

ASSIGNMENT DISCOVERY ONLINE CURRICULUM

Lesson title:

Investigating Our Past: Where Did Humans Come From?

Grade level:

9-12, with adaptation for younger students

Subject area:

Life Science

Duration:

Two to three class periods

Objectives:

Students will—

1. Understand the ways in which certain conditions facilitate the process of evolution.
2. Understand some basic facts about three hominid groups.
3. Understand the arguments involved in both sides of the out-of-Africa versus multiregional debate.

Materials:

For the class:

- Computers with Internet access (optional but very helpful)

For each student:

- Pens and paper
- One copy of Classroom Activity Sheet: Research Notes
- One copy of Classroom Activity Sheet: Comparing Two Theories
- One copy of Take-Home Activity Sheet: Mapping Evolution:

This lesson plan can be enhanced by purchasing a copy of the documentary *Humans: Who Are We?* from our School Store. *Humans: Who Are We?* airs on the Discovery Channel January 29, March 5, April 9, and May 14.

Procedures:

1.

Pose the following question to the class: “Using what you know about the theory of evolution, for what reasons do new species develop?” Ask students to contribute words or phrases to answer this question. Have students keep a list of responses on a sheet of paper. (If students

need to review the basics of evolution, have them review an encyclopedia entry.

2.

Divide the class into small groups of approximately four students each. Write the following words or phrases on the board:

- Geographic isolation
- Interbreeding
- Generalization
- Specialization

Discuss the definitions of these terms with the class. Geographic isolation refers to the physical separation of two different populations; interbreeding refers to the coming together of two different groups; generalization means the evolutionary capacity to survive in different habitats; and specialization refers to the evolutionary adaptation of an organism to a specific habitat at the expense of the flexibility to survive in different habitats. Before continuing, make sure that students understand what these terms mean.

3.

Then discuss how, under certain circumstances, these four conditions may either facilitate or hinder the evolution of one species into a new species (a process called “speciation”). Ask groups to discuss these conditions and to write one or two sentences explaining the ways in which each condition either facilitates or hinders the evolutionary process.

4.

By studying fossil evidence, paleoanthropologists learn about how each of the four conditions discussed above affected the following hominid groups: *Homo erectus*, Neanderthal, and *Homo sapiens*. (The term “groups” is used rather than “species” because there is some debate over whether Neanderthal was in fact a distinct species.) Have students research these three hominid groups using either print resources or the Web sites listed below. Students should also note the location of each species, the time that it lived, anatomical characteristics, and social and cultural characteristics. As students gather information, have them record their findings on the Classroom Activity Sheet: Research Notes. Also, tell students that in their research, they may read about archaic *Homo sapiens* and modern *Homo sapiens*. (The first *Homo sapiens* had a larger brain case relative to body size than modern ones and were capable of language, abstract thinking, and tool making.) Some scientists believe these are separate species, while others do not. For the purposes of this lesson, have students consider both these groups when they enter data for *Homo sapiens*.

- [Human Evolution: The Fossil Evidence in 3D \(requires Shockwave plug-in\):
http://www.anth.ucsb.edu/projects/human](http://www.anth.ucsb.edu/projects/human)

- Hominid Evolution: Distinguishing Features and Characteristics: <http://www.geocities.com/SoHo/Atrium/1381/hominids2.html>
- Human Evolution: A Look at Our Ancestors: <http://www.humboldt.edu/~mrc1>
- Human Evolution: You Try It: <http://cgi.pbs.org/wgbh/aso/tryit/evolution>
- Archaeology Info (for advanced readers only): <http://www.archaeologyinfo.com/index.html>

5.

Inform the class that there is an ongoing debate in the anthropological community about the process by which our species, *Homo sapiens*, evolved and became differentiated from *Homo erectus* and Neanderthal. The two hypotheses are referred to as “out of Africa” and “multiregional.”

