GRADING THE TEXTBOOKS

How Proposed Science Textbooks in Texas Address Climate Change and Evolution

TEXAS FREEDOM NETWORK EDUCATION FUND

NCSE National Center for Science Education

As the Texas State Board of Education considers new science textbooks for statewide adoption, reviews by a panel of experts show that the treatment of climate change and evolution in nearly all of these materials conforms to the state science standards and rules adopted by the board.

Where the reviews reveal weaknesses in coverage of the two topics, those deficiencies appear to be largely a consequence of inadequate state standards.

Background

Struggles over what students learn in their science classrooms remain deeply problematic. That is especially true in Texas, where political battles over teaching about evolution and climate change have a long and troubling history.

Creationists and proponents of junk science concepts like "intelligent design" have for decades demanded that Texas classrooms and textbooks misrepresent evolution as speculative or teach bogus "weaknesses" of evolution. Their efforts have provoked embarrassing debates over the adoption of new science standards and textbooks. And although they have rarely won such debates, the controversy may have affected the integrity of evolution education in Texas. In 2000 the Texas science standards received a C for their treatment of evolution in a study published by the Fordham Foundation. But a revised version of those standards received the grade of F in a 2009 replication of the 2000 study, and a 2017 study looking only at middle school standards concurred.

Climate change is a newer topic than evolution in American science education, but it swiftly emerged as a target of ideologically motivated attacks. This was particularly true in Texas, which in 2020 was one of just six states earning an F in a national report card that examined how state science standards at the time addressed climate change, including the role of human activity, consequences for the planet, and what can be done to mitigate those consequences. Despite public calls for improvement, the State Board of Education (SBOE) made only meager changes regarding climate change in new science standards – the Texas Essential Knowledge and Skills, or TEKS – adopted in 2020 and 2021. One SBOE member who resisted such improvements explained, "Our schools are paid for by the fossil fuel industry."

Texas is one of the country's largest markets for public school textbooks and other instructional materials because of its large population – second only to California. (For the sake of simplicity, this report will refer to all instructional materials submitted for adoption in Texas as "textbooks.") In April of this year, publishers submitted for review proposed new textbooks based on the 2020/2021 science TEKS. The Texas SBOE is scheduled to decide in November which submissions will be included on the state adoption list. Local school districts will then use that list to decide which products to buy for their students.

Evaluating the Science Submissions in Texas

The proposed textbooks vary in format, although the state required publishers to submit them in digital format for review. They have interactive features, some more so than others. Some present content in a format familiar to readers of a typical printed textbook (or might even have a printed version). Others rely more heavily on video content. The variety gives local administrators and educators options in choosing which products they think would be best for their students. The state is conducting its own review of the textbooks with the aid of panels of educators, scientists, and other volunteers.

In light of concerns about attempts to undermine the treatment of climate change and evolution, the Texas Freedom Network Education Fund (TFNEF) and the National Center for Science Education (NCSE) asked a panel of scientists and educators to evaluate how the proposed textbooks address these topics. At least two reviewers evaluated each submission. They rated how well the products performed – very satisfactory, somewhat satisfactory, somewhat unsatisfactory, very unsatisfactory/absent – in response to 10 focus questions. The focus questions are listed in Appendix A (climate change) and Appendix B (evolution) of this report. A list of reviewers is in Appendix C.

The 10 focus questions divide into two sets of five. The first set focuses on whether the submissions conform to specific requirements articulated by the state: presenting accurate information, avoiding bias, encouraging discussion and inquiry, addressing specific TEKS related to climate change and evolution, and discussing the nature of science as expounded in the TEKS. The second set focuses on whether the submissions adequately present key information students should master in learning about the topic, including the fact that there is a robust evidence-based consensus on climate change and evolution.

Based on the reviewers' rankings, TFNEF and NCSE assigned a grade to each textbook.

To earn a grade of **conforming**, a submission had to receive at least one very satisfactory or somewhat satisfactory rating from its two reviewers on all five topics in the first set of focus questions, the specific requirements articulated by the state.

To earn a grade of **superior**, a submission had to meet both of two additional requirements:

- Receiving either a very satisfactory or somewhat satisfactory rating from both reviewers on all 10 focus questions
- Receiving very satisfactory ratings from both reviewers on at least half of the 10 focus questions.

Grading the Submissions

Reviewers evaluated coverage of climate change in textbooks submitted for Grade 8 science (a required course), high school earth systems science (an elective course), and high school environmental systems (an elective course). Reviewers evaluating coverage of evolution examined submissions for Grade 8 science (required), high school biology (required), and high school earth systems science (elective).

Climate Change

Based on reviewers' evaluations, the single submissions for the high school earth systems science and high school environmental systems courses as well as 11 of 13 submissions for Grade 8 science earned overall grades of conforming or better on their coverage of climate change. Two of those conforming Grade 8 science submissions, from Green Ninja and McGraw-Hill, each earned an overall grade of superior. The submissions from Discovery Education, Summit K–12 Holdings, and Savvas Learning Company also came close to earning superior grades.

