



SCIENCE DISSECTED

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Teaching the “E” Word: Evolution in the Classroom

Evolution is an essential topic within the biology curriculum as it explains the diversity of life on Earth by using evidence from various fields such as biochemistry, paleontology, and ecology. *In the scientific community, there is no debate whether or not evolution has occurred, but rather how it happened.* Scientists regard evolution as a fact and a theory. Despite the overwhelming evidence which supports that evolution has occurred and continues to occur; the general public considers evolution a controversial topic. It is unfortunate that such an important concept evokes an emotional response from students and parents. The “E” word causes an emotional response from individuals due to several commonly held misconceptions.



What is evolution?

“In the biological sciences, evolution is a scientific theory that explains the emergence of new varieties of living things in the past and in the present; it is not a “theory of origins” about how life began. Evolution accounts for the striking patterns of similarities and differences among living things over time and across habitats through the action of biological processes such as natural selection, mutation, symbiosis, gene transfer, and genetic drift. Evolution has been subjected to scientific testing for over a century and has been (and continues to be) consistently confirmed by evidence from a wide range of fields.”

From: *National Center for Science Education*

Misconception #1: Evolution is just a theory.

Biology teachers may face a struggle in their classrooms when they explain evolution science. Notice the use of the term “evolution science” rather than the often misconstrued phrase “theory of evolution.” Scientifically illiterate individuals often concur that evolution is “just a theory” as a way to explain that there must be other accepted alternatives to explain the diversity of life on the planet. However, the scientific definition of a theory is quite different from the everyday use of the term. All scientific theories are well-established explanations that are subject to revision as additional evidence reveal deficiencies. It is as unlikely that new evidence will completely overturn the theory of plate tectonics just as new evidence probably will not require a complete overhaul of the theory of evolution. There is such a vast amount of evidence to support that organisms have changed over time, that scientists do not study *if* organisms have evolved, instead they debate *how* they evolved.

Misconception #2: Humans evolved from monkeys.

Darwin’s theory of common ancestry was revolutionary during his time. He explained that all organisms on Earth evolved from a single tree of life. Darwin’s claim was disturbing to people because humans were included on this tree. Some individuals may have difficulty accepting evolution because it means that humans are not as special as many would like to think. However, humans should be accustomed to scientific discoveries that show how insignificant we are. For example, in astronomy, the heliocentric theory shows that the Earth is not the center of the solar system or universe. In fact, this theory states that the Earth orbits the sun just like all the other planets. With the advancement of technology, later discoveries showed us that our entire solar system lies within one galaxy among billions of galaxies in the universe. In geology, the geological time scale shows that humans have only inhabited the Earth for a tiny fraction of time during its 4.6 billion year history. Evidence from sources such as fossils, comparative anatomy, and biochemical analysis show how similar humans are to other primates. Evolution does not claim that humans evolved from chimpanzees or any other primate that exists today. Instead, humans and chimpanzees both evolved from a common ancestor that existed approximately 6-7 million years ago. That common ancestor has since gone extinct.

Written by: Elizabeth Marconi

Misconception#3: Evolution and religion are in conflict with one another.

In America, unlike other industrialized nations, a majority of the population is unaware of the evidence that supports evolution. According to a February 2009 Gallup poll, 39% of Americans “believe in evolution.” In the same survey, 25% of Americans did not believe in evolution and 36% had no opinion. Although there are many issues associated with a belief in a scientific concept, that will not be addressed in this article. According to the Gallup poll results, there is a relationship between an individual’s acceptance of evolution and church attendance. The individuals who attend church regularly are less likely to state that they believe in evolution. Among the weekly churchgoers, 24% believe in evolution, 41% state that they do not believe, and 35% percent have no opinion. Compared to those who seldom or never attend church, 55% believe in evolution, while 11% do not, and 34% have no opinion. A link was also established between the amount of schooling an individual had and their belief in evolution. Among those with a high school education or less, only 21% believed in evolution and 52% had no opinion on the subject. Compared to those with postgraduate degrees, 74% believed in evolution and only 16% had no opinion. A similar poll conducted in May 2007, focused on republicans who do not believe in evolution and the reason for their position. According to the survey, four out of the five most common reasons why these individuals did not believe in evolution related to a conflict with their religious beliefs (shown in Figure 1). It is interesting to note that most mainstream religions do not see a conflict between the acceptance of evolution and their faith. There should not be a conflict between religion and science. In addition, most religions accept that the Earth is billions of years old and that evolution provides a logical explanation for the diversity of life on the planet. Religion and science are separate entities and should not conflict with one another. Science focuses on observations and experiments of the natural world. Religion is not based on empirical evidence and involves supernatural phenomenon.

Figure 1. Gallup Poll, May 2007

What is the most important reason why you do not believe in evolution?	
I believe in Jesus Christ.	19%
I believe in God.	16%
Due to my religious faith.	16%
Not enough evidence.	14%
I believe the Bible.	12%

Misconception #4: Both creationism and evolution should be taught in a science classroom.

Creationism is religion. Whether it is the young Earth creationists who believe the Earth is less than 10,000 years old or the Intelligent Design sect that states an intelligent agent (i.e. God) is responsible for the creation of each organism on Earth; religion has no place in a science classroom. It is unlawful to impose a specific religious belief upon students in American public schools. Creationism in any form is not science. The *Kitzmiller v. Dover School District* (2005) case reinforced the decision that all forms of creationism, including Intelligent Design, should not be taught in American public schools. In the *Dover* case, Judge John E. Jones ruled that Intelligent Design is not science and has no place in science curriculum. Unfortunately, the goal of many creationists is to reinforce evolution misconceptions and cause an internal struggle for students forcing them to choose between their faith in God and the acceptance of the process of evolution.

Teachers should not avoid teaching evolution or lead students to believe that it is an independent concept that does not impact their lives. Evidence of evolution is apparent everyday from the effects of an invasive species on an environment to the problems associated with antibiotic resistant bacteria. In addition, many evolutionary breakthroughs lead to scientific advances in medicine. Evolution science is necessary when investigating resistant strains of pathogens such as influenza and malaria. Comparing human and chimpanzee genomes will aid scientists in determining why ailments such as AIDS, heart disease, hepatitis and malaria impact humans more than chimps.

Related Links

National Center for Science Education: <http://ncseweb.org/>

UC Berkeley- Understanding Evolution: http://evolution.berkeley.edu/evolibrary/article/evo_01

PBS- Frequently Asked Questions About Evolution: <http://www.pbs.org/wgbh/evolution/library/faq/index.html>

February 2009 Evolution Gallup Poll: <http://www.gallup.com/poll/114544/Darwin-Birthday-Believe-Evolution.aspx>

May 2007 Evolution Gallup Poll: <http://www.gallup.com/poll/27847/Majority-Republicans-Doubt-Theory-Evolution.aspx>

NOVA: Judgment Day- Intelligent Design on Trial: <http://www.pbs.org/wgbh/nova/id/>

Decision by Judge John E. Jones on the Kitzmiller v. Dover Case: http://ncseweb.org/webfm_send/73