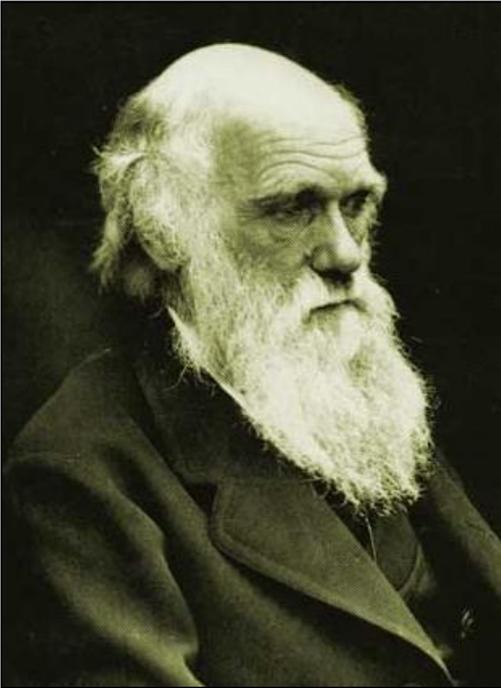


Evolution Lesson Plan: Taking Darwin's Challenge

Recommended Grade Levels: 4-7. Requires 4 hours of class time to complete.



Introduction

In *Origin of Species* Darwin challenged future generations of scientists to remember that “a fair result can be obtained only by fully stating and balancing the facts and arguments on both sides of each question.”

Despite the fact that leading science education theorists agree that students learn science best when taught “to discriminate between evidence that supports ... or does not support”¹ a given concept, many modern defenders of Darwin’s ideas reject his advice when teaching evolution.

Rather than encouraging students to understand “both sides” of the evidence, wrestle with it, and form their own opinions, the primary goal of many Darwin defenders is simply to get students to “believe in”² evolution by teaching only the “evidence that supports”³ it. They only want students to hear one side of the scientific debate, and then form the same opinion.

Science education authorities warn of two primary deficiencies in science education. First, insufficient numbers of students are being inspired to pursue careers in science.⁴ Second, many Americans simply don’t understand science, and are not scientifically literate.⁵

Unfortunately, the one-sided teaching of evolution teaches students less about science, and does not encourage them to develop critical thinking skills or inspire them to become scientists. It thus misses an opportunity to solve some of the most important problems facing science education today.

By teaching students about the facts and arguments on both sides of the scientific debate over evolution, teachers can help work towards solving problems in science education. Students learn more about the scientific evidence and improve their scientific critical thinking skills, becoming better scientists. Darwin would be proud.

For more information about teaching evolution objectively, contact Casey Luskin, Program Officer in Public Policy & Legal Affairs at the Discovery Institute:

E-mail: cluskin@discovery.org

Phone: (206) 292-0401, ext. 119.

Web: www.discovery.org

Materials Needed for *Taking Darwin's Challenge* Lesson:

- *Life on Earth: The Story of Evolution*, available at Amazon.com
- *Icons of Evolution Documentary*, available at www.discovery.org/a/2125

Step 1: Pre-assessment (30 minutes)

Ask questions to assess student views and concerns about evolution. Encourage student to understand a scientific approach to the topic.

- Ask students what they know about evolution. What have they heard about Darwin?
- Some students may raise religious objections to evolution. Explain that students are welcome to form whatever opinions they wish about evolution, but that in this class we will be discussing a scientific approach to the topic.
- Read this quote from Darwin: "A fair result can be obtained only by fully stating and balancing the facts and arguments on both sides of each question." Ask students whether this means they should be willing to consider just one side, or more than one side of the scientific evidence about evolution.
- Explain that good scientists look at all the evidence, ask hard questions, and then form an opinion. Ask students whether they think science is always correct, or whether sometimes scientists can be wrong.
- Explain that in these lessons, students will be learning about both the scientific evidence for and against evolution. Encourage them to think critically about the scientific evidence on both sides, and then form their own scientific opinions.

