

The Ongoing Challenges to Evolution Education: Schools, the Law, and Classroom Instruction

GORDON EMMETT HALL, SHIRLEY ANDREA WOIKA

ABSTRACT

There are forces at the local, state, and national levels that have worked to delegitimize the teaching of evolution and, in some cases, to legitimize the teaching of religious theory. Despite scientific evidence, public opinion, and even legislation, these forces have continued to influence, and in some cases block, the teaching of evolution in public schools. Proponents for the teaching of religious theory in schools have been defeated in the courts many times but have continued to find new ways to insert their ideology into the U.S. education system. Strategies for avoiding controversy, confronting misinformation, and distinguishing science from faith are provided at the end of this article.

Key Words: evolution; teaching of evolution; religious theory; law; classroom instruction.

“Nothing in biology makes sense except in the light of evolution.”

—Theodosius Dobzhansky

In a 2008 publication, the National Academy of Sciences stated, “the evidence supporting [evolution] is so strong, scientists no longer question whether biological evolution has occurred and is continuing to occur. Instead, they investigate the mechanisms of evolution [genetic drift, punctuated equilibrium, founder effect, etc.], how rapidly evolution can take place, and related questions” (cited in Berkman & Plutzer, 2010). (Evolution is a change in genetic frequency in a population over time. Natural selection is the theoretical process by which certain alleles are chosen. There are other proposed mechanisms, such as punctuated equilibrium.)

Similarly, 83 percent of Americans surveyed in national opinion polls indicated that evolution should be taught in public schools (DYG, 2000). By contrast, a recent survey indicated that

Natural selection is the theoretical process by which certain alleles are chosen.

close to 60 percent of high school biology teachers do not consider themselves advocates for evolutionary biology (Berkman & Plutzer, 2010). In fact, many teachers from the study reported fear at the prospect of teaching evolution. What is the reason for the fear?

There are forces at the local, state, and national levels that have worked to delegitimize the teaching of evolution and, in some cases, to legitimize the teaching of religious theory. Despite scientific evidence, public opinion, and even legislation, these forces have continued to influence, and in some cases block, the teaching of evolution in public schools. As will be seen below, proponents of the teaching of religious theory in schools have been defeated in the courts many times but have continued to find new ways to insert their ideology into the U.S. education system. Strategies for avoiding controversy, confronting misinformation, and distinguishing science from faith are provided at the end of this article.

○ Evolution and Its Opponents

In 1859, Charles Darwin published *On the Origin of Species*, a book that proposed the theory of evolution by natural selection as a tool for explaining the history of life on Earth. Many members of the scientific community were initially skeptical of Darwin’s proposal (Moore et al., 2010). However, over the next sixty years, there was such an accumulation of evidence that in 1922, the American Association for the Advancement of Science passed a resolution stating that “the evidence in favor of the evolution of man are sufficient to convince every scientist of note in the world” (Berkman & Plutzer, 2010).

Despite the accumulation of evidence, the teaching of evolution in U.S. public schools remains a controversial topic. For long periods in American history, the teaching of evolution was excluded from the standard curriculum in U.S. public schools. In more recent years, opponents of the

teaching of evolution have targeted state education agencies, textbook makers, and local school boards. The controversy is largely a disagreement between science and religion. Opponents of evolution are often proponents of creation science or, more recently, the theory of intelligent design. Both theories stem from the belief that life and the universe are the creation of a supernatural being (or intelligent designer), most often referring to the Christian God. Proponents of creation science or intelligent design theory contend that evolution contradicts the story of Genesis. According to the Center for Science and Culture, the theory of intelligent design holds that the universe and all living things “are best explained by an intelligent cause, not an undirected process such as natural selection.”

Opponents of evolution have been successful in their attempts to influence what gets taught in the classroom. In the 2007 National Survey of High School Biology Teachers conducted by researchers at the Pennsylvania State University, 17 percent of the teachers surveyed did not cover human evolution at all in their biology class, and 13 percent of the teachers surveyed did not personally believe that evolution by natural selection was the best mechanism for explaining the history of life on Earth. In addition, 60 percent of the teachers surveyed spent only 1 to 5 hours of class time covering the topic (cited in Berkman & Plutzer, 2010). When teachers were asked to explain the amount of time that they spent covering human evolution, they stated that they often avoided the subject for fear of stirring conflict.

