



Activity Description & Estimated Class Time

In this 50-minute exercise students will receive 5 bags of human-made items, representing 5 different time periods. They will arrange the bags in chronological order from oldest to newest, thus simulating the role of fossils in the study of Earth's history.

Correlations to NC Science Standards

ESS.8.1.1 Analyze and interpret data to conclude the relative age of Earth and relative age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers.

Learning Target

Students will demonstrate knowledge and understanding that index fossils are useful for comparing the age of rocks at different locations, even if those locations are on different continents.

Brief Science Background

When early geologists collected fossils and made detailed notes about the rock layers they came from, they noticed that certain fossils only appeared in specific rock layers (or horizons). Together with an existing understanding of the **Law of Superposition** (which states that in an undisturbed sequence of sedimentary rocks, the oldest layers are on the bottom and the youngest are on top), this showed that some fossils could be used as indicators of the relative age of the rock that contained them. First discussed by a British surveyor, William Smith, the **Principle of Fossil Succession** is based on this observation. The fossils that are useful for comparing the age of rocks at different locations, even if those locations are on different continents, have become known as **index fossils**. A good index fossil comes from an organism that had hard parts that could be easily preserved and identified, had a wide geographical distribution, and existed during a short span of geologic time.

This activity uses human-made objects instead of fossils to develop an understanding of the role played by index fossils. It should be noted that biological evolution is different from human-generated technological evolution. Things change over time in both processes, but biological evolution has no 'directed purpose.' Random genetic changes persist or disappear through natural selection. On the other hand, when humans purposefully set out to design something, they may discover new methods to achieve their goals. These intentionally developed new methods often are improvements or refinements on existing methods; thus the notion of technological evolution.

Time Capsules

Materials

Materials for the whole class

The ability to project:

- Contents of Time Capsule Bags (SD 1)

Materials for groups of 4 students

- One set of 5 different time capsule bags for each pair of students (see SD 1)
- 4 Time Capsule Student Activity Sheets (SD 2)



Procedure

1. Tell students that a worker at the Perplexed Paleontology Plant mixed up some science materials. They will receive 5 bags of items, representing 5 different time periods. The contents of the bags are correct, but the worker lost the information about the ages of the bags. They need to arrange the bags in chronological order from oldest to newest. They should inspect and analyze the items in the bags to provide evidence for their order. The items in each bag are items that could be found in that time period.
2. Hand out materials to each group. **Have students take one time capsule bag at a time** and record a detailed inventory of the items in that bag on their Time Capsule Student Activity Sheet (SD 2). They should then list what clues each item provides as to the relative time period of that entire bag with respect to the other bags.
3. Once they have processed each individual time capsule bag, have students place the bags in order based on relative time period as determined by the clues in each bag. They should be prepared to back up their order with clear evidence and reasoning.
4. After students have put the bags in order, have a class discussion about the order and ask students for their supporting evidence. Ask them to explain the traits that made an item helpful or not helpful. If the job seems too easy, ask them which items should be removed from the bag to make the task more difficult.
5. Project Contents of Time Capsule Bags (SD1) and inform students that this is the correct order. Use the discussion of the human-made items to begin a discussion of index fossils. Be sure to include a comparison between biological and technological evolution as described in the Brief Science Background section on pg 35. Once complete, have the students return the appropriate items to each bag.

**Formative Assessment/
Guided Practice**

Have students pick ten different items that should be put in a time capsule that would help paleontologists a thousand years from now understand life in the early 21st century. Ask them to justify each selection with emphasis on how their selection might be different from a related item in the future.

SD 1

Contents of Time Casule Bags

| Capsule H91 | Capsule A622 | Capsule X435 | Capsule R183 | Capsule F77 |
|--------------------------------|--------------------------------------|--------------------------------------|-----------------------------|----------------------------------|
| wooden match | wooden match | wooden match | wooden match | wooden match |
| leather shoelace | | | black shoelace | |
| wooden button | | | plastic button | plastic button |
| | metal zipper | metal zipper | plastic zipper | Velcro strip |
| | | 45 RPM record | cassette tape | CD |
| fabric samples w/blue flannel | fabric samples w/blue striped cotton | fabric samples w/green check pattern | fabric samples w/3 pieces | fabric samples w/fleece material |
| quill pen | pencil | pencil | pencil | pencil |
| metal spoon w/intricate design | metal spoon w/intricate design | metal spoon w/intricate design | metal spoon w/simple design | metal spoon w/simple design |
| | | white plastic spoon | white plastic spoon | colored plastic spoon |

SD 2 1 of 2

Time Capsules: Student Activity Sheet

Name:

Record a detailed inventory of the items in each bag. List what clues each item provides as to the relative time period of that entire bag with respect to the other bags

Capsule F77

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Capsule H91

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Capsule R183

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.

Capsule X435

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

Capsule A622

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

SD 2 2 of 2

Time Capsules: Student Activity Sheet

Place the bags in order based on relative time period from oldest to youngest. Explain why you placed the bags in that order using evidence from the clues in each bag.

Oldest

Youngest

Pick ten different items that should be put in a time capsule that would help paleontologists a thousand years from now understand life in the early 21st century. Justify each selection with emphasis on how your selection might be different from a related item in the future.