

## UNIT 7 DEALING WITH CONTROVERSY



### Evolution TV Show “What About God?”



## ONLINE STUDENT LESSON 7

### Why Is Evolution Controversial?

Students explore why evolution has always been a controversial topic.

## QUICK CLICKS



### Teacher’s Guide Web Resources

Access the Web resources referenced in this guide—from handouts to video segments to Web features—by going to [pbs.org/evolution](http://pbs.org/evolution) and clicking on Teachers and Students, and then going to the *Evolution Teacher’s Guide*, where the material is presented by unit.

“The imposition of a fundamentalist viewpoint about the interpretation of Biblical literature...is in conflict with the perspective on Biblical interpretation characteristically maintained by Biblical scholars and theological schools in the mainstream of Protestantism, Roman Catholicism, and Judaism. Such scholars find that the scientific theory of evolution does not conflict with their interpretation of the origin of life found in Biblical literature.”

—United Presbyterian Church in the USA (adopted by the General Assembly, 1982)

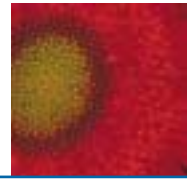
In the mid-1990s, a conflict over the teaching of evolution shook a small New Hampshire town. A newly elected school board introduced a proposal to teach **creationism** in high school biology classes. Almost overnight, the community became divided over issues of science education, educational quality, religion in the schools, and community values. The national media beat a path to Merrimack, New Hampshire’s door. Teachers felt besieged and the school and community divided. In the end, the proposal was withdrawn. A year and a half later, a new school board was elected and science education was back on track. But years later damage from the conflict still lingers.

The story of controversy over the teaching of evolution has been repeated in many different forms and in many different communities since the famous Scopes trial in Tennessee almost 80 years ago. In 1999, the Kansas state school board voted to eliminate evolution from the state science standards. Two years later, after much dissension and discussion, the school board election brought new members and a return of evolution to the Kansas standards.

In 2001, a bill was introduced in the Michigan legislature to allow “teaching the [intelligent] design hypothesis as an explanation for the origin and diversity of life.” In one Kentucky community, the superintendent had teachers glue together the pages of the earth science text that presented the **big bang theory** because the story of Genesis was not also included. How frequent are the controversies over evolution and creationism? From 1996 to 1999 the National Center for Science Education tracked an average of one new state or local problem per week.

Despite many decisions by educators, curriculum and standards committees, school boards, and the courts supporting the teaching of evolution, the conflict keeps reemerging. Biology teachers understand their responsibility to develop scientifically literate students who are able to use scientific process to determine patterns and to critically analyze alternative explanations for natural phenomena. They want their students to understand the unifying theme of evolution. But they also want to be respectful of diverse religious beliefs in their community. This is the challenge.

# WHAT ARE STRATEGIES FOR PREVENTING POTENTIAL CONFLICT?



## ***Distinguish between science and religion***

Help students understand that science and religion are two different ways of knowing the world. They are not necessarily in conflict; they are two perspectives, two different lenses.

Science develops explanations for the natural world by gathering evidence. Explanations that are supported by evidence stand and those that are not are discarded. Science does not include **supernatural** explanations that cannot be tested by scientific processes.

Religion is a system of beliefs based on faith, not bound by evidence from nature. It offers a distinctly different path for understanding the purpose of the natural world and our place in it. It is not better or worse than science, it is just different. As such, people don't need to choose between the two.

Acknowledge that many scientists are religious and that many religions support the teaching of evolution. To see what major religious denominations say about teaching evolution, see the *Science and Faith* Web feature and [www.ncseweb.org/resources/articles/4650\\_statements\\_from\\_religious\\_orga\\_3\\_13\\_2001.asp](http://www.ncseweb.org/resources/articles/4650_statements_from_religious_orga_3_13_2001.asp)

Understand that the courts distinguish between science and religion in the classroom. It is not a matter of “fairness” to present creationism along with evolution in a science classroom. It is inappropriate to teach religion in a science classroom.

The decisions:

–*Edwards v. Aguillard*, 482 U.S. 578 (1987) (USSC+):

The U.S. Supreme Court has determined it is unconstitutional to require educators who teach evolution to also teach creationism.

–*Epperson v. Arkansas*, 393 U.S. 97 (1968): The U.S. Supreme Court has determined it is unconstitutional to restrict an educator's right to teach evolution.

–*McLean v. Arkansas Board of Education*, 529 F. Supp. 1255 (1982): A Federal Court has determined that a “balanced treatment” statute to give balanced treatment to “creation-science” and “evolution-science” is unconstitutional. It declared that “creation-science” is not science.

Understand that “**intelligent design**” and “**creation science**” arguments ultimately are religious explanations that rely on supernatural causes and thus are outside of science. Become familiar with some of the “creation science” arguments such as “intelligent design” using the lens of science, but don't introduce this examination into your classroom because introducing religion into a science classroom is inappropriate. For information on creationist arguments, see [ncseweb.org/link.asp?category=5](http://ncseweb.org/link.asp?category=5)

## ***Focus on science and scientific literacy***

Use precise language. Watch how you use the terms *belief*, *theory*, and *fact*. Help students distinguish between everyday usage and scientific meanings. People might say “it's just a theory,” meaning a guess or hunch. In science, a theory is an overarching explanation that connects many tested hypotheses and observable facts.