Teachers may fear the topic because there are many people who continue to doubt the evidence supporting evolution, or they may have, themselves, only received cursory instruction on evolution. In a recent review of public opinion polls from 1981 to 2007, researchers found that in a typical year, about 45 percent of individuals polled agreed with the statement that humans developed from earlier species of animals. In addition, nearly two-thirds of the individuals polled believed that creationism should be taught alongside evolution as an alternative theory rather than teaching evolution alone (Plutzer & Berkman, 2008). Teachers and the science classroom have become ground zero for the public debate between science and religion, and they, understandably, shy away from material that could be construed as offensive.

○ The Legal Case for Teaching Evolution

The backlash against the teaching of evolution eventually led to the passage of laws excluding it from state educational standards. One of the most famous was the Butler Act in Tennessee, which prohibited any state-supported public school from teaching any theory that contradicted the divine creation of man as taught in the Bible. A general science teacher from Dayton, Tennessee, by the name of John T. Scopes admitted to using a text that taught human evolution. He was prosecuted under the new law in one of the most famous court cases in U.S. history, the Scopes “Monkey Trial.”

The jury trial in Dayton and the appeal to the Tennessee Supreme Court involved three distinct arguments about evolution in the public schools. These arguments will be discussed in detail from a legal perspective because they remain relevant to educators today. The first argument had to do with the strength of the evidence supporting evolution and the question of whether or not the evidence supporting evolution would contradict the teachings

of the Bible. The second argument had to do with the constitutionality of a law that tells teachers what not to teach. This line of questioning sought to answer the question, should the legislature be able to set curricular policies for public school employees? The final argument involved the issue of academic freedom and tackled the question, does a public school employee have the right to teach what he or she deems appropriate? These themes would continue to dominate the discussion about evolution in the schools long after the Scopes Monkey Trial.

The Criminal Court of Rhea County in *Tennessee v. Scopes* (1925) focused almost exclusively on the question of whether teachers have the right to ignore a law prohibiting the teaching of a certain subject. In so doing, they found Scopes guilty of violating a state law. Scopes and his legal team appealed. However, in *John T. Scopes v. the State* (1927), the Supreme Court of Tennessee focused on whether or not the legislature should be allowed to set curricular policies for teachers. The Supreme Court upheld the Butler Act and concluded that Scopes had a responsibility to teach whatever the state said was appropriate, and to restrict his instruction to the topics the state established (Berkman & Plutzer, 2010).

The ruling in the Scopes Monkey Trial effectively removed evolution from the public school curriculum for thirty years (Berkman & Plutzer, 2010). It would not be until the launch of Sputnik by the Soviet Union in 1958, which fueled a critical analysis of science curricula in U.S. public schools, that evolution would return to U.S. classrooms. The case for teaching evolution was strengthened by the “modern evolutionary synthesis,” which took place during the middle of the twentieth century. The modern evolutionary synthesis drew together ideas from genetics, biology, botany, morphology, ecology, paleontology, and medicine to provide a comprehensive understanding of evolution. The increased focus on science and the addition of new evidence supporting evolution led to its widespread inclusion in new textbooks adopted by public schools. Despite its inclusion in standard science curricula, many states still had laws on the books prohibiting the teaching of evolution in public schools.

Arkansas had one such law that was challenged by a tenth grade biology teacher named Susan Epperson. Epperson won her case in the Arkansas Chancery Court, which found that the law restricted her academic freedom (Berkman & Plutzer, 2010). The case was appealed to the Arkansas State Supreme Court, where Epperson lost (*Epperson v. Arkansas*, 1968). The Arkansas State Supreme Court rejected the notion of academic freedom and concluded that the prohibition of evolution instruction was an appropriate exercise of the power of the state. Finally, Epperson appealed to the U.S. Supreme Court, where she won her case in a unanimous decision (*Epperson v. Arkansas*, 1968, 107). However, the U.S. Supreme Court ignored the issue of academic freedom altogether and, instead, focused on an interpretation of the First Amendment’s establishment clause, which states, “Congress shall make no law respecting an establishment of religion.” The court had concluded that the exclusive motivation behind the prohibition of evolutionary instruction was to protect a particular religious viewpoint. The ruling allowed for state legislatures to make decisions about science curricula and textbooks as long as they do not favor a particular religious perspective.

The anti-evolution forces responded to the U.S. Supreme Court ruling by pressing state legislatures to pass new laws promoting the teaching of several alternatives to evolution. In similar fashion, the

Balanced Treatment for Creation-Science and Evolution-Science Act, passed in Arkansas in 1981. Act 590 mandated equal time for instruction in evolution and creation science. Arkansas's law was challenged in federal court in *McLean v. Arkansas Board of Education* (1982). The Federal District Court concluded that creation science was not a science at all, but an attempt to bring the biblical account of creation into the science curriculum, and was, therefore, unconstitutional.

