Time:15 - 20 minutes** |
| **What the Teacher Will Do** | **Probing Questions** | **Student Responses and Potential Misconceptions** |
| Show pictures of the fossils (used in the activity) to the students (in the PPT), and ask them which time period they fall into based on the geologic time sheet (attached.)One teacher will be ‘recording’ the information using a poster board and printed off pictures of the fossils.  | What fossil is this? Which time period did this come from?What is a fossil’s ‘relative date’?Why is it important to know the relative dates of index fossils? | (Answers will vary depending on which fossil is shown.) [possible choices come from the “Fossils in Geologic Time” page”][The age of the fossil relative to other fossils.] (The students may also include: [This can also be determined by looking at the rock layer the fossil is in, and comparing it with other rock layers and prior knowledge about the relative ages of the rock layers.])[Because it can help scientists identify when other fossilized organisms lived in the past. These other organisms may have occurred in several geologic eras.] (Note: whether the students know this or not, it is a perfect lead-in to the next set of explanation.) |
| Guide the students to demonstrate how fossils of other creatures can be dated using these index fossils. | What if we found this \*picture of a fossil from Triassic era\* among fossils of the meekoceras? What time period would we estimate that this creature lived?(Repeat with a few more index fossils, and creatures from other time periods.) | [In the Triassic period.](Answer will vary depending on which specific era and fossil are used.) |
| Discuss reasons why the fossil record is incomplete. | Are all fossils index fossils?Why isn’t every fossil an index fossil?Does the fossil record include all animals that ever lived? Why not? (Does anyone have any ideas why it doesn’t?) (Look at the “Fossils in Geologic Time” sheet. What do you notice about most of these index fossils?) | [No.] (If students say yes, then go back to previous example questions to help guide them.)[Because some fossils of organisms occur in smaller numbers. Some fossils occur through multiple eras.][No.] (If students say yes, remind them that some fossils occur in smaller numbers.][Some fossils are buried under cities, so we can’t get to them. Not every creature that ever lived becomes a fossil. Some creatures are more likely to become fossils than others.] (They look like shells and teeth.) (Whatever students do not say from the following list, be sure to bring up and discuss:Organisms with hard shells or bones are more likely to be fossilized.There may be fossils covered up by cities.Fossils that may have formed in the past have been destroyed by geologic processes.Not everything that dies can become a fossil. It depends on the environment and the way in which the organism died.)) |

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| **Elaboration** | **Time: 5 - 8 minutes** |
| **What the Teacher Will Do** | **Probing Questions** | **Student Responses and Potential Misconceptions** |
| Brief discussion about a particularly famous fossil discovery. For example, Lucy, the Australopithecus afarensis, which is the nearly 40% complete fossil who lived approximately 3.2 million years ago. She was discovered in Ethiopia in 1974. The bones that were found show many features similar to modern humans and other ape species. (For example, walking upright on two legs.)  | What does this look like?While looking at this picture, does the name ‘Lucy’ mean anything to you? | [A skeleton.](They may or may not have anything to say. Preferably, one of the students might recall hearing that it’s a fossil that was an ancestor of humans, but if not, explain this to them.) |

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| **Evaluation** | **Time: 5-10 minutes** |
| **What the Teacher Will Do** | **Probing Questions** | **Student Responses and Potential Misconceptions** |
| At the beginning of class, a pre-test will be passed out. (Following page titled: What do you know?) | 1) Circle whether the statements below are true or false.Fossils are important because… A. they provide a record for biological change over time.B. they help people learn about living things from the past.2) Which of the following are reasons why the fossil record is incomplete? (Circle all correct responses.)A. Only organisms with hard shells and bones are more likely to become fossilized.B. There may be fossils covered up by cities, which we will never be able to unearth.C. Fossils only exist in underwater environments, or environments which used to be underwater.D. Other geologic processes have destroyed fossils that may have formed in the past.3) Why are index fossils especially important? (Circle all correct responses.)A. Because the organism that left the fossil only lived in a specific geological time period.B. Because they allow us to make a time-line of earth’s past geological and biological history.C. Because the organisms that these fossils come from all drowned before becoming fossilized. | Pre-test answer key:1)A. TrueB. True2) A, B, and D3) A and B |
| At the end of class, a post-test will be distributed. (Following page titled: What did you learn?) | 1) What is the name for fossil remains that appear only in a specific geologic age and can be used to date the rock layer in which it is found? (Circle the correct response.)a. Dating fossilsb. Key fossilsc. Index fossilsd. Code fossils2) List at least two reasons why index fossils are important.3) List at least two reasons why the fossil record is incomplete. | Post-test answer key:1) C2) any combination of:[They provide a record for biological change over time.They help people learn about living things from the past.They support evidence for evolution.They can tell us about past environments. ]3) any combination of:[Organisms with hard shells or bones are more likely to be fossilized.There may be fossils covered up by cities.Fossils that may have formed in the past have been destroyed by geologic processes.Not everything that dies can become a fossil. It depends on the environment and the way in which the organism died.] |