One does not “believe” in evolution. It is a theory that scientists accept as the best, current scientific explanation. As a biology teacher, you are asking students to understand evolution and the scientific evidence that supports the theory, not to accept it.

Give students experience using the scientific process. Help students understand that science involves creating testable hypotheses and using critical thinking to analyze and synthesize data. It depends on objective tests of alternative explanations and uses multiple lines of evidence to confirm explanations. Students who understand science process and theory formation are more likely to have respect for the evidence that supports the theory of evolution.

Present scientific information based on the best current evidence. Emphasize that scientific ideas may have varying degrees of support, depending on available evidence. Help students use criteria to assess ideas, such as the veracity and number of lines of independent evidence that support a hypothesis or theory.

### TEACHER'S GUIDE WEB RESOURCES

#### Video 1 for Students

“Isn't Evolution Just a Theory?”

#### Online Course for Teachers

Session 1: “What Is the Nature of Science?”

#### Online Student Lesson

Lesson 1 “What Is the Nature of Science?”

#### Teacher's Guide

Unit 1: “What Is the Nature of Science?” (pp. 6–9)

Unit 2: “Who Was Charles Darwin?” (pp. 10–13)

### TEACHER'S GUIDE WEB RESOURCES

#### Video 7 for Students

“Why Is Evolution Controversial Anyway?” (for teacher's background)

#### Evolution Web Features

“Science and Faith”

“Evolution FAQ”





# WHAT ARE STRATEGIES FOR PREVENTING POTENTIAL CONFLICT?

## ***Be knowledgeable about evolution and dispel misinformation***

Recognize that the theory of evolution is considered a cornerstone of biology. Know that the foremost science and science education organizations support the position that evolution is a central unifying concept of biology and should be included as part of K-12 science frameworks and curricula. For position statements on teaching evolution by the National Science Teachers Association, National Association of Biology Teachers, and American Association for the Advancement of Science, go to: [www.nap.edu/readingroom/books/evolution98/Teaching about Evolution and the Nature of Science, Appendix C](http://www.nap.edu/readingroom/books/evolution98/Teaching%20about%20Evolution%20and%20the%20Nature%20of%20Science,Appendix%20C), and [www.ncseweb.org/resources/articles/33\\_national\\_science\\_teachers\\_ass\\_1\\_9\\_2001.asp](http://www.ncseweb.org/resources/articles/33_national_science_teachers_ass_1_9_2001.asp)

Thoroughly understand the evidence for evolution as well as the current understanding of mechanisms for evolutionary change.

Give examples of how evolution is relevant to our daily lives (such as antibiotic resistance, pest control in agricultural crops, invasive species, etc.). By giving students an understanding of the role of evolution in society, they can be better-informed citizens and decision-makers.

Correct misconceptions about the process of evolution when they occur (e.g., we didn't evolve from apes, but we share a common ancestor with the apes that exist today; evolution happens in populations, not individuals).

### TEACHER'S GUIDE WEB RESOURCES

#### Online Course For Teachers

Sessions 1 through 7

#### Online Student Lessons

Lessons 1 through 7

#### Teaching Evolution Case Studies

"Ken Bingman"

"Marilyn Havlik"

"Bonnie Chen"

#### Evolution Web Feature

"Evolution FAQ"

#### Evolution TV Shows

Shows 1 through 7

## ***Create a respectful learning environment***

Model respectful listening for students.

Interrupt any putdowns between students and insist on respectful interactions.

Gently redirect questions about religion back to science.

Respect and communicate that students may have a wide range of beliefs about religion and that religious beliefs are a personal issue.

Point out that students are expected only to learn about evolution, not accept it. How they integrate it with their own beliefs is a personal matter.

Accept your "creationist" students without prejudice.

### TEACHER'S GUIDE WEB RESOURCES

#### Teaching Evolution Case Studies

"Ken Bingman"

"Marilyn Havlik"

"Bonnie Chen"

## ***Use sound pedagogy***

Engage students with active learning experiences that develop deeper understanding of key concepts.

Present science as an ongoing process, not final conclusions. In science, change is expected and accepted. If something isn't testable, it isn't science. In science you never prove, only disprove. Therefore, statements such as "evolution hasn't been proven" aren't meaningful; gravity hasn't been "proven" either.

Bring preconceptions to the surface early on as students build knowledge on what they previously understood to be true.

Give students practice applying their knowledge to new situations.