A similar case was brought against a Louisiana law with similar wording. This case went all the way to the U.S. Supreme Court. In *Edwards v. Aguillard* (1987), the court determined that the law's inclusion of "creation science" had a religious purpose and was impermissible as a result. In addition, the requirement that creation science be taught alongside evolution undermined the provision of a comprehensive science education. The Louisiana law was ruled unconstitutional. The result of these decisions was that state legislatures could not entirely ban evolution, nor could they require the inclusion of the story of creation from the Bible or "creation science."

Not to be deterred, the forces opposing the teaching of evolution found new ways to delegitimize instruction in evolutionary biology. In two separate instances, state legislatures passed laws requiring a warning label to be shown visibly or read aloud during the instruction of evolution, which were then challenged in court (*Freiler v. Tangipahoa Board of Education*, 1997; *Selman et al. v. Cobb County School District and Cobb County Board of Education*, 2005). These rulings found that warning labels for evolution violate the Establishment Clause of the First Amendment. In the case of *Freiler*, the warning label actively promoted religion because teachers were required to state, prior to a unit on evolution, that the information was "presented to inform [them] of the scientific concept and not intended to influence or dissuade the Biblical version of Creation or any other concept."

The restrictions on state legislatures created by the court cases described above led to the development of a new rival to evolution called "the theory of intelligent design." State legislatures were clearly prohibited from drafting legislation that would include creation science, thus creation science was repackaged. Intelligent design theory includes the same arguments that were proposed in creation science, but with all obvious connections to religious ideology removed. Recently, the school board of Dover, Pennsylvania, adopted a textbook that included the theory of intelligent design as an alternative to evolution. A group of teachers and parents challenged the decision in *Kitzmiller v. Dover* (2005). Barbara Forrest testified at the hearing and demonstrated that the words "creation" and "creationist" were systematically changed to "intelligent design" and "design proponent" in an intelligent design textbook. Her testimony demonstrated that intelligent design was a direct descendent of creationism. The court ruled that the theory of intelligent design could not be classified as a scientific theory. As a descendant of creation science, it could not be distinguished from religion. This ruling has likely had the effect of discouraging other school boards from adopting intelligent design theory as a part of their science curriculum.

The history of case law makes clear that laws prohibiting the instruction of evolution or marrying it to some form of creation science are unconstitutional. Seeking a new way to challenge the instruction of evolution, several teachers made the argument that

requiring a teacher to provide instruction on evolution was a violation of the teacher's individual first amendment rights to freedom of speech or exercise of religion (*Webster v. New Lenox School District 122*, 1990; *John E. Pelozo v. Capistrano Unified School District*, 1994; *Rodney LeVake v. Independent School District 656*, 2000). The rulings in each case found that neither free speech rights nor the right to free exercise of religion are violated when science teachers are asked to teach a scientific theory or to refrain from teaching creation science.

In summary, the scientific evidence for evolution is clear and unequivocal. As national associations of science teachers and national associations of scientists have made clear, teaching evolution is a critical component to producing scientifically literate graduates from U.S. public schools. The case law also makes clear that evolution is recognized as the only scientific theory for explaining the history of life on Earth. All other explanations, as represented in the case law, have been found to promote a particular religious perspective. However, as can also be concluded from examining the case law, this has not stopped the opponents of evolution from injecting doubt and sowing confusion about evolution's place in the science classroom. The introduction of a new ruling supporting instruction in evolution appears to breed new strategies for dismantling its instruction.

○ Current Laws Regarding Evolutionary Instruction

Currently, seven states require that "students critically analyze key aspects of evolutionary theory" in their science curriculum standards: Texas, Minnesota, New Mexico, Pennsylvania, Missouri, South Carolina, and Alabama (Discovery Institute, 2009). However, these same states do not ask students to critically analyze the aspects of any other bedrock scientific theory. Two additional states, Louisiana and Mississippi, have passed legislation encouraging teachers to discuss scientific evidence critical of evolution. The court cases mentioned above have restricted the language that can be used to deny evolution, but they have not stopped the opponents of evolution from continuing the effort to undermine the teaching of evolution in public schools.