Two submissions for Grade 8 either didn't cover climate change (from Smart Science Education) or performed poorly on nearly all focus questions regarding the topic (from School-It!).

We should note that there were areas of sometimes sharp disagreement between reviewers on how well submissions addressed topics covered in particular focus questions. That was especially the case in which the reviewers disagreed on how well a submission addressed the role of human activity in causing current climate change, how severe climate change is, and what the scientific consensus is. Products with such sharply varying ratings from reviewers were unable to earn a grade better than conforming.

Reviewers' criticism of content focused on what they thought was missing from the materials; none expressed any concern that the content exaggerated the problem of climate change. Some reviewers also expressed dissatisfaction with submissions they thought didn't do enough to help students understand how to identify disinformation about the topic.

CLIMATE CHANGE IN GRADE 8 SCIENCE

PUBLISHER	CONFORMING	SUPERIOR
Green Ninja	●	●
McGraw-Hill	●	●
Accelerate Learning	●	○
Carolina Biological Supply Company	●	○
Discovery Education	●	○
EduSmart	●	○
Houghton Mifflin Harcourt	●	○
Kiddom	●	○
Savvas Learning Company	●	○
Summit K–12 Holdings	●	○
TPS Publishing	●	○
School-It!	○	○
Smart Science Education	○	○

CLIMATE CHANGE IN HIGH SCHOOL EARTH SYSTEMS SCIENCE

PUBLISHER	CONFORMING	SUPERIOR
Cengage Learning	●	○

CLIMATE CHANGE IN HIGH SCHOOL ENVIRONMENTAL SYSTEMS

PUBLISHER	CONFORMING	SUPERIOR
Cengage Learning	●	○

Evolution

Based on reviewers' evaluations, the single submission for the high school earth systems science course as well as 12 of 13 submissions for high school biology earned overall grades of conforming or better on their coverage of evolution. Five of the conforming high school biology submissions earned an overall grade of superior. But the ratings for other conforming submissions were not far behind. Based on the reviewers' evaluations, all but one high school science submission offered solid coverage of evolution.

One likely reason publishers tended to receive higher ratings for how their submissions covered evolution compared to how they covered climate change is the relative quality of the TEKS standards dealing with the two topics. The science standards for high school biology, approved by the Texas SBOE in November 2020, require robust coverage of evolution. In contrast, the science standards have considerably less substantial requirements about what students must learn about climate change.

That said, the standards for Grade 8 science require far less coverage of evolution than those for high school biology. This is probably because Grade 8 is an interdisciplinary class focusing on earth and space science. That made providing an overall grade for the treatment of evolution in the submissions from publishers at that level problematic.

By and large, the reviewers found the Grade 8 submissions covered the single standard that indirectly addresses evolution. But reviewers often noted that most of the submissions otherwise don't mention the word "evolution" and offer less substantive coverage of the topic. For this reason, we have chosen not to provide overall ratings for how the Grade 8 science submissions cover evolution.

In general, however, the Grade 8 submissions from Accelerate Learning, Green Ninja, Kiddom, Savvas Learning Company and Smart Science Education got the highest marks from reviewers for the first set of focus questions, which addresses the state's requirements. Kiddom's submission for Grade 8 would have come very close to receiving a grade of superior for its coverage of evolution.

EVOLUTION IN HIGH SCHOOL BIOLOGY

PUBLISHER	CONFORMING	SUPERIOR
BIOZONE Corporation	●	●
Discovery Education	●	●
McGraw-Hill	●	●
Savvas Learning Company	●	●
TPS Publishing	●	●
Accelerate Learning	●	○
Cengage Learning	●	○
EduSmart	●	○
Kiddom	●	○
Myriad Sensors	●	○
Smart Biology	●	○
Summit K–12 Holdings	●	○
Smart Science Education	○	○

EVOLUTION IN HIGH SCHOOL EARTH SYSTEMS SCIENCE

PUBLISHER	CONFORMING	SUPERIOR
Cengage Learning	●	○

Conclusion

The science textbooks the State Board of Education adopts this year will be in Texas classrooms for nearly a decade. The state board's vote in November thus is an opportunity for board members to set aside politicized debates over science and help public schools simply teach the truth to the next generation of Texas students.

Almost all of the textbooks submitted by publishers conform to requirements set out by the board in the state science standards (TEKS) and other rules. In addition, they correctly do not give credence to junk science and scientifically unsupported critiques of evolution and anthropogenic climate change.

By and large, overall ratings from the reviewers indicate most textbooks do an adequate and at times superior job in addressing the science of climate change and evolution at a level suitable to the subject and grade level. To be sure, reviewers noted room for improvement (in strong language in some cases). They wanted to see more information about the reality of human activity behind present climate change, as well as about the seriousness of the problem, ways to mitigate the consequences, and strategies for students to identify disinformation on the topic. The board's adoption of more robust science TEKS on the topic would have helped in this regard. In addition, the lower marks for how Grade 8 textbooks cover evolution were largely a result of the meager treatment of the topic in the relevant standards.