- Out of Africa: The theory that modern *Homo sapiens* evolved out of Africa and spread into Europe and Asia. They had evolutionary advantages that allowed them to outlive (and perhaps cause the extinction of) all other hominid groups, such as *Homo erectus* and Neanderthal.
- Multiregional: The theory that modern *Homo sapiens* evolved from other hominid groups, such as *Homo erectus* and Neanderthal, in Europe and Asia.

6.

Have students become familiar with these two theories. (Short definitions of each are available at the Archaeology Information Glossary: <<http://www.archaeologyinfo.com/glossary.htm>>.) Ask them to summarize each hypothesis in a sentence or two. Then have a brief discussion about the theories to make sure students understand them before continuing with the activity.

Note: At this point in the lesson, you may choose to keep students in their groups or let them work individually.

7.

Have students look more closely at the evidence for out of Africa and multiregionalism by going to the following Web sites, as well as print resources in your school library. As students conduct their research, have them complete their Classroom Activity Sheet: Comparing Two Theories with information they find to support each theory.

- Is an African “Eve” the Mother of Us All?: <http://www.amnh.org/enews/news/index.html>

- DNA's Evolutionary Dilemma:
http://www.sciencenews.org/sn_arc99/2_6_99/bob1.htm
- Is Out of Africa Going out the Door?:
<http://www.sciam.com/1999/0899issue/0899infocus.html>

8.

After students have a good understanding of each theory, have them pretend that they are anthropologists who have been asked to help the general public better understand the current knowledge and theories of human origins. Tell each student to write a two-page magazine article on this topic for a general audience. Each article should begin by providing some basic information about *Homo erectus*, Neanderthal, and *Homo sapiens*. It should then describe the out-of-Africa and multiregional hypotheses and the evidence in favor of each one. Students should provide specific examples from the research they have conducted, and they should make sure to phrase their explanations in language that they think most people (such as their friends) can understand. Ask students to try to mention the concepts of geographic isolation, interbreeding, generalization, and specialization in their discussion. Encourage students to include illustrations, such as sketches of fossils or of the hypothesized appearance of these hominids, or maps showing the locations and time frames for each hominid group.

9.

For homework, have students complete the Take-Home Activity Sheet: Mapping Evolution. Students will use the map to illustrate the two theories they have learned about the evolution of *Homo sapiens*.

Adaptations:

Have younger students conduct basic research to find out about the three hominid groups that are mentioned in this lesson. They should use the same Web sites listed in step 4 (omitting the one labeled "for advanced readers only") or appropriate print resources available in the library. Ask students to take notes on the physical, intellectual, geographical, and chronological characteristics of the three hominid groups and discuss their findings as a class. Then describe the out-of-Africa and multiregional hypotheses in simple terms. Ask them to list questions that they think scientists need to research in order to figure out which hypothesis is most likely to be correct.

Questions:

1. Hypothesize the traits that you think would have been most important for a hominid species during the evolutionary process.
2. Explain the effects of geographic isolation on the evolutionary process. What happens when species become isolated from one another?

3. Discuss whether you think members of a hominid species would have benefited more from being generalists or specialists with regard to their habitat and diet.
4. Analyze the facts related to the evolution of *Homo sapiens*. Then explain which hypothesis seems the most convincing. Provide evidence to defend your position.
5. Explain the reasons why anthropologists are currently unable to settle the debate between out of Africa and multiregionalism. Hypothesize what anthropologists will have to learn before reaching a more firm conclusion about which theory is more correct.
6. Suppose that a vegetarian hominid species develops an adaptation to a meat-based diet. Hypothesize the effects of this on the species' anatomy and intellectual abilities.

Evaluation:

Use the following three-point rubric to evaluate students' work during this lesson. They should be evaluated on their ability to participate in groups, follow directions, and write magazine articles illustrating their understanding of the topic. The articles should reflect thorough research of the subject using available Web and print materials, and specific examples from their research should be included in their articles.

