



**Jones, Stephanie**

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**Sent:** Monday, June 28, 2021 3:01 PM  
**To:** ED, State Board of Ed  
**Subject:** [External] comment on science standards

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please see my comments on the Pennsylvania science standards, as published today in an op-ed today in the Philadelphia Inquirer:

<https://www.inquirer.com/opinion/commentary/amid-climate-change-crisis-pas-science-curriculum-falls-short-opinion-20210628.html>

by Michael E. Mann, For The Inquirer  
Updated  
Jun 28, 2021

Climate change is an ongoing crisis, so it's no surprise that a solid majority of Pennsylvanians — 78%, [according](#) to the Yale Program on Climate Change Communication's estimate — think that schools should teach about the causes, consequences, and solutions to global warming. But how well are Pennsylvania's public schools faring in this effort? And how much would a [revision released this month help](#)?

A primary factor affecting public science education is state science standards, documents that set forth what knowledge and abilities students are supposed to acquire in the course of their science education. State science standards thus help to determine the content of textbooks, statewide testing, teacher preparation, curriculum, and lesson plans.

In a recent [study](#) of the treatment of climate change in state science standards around the country from the [National Center for Science Education](#) and [Texas Freedom Network Education Fund](#), Pennsylvania's state science standards received an F grade — and the lowest average numerical score of all states. "They don't acknowledge climate change at all," one of the scientists evaluating the standards commented. The report acknowledged, however, that the standards evaluated were nearly two decades old with a revision underway.

The latest [revision](#) is currently out for a month-long public comment period. As a climate scientist at one of Pennsylvania's state-affiliated universities, a great number of whose students were educated in our public schools, I was more than a little interested in what my future students would be learning about climate change if the revised standards are approved.

I was not pleased with what I found. Yes, climate change is now present in the proposed standards. [Middle school students](#) would be expected to "[a]sk questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century."

That might look OK, but in fact, it's problematic, since "factors" seem to imply that there are multiple factors — some of them presumably natural — that are responsible for the warming. There aren't. Carbon pollution from fossil fuel burning and other human activities alone is responsible for [all of the warming](#) of the planet over the past century.

High school students would be expected to use data to make evidence-based forecasts about global and regional climate change. Yet, this is impossible without learning the most important lesson of all: the cause. How else could they be prepared to cope with the challenges that they will face in the warming world that they will inhabit?

The 2013 Next Generation Science Standards (NGSS) — on which the proposed Pennsylvania standards have been [substantially modeled](#) — contain [the same language](#) at the middle school level. But they add, in a clarification statement, that these factors include human activities, and recommend emphasizing “the major role that human activities play in causing the rise in global temperatures.”

Even the NGSS understates the importance of human activity which, as already noted, is responsible for all of the present-day global warming. That’s one of the reasons they only received a B+ grade in the recent study. A number of states — Wyoming, Alaska, New York, North Dakota, Colorado, and Massachusetts — did better. But the proposed standards for Pennsylvania would clearly be worse.

How can it be that, when it comes to science standards, our great commonwealth, proud of its intellectual heritage tracing back to the father of the American Enlightenment, Ben Franklin, is trailing behind? Could it be that, as with other states with lagging climate education standards, [climate-change-denying](#) policymakers are to blame?

I don’t see any evidence that’s actually the source of the problem here in Pennsylvania. Rather, the source seems to be that the proposed standards include only performance expectations. They don’t include additional key features of the NGSS — clarification statements, disciplinary core ideas, science and engineering practices, [crosscutting concepts](#) — that provide additional guidance to teachers as to what constitutes sound and effective pedagogy.

Adding these features to the proposed state guidelines would improve our standards across the board, not only for climate change but for other areas of science education. And more science-literate graduates will compete more favorably in a global economic marketplace that increasingly emphasizes scientific and technological skills.

The Pennsylvania Science Teachers Association [called](#) in 2018 for the NGSS to be adopted in Pennsylvania. That was three years ago, but late, as they say, is better than never. It’s time we make it happen.

*Michael E. Mann is distinguished professor of atmospheric science and director of the Earth System Science Center at Penn State University and author of the recent book, “[The New Climate War: The Fight to Take Back our Planet.](#)” He serves on the board of the [National Center for Science Education](#).*

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