Step 2: Learn About the Case for Evolution (1.5 hours)

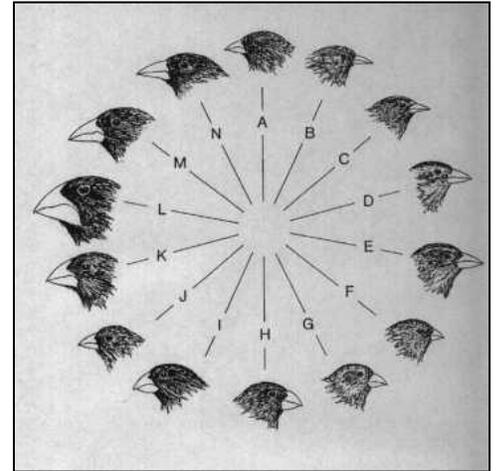
The "Evolution Readiness Project" recommends reading students the book *Life on Earth: The Story of Evolution*. Read this short 40-page book to students. *Note: Teachers with older students may wish to replace Life on Earth with readings from the pro-evolution biology textbook used as part of the standard biology curriculum.* Ask questions for discussion.

- Ask students whether life on earth has changed over time.
- What does the book claim is the main cause of evolutionary change?
- Ask students to explain how natural selection works.
- According to the book, what causes variation in living things?
- What do mutations do? In their experience, do mutations help or harm living things? Ask for examples.
- The book mentioned the Galápagos finches as an example of natural selection. How do different beak sizes help some finches survive?
- Does the book claim that species evolve by small gradual changes, or large sudden changes? Why or why not?
- The book also mentions the origin of life. Do scientists know how life arose? What are some ideas about how life might have gotten started?

Step 3: Learn About the Case against Evolution (1.5 hours)

Now students will learn about some of the science that challenges evolution. Watch the DVD *Icons of Evolution*.

- Ask students to explain the difference between microevolution and macroevolution.
- The video mentions the Galápagos finches. Do the finches represent an example of microevolution or macroevolution?
- The video mentions mutations in fruit flies which gave fruit flies an extra pair of wings. Were these fruit flies able to fly better and survive with the extra wings?
- Are mutations helpful or harmful? Ask for examples of harmful mutations? How about helpful ones?
- What was the Cambrian explosion?
- Does the fossil evidence show that species have evolved by small gradual changes, or large sudden changes? Do fossils support Darwin's theory? Why or why not?
- The video also mentions the origin of life. Does the evidence support the claim that the building blocks of life were present on the early earth? Why or why not?
- Compared to humans, was the first life simple or complex? How about compared to a calculator, computer, or cell phone? Are living organisms more or less complicated than human technology? What do students think?



Step 4: Compare, Contrast, and Critically Weigh the Evidence (30 minutes, plus homework)

Close the lesson by asking students to weigh the evidence and form their own opinions after thinking critically.

- Ask students what they learned about evolution. What is the scientific evidence supporting evolution? What is the scientific evidence against it?
- Is it possible that Darwin's theory of evolution is right about some things, but wrong about others?
- Ask whether all scientists believe in evolution. Why do some scientists challenge evolution? Why do some scientists support it?
- Assign students a homework assignment to write a short position statement explaining what they believe about evolution. Explain that they can defend whatever position they wish, but they must justify it using only scientific evidence and scientific arguments.

¹ See Jonathan Osborne, "Arguing to Learn in Science: The Role of Collaborative, Critical Discourse," *Science*, Vol. 328 (5977): 463-466 (April 23, 2010).

² See About the Evolution Readiness Project at <http://er.concord.org/about/> ("it is unacceptable that 150 years after the birth of the theory of evolution only four out of ten Americans believe in it!").

³ See Evolution Readiness Project Grant Award at <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0822213> ("This project will use computer-based models of interacting organisms and their environments to support a learning progression leading to an appreciation of the theory of evolution and evidence that supports it").

⁴ See National Science Board, "The Science and Engineering Workforce: Realizing America's Potential," p. 7 (August 14, 2003) at <http://www.nsf.gov/nsb/documents/2003/nsb0369/nsb0369.pdf> and National Science Foundation, "An Emerging and Critical Problem of the Science and Engineering Workforce: A Companion to Science and Engineering Indicators 2004" (2004) at <http://www.nsf.gov/statistics/nsb0407/nsb0407.pdf>

⁵ Many authorities recognize this problem. For one example, see *America's Lab Report: Investigations in High School Science*, p. 1 (National Research Council, 2006).