Anti-evolution legislation continues to be introduced in state legislature on a regular basis. In January 2015 alone, five anti-evolution bills were introduced across the nation. These included Missouri's House Bill 486, Indiana's Senate Bill 562, Oklahoma's Senate Bill 665, South Dakota's Senate Bill 114, and Montana's House Bill 321. As of this writing in 2016, similar legislation was introduced in Florida, Idaho, Mississippi, Oklahoma, and South Dakota. Additionally, Alabama decided that its biology texts would continue to carry a disclaimer about evolution (despite previous case law striking down such disclaimers), and Louisiana failed to repeal the Balanced Treatment for Creation-Science and Evolution-Science Act of 1981, which was found to be unconstitutional by the *Edwards v. Aguillard* Supreme Court decision in 1987. Taken in consideration alongside the states with legislation already on the books, it is evident that the fight against evolution instruction is not restricted to one geographical region. Clearly, the controversy lives on.

In a 2016 study conducted on 110 anti-evolution bills introduced between 2000 and 2012 across 26 states, researchers at

Rice University and West Virginia University reported that only 25 percent of the legislation made it through a state's education committee to a vote by the state legislature. Only two bills were enacted into law, one in Louisiana and one in Tennessee. The three states in which the most bills were introduced were Oklahoma, Mississippi, and Alabama with 13, 11, and 10 bills, respectively. These three states also have the highest number of conservative Protestants in the United States. The researchers found that higher rates of conservative Protestants were correlated with a higher number of bills being introduced, but the correlation did not carry over to bills being considered in the state legislation. Given the low rate of success in having anti-evolution bills become law, it was concluded that legislators introduce such bills "not because they expect success, but to mollify religious constituents" (Johnson et al., 2016).

○ Conclusion

The amount of control that districts have over curriculum is slim and getting slimmer due, in part, to the efforts of the accountability movement (e.g., Common Core curriculum and No Child Left Behind Act). The court cases make clear that the inclusion of creation, creation science, or intelligent design theory in the science curriculum is unconstitutional. Based on these decisions, the banning of evolution is unconstitutional. Teaching evolution is not just part of a comprehensive science education, it is part of good scientific literacy. Evolution is considered to be one of four core ideas of biology instruction in the Next Generation of Science Standards (Bybee, 2012). The issue within the classroom, though, has little to do with the results of the most recent court cases. Teachers may still face challenges from passionate opponents of evolution. Shying from the issue to avoid controversy is an entirely understandable response. The evidence from surveys of biology teachers suggests that teachers are not devoting the necessary time to evolution instruction.

More research is necessary to answer questions about why teachers are devoting so little time to evolution instruction and what can be done to increase that amount of time. Science teacher preparation programs can play a critical role in emphasizing evolution instruction in schools. Science teacher education programs may want to consider the legal, ethical, and scientific imperative of teaching evolution. It is clear that the scientific evidence supporting evolution is no longer in dispute, and the court cases demonstrate that evolution is a necessary component of quality scientific instruction. There are many aspects of learning that require an individual to, at times, go beyond her or his comfort zone. Similarly, ethical teaching may require teachers to, at times, go beyond their comfort zone.

○ Recommended Actions

As a biology teacher, you are in a position to act in support of the teaching of evolution. The first step is to understand the religious background of the community in which you teach. This is good practice beyond evolution instruction. If the topic will be controversial in your school district, you might consider offering to testify at a school board meeting or writing a letter to the editor of your

local newspaper. Some excellent suggestions for taking such action can be found on the National Center for Science Education website (<http://ncse.com>) under the Taking Action tab on the home page.

Another area where biology teachers can have an impact is how they introduce evolution to students. One suggested introduction involves defining science, philosophy, and religion as ways of learning about the world. These fields differ in what they study and how they study it. A quick internet search will yield in numerous postings on the topic by educators. Southerland and Scharmann (2013) provide an excellent overview of the process of defining religious questions, aesthetic questions, and scientific questions (among others), as well as additional resources for introducing the topic of evolution. This practice has relevance for a number of other topics that have become politically charged, such as the human influence on climate change.

The proponents of intelligent design and creation science often come to an evolutionary discussion prepared to debate the supposed critiques of evolution. Biology teachers should be well versed in the conceptual framework of evolution. A detailed listing of conceptual understandings regarding evolution aligned across grade levels is available at Understanding Evolution, <http://evolution.berkeley.edu/evolibrary/teach/framework.php>. This framework has been aligned with the Next Generation Science Standards and is divided into five strands: History of life, Evidence of evolution, Mechanisms of evolution, Nature of science, and Studying evolution. A strong conceptual understanding will allow teachers to "stick to the facts," and framing the lesson as one strictly about science will allow teachers to talk about how evolution answers specifically scientific questions.

