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Science standards: The foundation of evolution education in the United States



Elizabeth Watts^{a,*}, Georgy S. Levit^b, Uwe Hoßfeld^{a,b}

^a Friedrich-Schiller-Universität Jena, Arbeitsgruppe Biologiedidaktik, Am Steiger 3, Bienenhaus, 07743 Jena, Germany

^b ITMO University, Chaikovsky st, 11/2, 191187 St. Petersburg, Russia

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Abstract Science standards and textbooks have a huge impact on the manner in which evolution is taught in American classrooms. Standards dictate how much time and what points have to be dedicated to the subject in order to prepare students for state-wide assessments, while the textbooks will largely determine how the subject is presented in the classroom. In the United States both standards and textbooks are determined at the state-level through a political process. Currently there is a tremendous amount of pressure arising from anti-evolutionists in the United States to weaken or omit the teaching of evolution despite recommendations from central institutions such as the National Academy of Science. Results from the Program for International Student Assessment (PISA) showed that not only are American students performing below average, but also that their performance is declining as they scored worse in 2012 than they did in 2010. Interestingly PISA also found that the internal variation within a country is often greater than between countries with a variation of up to 300 points, which is equivalent to seven years of education pointing to the extreme heterogeneous quality of education within a country (OECD, 2012). An implementation of strong standards would not only help to increase the average performance of American students but could also alleviate the vast discrepancy between the highest and lowest scoring groups of American students. Although the *Next Generation Science Standards* have been in existence since 2013 and *A Framework for K-12 Science Education* has been available to the public since 2011 many American states still continue to create their own standards that, according to the Fordham study, are well below par (Lerner et al., 2012). Due to the political nature of the adoption procedure of standards and textbooks, there are many opportunities for interested individuals to get involved in the process of improving these fundamental elements of science education.

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Abbreviations: ACT, American College Testing Program; AAAS, American Association for the Advancement of Science; NCSE, National Center for Science Education; NGSS, Next Generation Science Standards; SBOE, State Board of Education; TEA, Texas Education Agency; TEKS, Texas Essential Knowledge and Skills.

* Corresponding author.

E-mail addresses: elzwatts@gmail.com (E. Watts), gslavit@corp.ifmo.ru (G.S. Levit), uwe.hossfeld@uni-jena.de (U. Hoßfeld).

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Introduction

An organized movement against the teaching of evolution in public schools has been present in the United States since the 1920s (Numbers, 2009). Unlike other countries, the American school system is not regulated by the national government but is instead largely dictated by state-level decisions, which means that public education in the United States varies greatly state to state since the lack of a nationally centralized curriculum or education standards means that each state has the ability to determine its own standards (USNEI, 2008). Of course these standards are similar in some aspects but can differ greatly when it comes to controversial subjects like evolution (Padian, 2010).

The decision about curriculum is made by committees and boards of elected individuals (USNEI, 2008). The fact that these decision-making individuals are elected, and thus have responsibilities to represent the desires of their constituents, means that local individuals can get involved in helping determine the state standards through political activity. The ability for individuals to affect change to the education system is particularly relevant for science education in the United States since polls have shown that one in three American adults rejects the theory of evolution as a suitable explanation for life on Earth (Miller et al., 2006) and 40 percent of Americans believe that the earth was created through supernatural forces within the last six to ten thousand years (Blanke and Smedt, 2013; Newport, 2010).

This opportunity to affect statewide science standards has in fact become a relatively new target for Darwin doubters; one that has a broader impact than local school-board decisions as Glenn Branch of the *National Center for Science Education* describes, "Savvy creationists are focusing their efforts on this relatively new arena (Wallis, 2005, p. 55)." And they are succeeding – the Fordham Institute published a report in 2012 about state science standards in the United States and found that the most important weakness in the science standards is how evolution is undermined and presented as a weak scientific theory in many states. They further found that although some states are teaching evolution better than they did in the past, the increasing pressure from anti-evolution groups continues to pose a serious threat to science standards in the United States (Lerner et al., 2012). This attempt to weaken the teaching of evolution by trying to emphasize the weaknesses and gaps in evolution is in essence the crux of the intelligent design movement (Wallis, 2005). For anyone who believes that intelligent design is less harmful to science education than its older cousin, creationism, must understand that intelligent design may be the most potent and dangerous version of creationism yet and it is a major threat to the scientific education of American students (Blanke, 2014; Forrest, 2007). This threat to science education is particularly relevant in the United States, since studies have shown that 69% of American students failed to meet the ACT's college readiness benchmarks for science (ACT, 2012).

To understand, just how fast and wide spread the effects of these political decisions can be, one can simply look at what happened in Kansas in 1999 when the State Board of Education voted to completely remove evolution from the state science standards and pursue a science curriculum that omits evolution (Cunningham, 1999). Although the

omission from the science standards does not prohibit the teaching of evolution, by removing it from the state curriculum and thus from state assessment tests, it may discourage school districts from investing any time or money in teaching the subject (Belluck, 1999). The decision was protested by the scientific and education communities (Good et al., 2001). In 2001, the power of the citizens of Kansas was again evident when they were given the opportunity to elect different representatives and the newly-seated Kansas State Board of Education voted to restore the teaching of evolution to the state science standards, a decision that was applauded by the *American Association for the Advancement of Science*, the *National Academy of Sciences* and *National Research Council*, and the *National Science Teachers Association* (NCSE, 2001). This situation illustrates how much influence the citizens have in affecting the science standards and thus science education within their state through their ability to vote for representatives that will reflect their interests in either direction.

Evolution and biological education in America

Thus, the Americans' views on evolution have a direct effect on science education in the United States through their ability to vote for representatives and to lobby to directly affect decisions regarding science standards. For that reason it is important to understand where the Americans stand regarding the teaching of evolution. In 2000, the People for the American Way conducted a survey following the Kansas decision in 1999 and found that the United States population is in fact very divided regarding the teaching of evolution as can be seen in Table 1 (People For the American Way Foundation, 2000).

It is important to note here the very small percentage of people who either do not have any opinion (1%) or are unsure of how the subject should be dealt with (4%). Meaning that 95% of the American population has a specific opinion about how evolution should or should not be taught in public schools (Table 1).

This is an important factor to consider since as mentioned above, state standards and textbook selections are decided by groups of elected individuals who are responsible for representing their constituents' opinions. By creating standards that strongly emphasize evolution, they would thus run the risk of alienating large portions of the population. To get a better understanding of how exactly state standards are

Table 1 American citizens' views on teaching creationism and evolution in science classes according to People for the American Way Foundation.

Only evolution/no Creationism in science class ^a	37%
Creationism/Intelligent Design with or instead of evolution in science class ^b	58%
Unsure or no opinion	5%

^a 17% believe that evolution belongs in the science classroom and religious theories should be taught elsewhere combined with 20% who are for a pure science education.

^b 16% believe that public schools should teach only Creationism plus 29% who believe that it is okay to mention Creationism plus 13% who believe that both should be taught.

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