In short, the findings in this report argue against the rejection of nearly all of these textbooks based on false claims that they fail to meet state standards or other rules set out by the state board (such as requiring factual accuracy, avoidance of bias, and encouragement of inquiry) on the topics of climate change and evolution. Texas parents and other residents who want our children to learn science accurately, honestly, and thoroughly should be wary of objections to textbooks for teaching the truth on these two important topics.

Appendix A: Climate Change Focus Questions

Reviewers used the following focus questions to evaluate the coverage of climate change in proposed textbooks for Grade 8 science and high school earth systems science and high school environmental systems:

1. How satisfactory is the textbook's treatment of climate change with regard to presenting accurate information?
2. How satisfactory is the textbook's treatment of climate change with regard to avoiding bias?
3. How satisfactory is the textbook's treatment of climate change with regard to encouraging discussion and inquiry?
4. How satisfactory is the textbook's treatment of climate change with regard to addressing the relevant grade-level and subject-specific TEKS adopted in 2020 and 2021? For grade 8 science [2021], see Rule 112.28, (b)(10)(A) and (11). For high school earth systems science [2021], see Rule 112.49, (c)(11) and (12). For high school environmental systems [2021], see Rule 112.50, (c)(9), (10), (12), and (13).
5. How satisfactory is the textbook's treatment of climate change with regard to addressing the nature of science provisions of the relevant TEKS adopted in 2020 and 2021? For grade 8 science [2021], see Rule 112.28, (a)(2). For high school earth systems science [2021], see Rule 112.49, (b)(2). For high school environmental systems [2021], see Rule 112.50, (b)(2).
6. How satisfactory is the textbook's treatment of climate change with regard to explaining that climate change is real?
7. How satisfactory is the textbook's treatment of climate change with regard to explaining that humans are causing present climate change?
8. How satisfactory is the textbook's treatment of climate change with regard to explaining that climate change is serious?
9. How satisfactory is the textbook's treatment of climate change with regard to explaining that there are ways of mitigating and adapting to climate change?
10. How satisfactory is the textbook's treatment of climate change with regard to acknowledging that there is a scientific consensus on climate change?

Appendix B: Evolution Focus Questions

Reviewers used the following focus questions to evaluate the coverage of evolution in proposed textbooks for high school biology, high school earth systems science, high school environmental systems, and Grade 8 science:

1. How satisfactory is the textbook's treatment of evolution with regard to presenting accurate information?
2. How satisfactory is the textbook's treatment of evolution with regard to avoiding bias?
3. How satisfactory is the textbook's treatment of evolution with regard to encouraging discussion and inquiry?

4. How satisfactory is the textbook's treatment of evolution with regard to addressing the relevant grade-level and subject-specific TEKS adopted in 2020 and 2021? For grade 8 science [2021], see Rule 112.28, (b)(13)(C). For high school biology [2020], see Rule 112.42, (c)(9) and (10). For high school earth systems science [2021], see Rule 112.49, (c)(7).
5. How satisfactory is the textbook's treatment of evolution with regard to addressing the nature of science provisions of the relevant TEKS adopted in 2020 and 2021? For grade 8 science [2021], see Rule 112.28, (a)(2). For high school biology [2020], see Rule 112.42, (b)(2). For high school earth systems science, see Rule 112.49, (b)(2).
6. How satisfactory is the textbook's treatment of evolution with regard to explaining that living things share a common ancestry?
7. How satisfactory is the textbook's treatment of evolution with regard to explaining the paths by which evolution occurs (i.e., phylogeny)?
8. How satisfactory is the textbook's treatment of evolution with regard to explaining the processes by which evolution occurs?
9. How satisfactory is the textbook's treatment of evolution with regard to recognizing the centrality of evolution to biology?
10. How satisfactory is the textbook's treatment of evolution with regard to acknowledging that there is a scientific consensus on evolution?

Appendix C: Acknowlegements

TFNEF and NCSE are grateful to the following reviewers who worked on this project. (Institutions are listed for identification only. Their inclusion does not imply their endorsement of this report's findings.)

Alejandra Dashe, PhD, MS, ACUE
Senior Instructional Designer
Learning Enterprise
Arizona State University

Judy Dickey
Graduate lecturer (and former high school science teacher)
Department of Atmospheric Sciences
Texas A&M University

Dylan Elliott
Graduate research assistant
Department of Atmospheric Sciences
Texas A&M University

Jeff Grant
Science teacher
Downers Grove North High School, Illinois

Andrew J. Petto, PhD
Distinguished Lecturer, Emeritus
Department of Biological Science
University of Wisconsin–Milwaukee

Steve Rissing, PhD
Professor Emeritus
Department of Evolution, Ecology, and Organismal Biology
The Ohio State University (Columbus)

Molly Selba, PhD
Assistant Professor
School of Pharmacy and Health Professions
University of Maryland Eastern Shore

Ericca Thornhill, MEd
Science Division Chair, Mizzou Academy
College of Education and Human Development
University of Missouri–Columbia

Casey Williams, PhD, MEd
Williams Research Consulting, LLC