It is also worthwhile to understand the talking points that are promoted by supporters of intelligent design or creation science, as these talking points will often be brought up in the science classroom. One resource can be found at <http://www.discovery.org/id>. This is the website for the Center for Science and Culture, and it contains, among other things, guides for arguing against instruction in evolution and promoting instruction in intelligent design. A teacher familiar with the talking points is much more likely to be able to sidestep attempts by students to draw the class into a discussion of religious theory, and to maintain focus on the science.

References

- Balanced Treatment for Creation-Science and Evolution-Science Act, Ark. Stat. 590 (1981).
- Berkman, M., & Plutzer, E. (2010). *Evolution, creationism, and the battle to control America's classrooms*. New York: Cambridge University Press.
- Butler Act, Tennessee General Laws Ch. 27 § 1 (1925).
- Bybee, R. (2012). The Next Generation of Science Standards: Implications for Biology Education. *The American Biology Teacher*, 74(8), 542–549. doi:10.1525/abt.2012.74.8.3
- Center for Science & Culture. (n.d.). Intelligent design definition. Retrieved from <http://www.intelligentdesign.org>
- Discovery Institute. (2009, March). Texas improves on strengths and weaknesses language in science standards on teaching evolution. (2009). Retrieved from <http://www.discovery.org/a/9851>
- DYG, Inc. (2000). *Evolution and creationism in public education: An in-depth reading of public opinion*. Retrieved from People for the

- American Way Foundation, <http://www.pfaw.org/sites/default/files/evolutionandcreationisminpubliceducation.pdf>
- Edwards v. Aguillard, 482 U.S. 578 (1987).
- Epperson v. Arkansas, 393 U.S. 97 (1968).
- Freiler v. Tangipahoa Parish Board of Education. Civil Action No. 94-3577. 975 F. Supp. 819 (E.D. La. 1997), <https://www.ravellaw.com/opinions/53682b96c440dc038a2712092967ee62?query=%22intelligent%20design%22>
- Johnson, D. R., Scheitle, C. P., & Ecklund, E. H. (2016). Conservative Protestantism and anti-evolution curricular challenges across states. *Social Science Quarterly*, 97(5), 1227–1244.
- Kitzmiller v. Dover, 400 F. Supp. 2d 707 (M.D. Pa. 2005).
- LeVake v. Independent School District 656, 625 NW 2d 502 (MN Ct. of Appeal 2000).
- McLean v. Arkansas Board of Education, 529 F. Supp. 1255 (1982).
- Moore, R., Decker, M., & Cotner, S. (2010). *Chronology of the evolution-creationism controversy*. Santa Barbara, CA: ABC-CLIO, LLC.
- Peloza v. Capistrano Unified School District, 37 F. 3d 517 (1994).
- Plutzer, E., & Berkman, M. (2008). The polls-trends. Evolution, creationism, and the teaching of human origins in schools. *Public Opinion Quarterly*, 72(3), 540–553. Retrieved from <http://web.ebscohost.com.ezaccess>.
- libraries.psu.edu/ehost/detail?sid=731bd92d-6c61-47c8-ad13-cd6281f671c5%40sessionmgr12&vid=1&hid=19&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#db=ufh&AN=34789865
- Scopes v. The State, 152 Tenn. 424 (1927).
- Selman et al. v. Cobb County School District and Cobb County Board of Education, 390 F. Supp. 2d 1286, 1313 (2005).
- Southerland, S. A., & Scharmann, L. C. (2013). Acknowledging the religious beliefs students bring into the science classroom: Using the bounded nature of science. *Theory Into Practice*, 52(1), 59–65. doi:10.1080/07351690.2013.743778
- Tennessee v. Scopes, 289 SW 363 (1925).
- Webster v. New Lenox School District, 122, 917 F. 2d 1004. (7th Cir., 1990).

GORDON EMMETT HALL (gemmett.hall@gmail.com) and SHIRLEY ANDREA WOIKA (saw194@psu.edu) are both in the School of Psychology, Pennsylvania State University, 125G CEDAR Building, University Park, PA16802, USA.

BONE CLONES
INCORPORATED
OSTEOLOGICAL  REPRODUCTIONS

FOR ALL YOUR OSTEOLOGICAL NEEDS



www.boneclones.com
info@boneclones.com 800-914-0091