Areas to Evaluate	1 (Exemplary performance or effort)	2 (Average performance or effort)	3 (Minimal performance or effort)
Students worked cooperatively and efficiently in their groups.			
Students completed all three classroom activity sheets thoroughly.			
Students turned in clearly written articles that included specific examples from their research.			

Extensions:

Mini-Debate

Divide the class into small groups of two or three. Assign half the groups to support the out-of-Africa theory and the other half to argue in favor of the multiregional theory. Ask students to

imagine that they are anthropologists who have to present their arguments and evidence to a panel of senior anthropologists. Have each subgroup make a poster that uses diagrams, drawings, maps, and text to illustrate the basics behind its theory and the evidence in support of that theory. The posters also should include some background information on the three hominid groups that students have investigated. Have groups share their posters with the class, with students taking turns presenting their side of the debate.

Characteristics of a Successful Species

Divide the class into small groups. Ask the groups to look at the list below. Tell them that some of the items on this list are characteristics of the groups of early hominids that succeeded in climbing the evolutionary ladder, eventually leading to the evolution of modern humans. Ask students to think about what they know about hominids and modern humans and to circle the traits they think were probably the most advantageous to early hominid groups. Then ask each group to write sentences or short statements describing how each characteristic was important in the evolutionary process.

- Inventing tools
- Running fast to escape predators
- Early language skills
- Meat eaters
- Vegetarians
- Copying the inventions of other hominid species
- Passing down ideas over generations
- Suited for warm climates
- Adapted to survive cold winters
- Very large and strong bodies
- Creating art in the form of cave paintings
- Trading tools with other families
- Remaining in the same location with their own family

Suggested Readings:

Early Humans

Roy A. Gallant, Benchmark Books, 2000.

This book offers a concise discussion of human evolution and the search for the earliest humans. Illustrations, photographs, and maps help show the range of fossil evidence, what life may have been like for Neanderthals, Homo erectus, and Homo sapiens, and what scientists are looking for to further our understanding of human origins.

Dawn of Man: The Story of Human Evolution

Robin McKie, Dorling Kindersley Publishing, Inc., 2000.

Using photographs of recent fossil finds, illustrations of the life of early man, and maps of prehistoric migrations, this book tells the fascinating story of human evolution. It includes dramatic examples of the mental, physical, and social developments that led to the survival successes of Homo sapiens over the past five million years.

Web Links:

In the Stone Ages: Back to Prehistoric Roots

Take your students on a journey exploring a cave and find out about the day in a life of a Neanderthal. If your looking for behaviors and traits of man look no further than site.

<http://dsc.discovery.com/stories/science/stoneages/stoneages.html>

Exploration of Our Kind

Explore Mesa Community Colleges Anthropology site for great teacher resources. This site explains many of the concepts covered in the study of early man in World History.

http://www.mc.maricopa.edu/academic/cult_sci/anthro/

Who was first? Untangling America's Prehistoric roots

Explore the argument of who was first to immigrate to what was to become North America. Discover interesting facts about different theories.

<http://www.discovery.com/news/features/ancientimmigrants/ancientimmigrants.html>

Human Evolution: the Fossil Evidence in 3-D

An impressive online 3D gallery of modern primate relatives and fossil ancestors of humans from the University of California at Santa Barbara. You can virtually rotate the crania for further examination and discussion in class.

<http://www.anth.ucsb.edu/projects/human/>

Human Origins: Revealing Ancient Family ties

A great good hominid timeline from TLC as well as links under “Talk Origins” which will lead you to an extensive site of both Pro and Anti Evolution sites.

<http://www.discovery.com/news/features/humanorigins/humanorigins.html>

Vocabulary:

DNA

Context: Paleoanthropologists often use DNA samples from fossil cells to determine the biological relationships between different hominid specimens they find.

Definition: A nucleic acid that constitutes the genetic material of all cellular organisms (deoxyribonucleic acid).

generalization

Context: Cockroaches are known for their generalization; unfortunately for many humans, these insects are able to adapt well to numerous habitats.