### TEACHER'S GUIDE WEB RESOURCES

#### Online Course for Teachers

Sessions 6 and 7

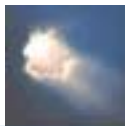
#### Teaching Evolution Case Studies

"Ken Bingman"

"Marilyn Havlik"

"Bonnie Chen"

## WHAT DO YOU DO IF CONFLICT EMERGES?



Get the support of your colleagues, school administration, and school board. You may also get valuable advice from the National Association of Biology Teachers and the National Science Teachers Association. For examples of how different communities handled controversy, see TV Show 7: “What About God?” and *Teaching Evolution Case Studies: “Dealing with Controversy.”*

Know the legal prohibitions against the teaching of creationism and legal support for teaching evolution. For a list of significant court decisions regarding evolution and creationism issues, see [www.nap.edu/readingroom/books/evolution98/](http://www.nap.edu/readingroom/books/evolution98/) *Teaching about Evolution and the Nature of Science, Appendix A*, and [www.ncseweb.org/resources/articles/3333\\_eight\\_significant\\_court\\_decisi\\_2\\_15\\_2001.asp](http://www.ncseweb.org/resources/articles/3333_eight_significant_court_decisi_2_15_2001.asp)

Communicate with parents, administrators, and school boards about the importance of scientific literacy for students. Emphasize that teaching evolution is good science education, and omitting or qualifying it deprives students of an important scientific understanding.

Invite local scientists to explain how they use scientific process in their work and/or how their work relates to evolution.

### TEACHER’S GUIDE WEB RESOURCES

#### Online Course for Teachers

Session 8: “How Do You Deal with Controversy?”

#### Teaching Evolution Case Studies

“Dealing with Controversy”

#### Evolution TV Show

Show 7: “What About God?”

## KNOW MORE

### Web Sites

[www.ncseweb.org/](http://www.ncseweb.org/) (National Center for Science Education; nationally-recognized clearinghouse for information and advice to keep evolution in the science classroom)

[www.nap.edu/readingroom/books/evolution98/](http://www.nap.edu/readingroom/books/evolution98/) (Online version of the NAP publication, *Teaching about Evolution and the Nature of Science*)

[http://www.nabt.org/sub/position\\_statements/evolution.asp](http://www.nabt.org/sub/position_statements/evolution.asp) (National Association of Biology Teachers position statement about teaching evolution)

[www.nsta.org/handbook/evolve.asp](http://www.nsta.org/handbook/evolve.asp) (National Science Teachers Association position statement on teaching evolution)

<http://ncseweb.org/article.asp?category=7> (An update of Voices)

[www.law.umkc.edu/faculty/projects/ftrials/scopes/scopes.htm](http://www.law.umkc.edu/faculty/projects/ftrials/scopes/scopes.htm) (Site on the Scopes Trial, including excerpts from the court transcripts)

### Books

Alters, Brian, and Sandra Alters. *Defending Evolution: A Guide to the Creation/Evolution Controversy*. Sudbury, MA: Jones and Bartlett, 2001.

Annenberg/CPB and WGBH. *Teaching High School Science Guidebook*. South Burlington, VT: Annenberg/CPB, 2000.

Barbour, Ian G. *When Science Meets Religion*. San Francisco: HarperCollins Publishers, 2000.

Bybee, Rodger. *Achieving Scientific Literacy: From Purposes to Practice*. Portsmouth, NH: Heinemann, 1997.

Eldredge, Niles. *The Triumph of Evolution and the Failure of Creationism*. New York, NY: W.H. Freeman and Co., 2000.

Futuyma, Douglas. *Science on Trial: The Case for Evolution, Second Edition*. Sunderland, MA: Sinauer Associates, Inc., 1995.

Haight, John F. *Science and Religion: From Conflict to Conversation*. Mahwah, NJ: Paulist Press, 1995.

Matsumara, Molleen, ed. *Voices for Evolution, Second Edition*. Berkeley, CA: National Center for Science Education, Inc., 1995.

Miller, Ken. *Finding Darwin’s God*. Cliff Street Books, New York: 2000.

National Academy of Sciences. *Teaching about Evolution and the Nature of Science*. Washington, DC: National Academy Press, 1998. (See especially, Dialogue: The Challenge to Teachers, Frequently Asked Questions About Evolution and the Nature of Science, and Appendices A, B, and C.)

National Academy of Sciences. *Science and Creationism: A View from the National Academy of Sciences, Second Edition*. Washington, DC: National Academy Press, 1999.

National Research Council. *How People Learn: Brain, Mind, Experience, and School*. Washington, DC: National Academy Press, 2000.

National Research Council. *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning*. Washington, DC: National Academy Press, 2000.

Pennock, Robert. *Tower of Babel: The Evidence Against the New Creationism*. Cambridge, MA: MIT Press, 1999.

Schopf, J. William. *Evolution! Facts and Fallacies*. San Diego, CA: Academic Press, 1999.

Skehan, James, and Craig Nelson. *The Creation Controversy and the Science Classroom*. Arlington, VA: NSTA Press, 2000.

Strahler, Arthur N. *Science and Earth History— The Evolution/Creation Controversy*. Amherst, NY: Prometheus Books, 1999.

[pbs.org/evolution](http://pbs.org/evolution)



[www.scilinks.org](http://www.scilinks.org) Topic  
evolution in the classroom

Keyword  
EG33A