Definition: The evolutionary adaptation of an organism to survive in different habitats.

geographic isolation

Context: When Earth’s continental plates moved and the continents separated from each other, the resulting geographic isolation of certain dinosaur species contributed to the evolution of new dinosaur species.

Definition: The spatial separation of two potentially interbreeding populations.

hominid

Context: Hominid species can be distinguished from ape species by their upright position, bipedal walking, and larger brains.

Definition: Any of a family of bipedal primate mammals including recent man, his immediate ancestors, and related forms.

interbreeding

Context: Different groups of *Homo sapiens* living in Europe, Africa, and Asia engaged in interbreeding, resulting in the evolution of a single species.

Definition: The coming together of different populations.

paleoanthropologist

Context: She had always wanted to be a paleoanthropologist and study the fossils of prehuman species.

Definition: An anthropologist who studies human fossils.

specialization

Context: Koalas eat only certain types of eucalyptus leaves; this specialization means that when they are kept in captivity, zoos have to import the right type of trees and take great care to keep the trees healthy.

Definition: The evolutionary adaptation of an organism to a specific habitat at the expense of flexibility in surviving in different habitats.

speciation

Context: We are still not sure when and where the speciation that enabled modern *Homo sapiens* to come into being as a species occurred.

Definition: The process of biological species formation.

Academic standards:

Grade level:

9-12

Subject area:

Life Science

Standard:

Knows about the diversity and unity that characterize life.

Benchmark:

Knows how organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their evolutionary relationships (e.g., shared, derived characteristics inherited from a common ancestor; degree of kinship estimated from the similarity of DNA sequences).

Grade level:

9-12

Subject area:

Life Science

Standard:

Knows about the diversity and unity that characterize life.

Benchmark:

Knows how variation of organisms within a species increases the chance of survival of the species, and how the great diversity of species on Earth increases the chance of survival of life in the event of major global changes.

Grade level:

9-12

Subject area:

Life Science

Standard:

Understands the basic concepts of the evolution of species.

Benchmark:

Knows that heritable characteristics, which can be biochemical and anatomical, largely determine what capabilities an organism will have, how it will behave, and how likely it is to survive and reproduce.

Grade level:

9-12

Subject area:

Life Science

Standard:

Understands the basic concepts of the evolution of species.

Benchmark:

Knows that natural selection leads to organisms that are well suited for survival in particular environments so that when an environment changes, some inherited characteristics become more or less advantageous, or neutral, and chance alone can result in characteristics having no survival or reproductive value.

Credit

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Mapping Evolution

Instructions: Using the map below, illustrate the two theories you've learned about the evolution of *Homo sapiens*:

- **Out of Africa:** The theory that modern *Homo sapiens* evolved out of Africa and spread into Europe and Asia. They had evolutionary advantages that allowed them to outlive (and perhaps cause the extinction of) all other hominid groups, such as *Homo erectus* and Neanderthal.

- **Multiregional:** The theory that modern *Homo sapiens* evolved from other hominid groups, such as *Homo erectus* and Neanderthal, in Europe and Asia.

On the back, discuss the pros and cons of each theory based on geography. Which theory seems the most plausible?



Comparing Two Theories

Instructions: As you conduct your research, use this table to record the evidence you find that supports the two competing theories of human evolution.

Evidence for Each Hypothesis	
Evidence Supporting the Out-of-Africa Hypothesis	Evidence Supporting the Multiregional Hypothesis

Research Notes

Instructions: As you explore the Web sites your teacher suggests, use this table to take notes on what you learn about three hominid groups: *Homo erectus*, Neanderthal, and *Homo sapiens*.

Key Points	<i>Homo erectus</i>	Neanderthal	<i>Homo sapiens</i>
Geographic location; evidence for geographic isolation			
Earliest and latest known time period in which this species existed			
Anatomical characteristics; evidence for generalization or specialization			
Social and intellectual characteristics; evidence for interbreeding			