Help to fight the battle for Earth in US schools

Scientists everywhere must champion a set of US education standards that promote Earth sciences, argues Nicole D. LaDue.

In another embarrassing moment for US scientists, Senator James Inhofe (Republican, Oklahoma) last month theatrically tossed a snowball onto the floor of the Senate during a debate on global warming. Despite all the talk of record temperatures in 2014, he said, there was snow on the lawn of the Capitol in Washington DC in winter.

Inhofe may or may not be aware of the distinction between weather and climate. Either way, he is unlikely to alter his views on climate change. More important is how such messages are received by the public, and in particular by the millions of schoolchildren who will be wrestling with the problem of global warming long after Inhofe is gone.

The United States has an opportunity to hugely improve the way that Earth sciences are taught in its schools. The difference between weather and climate, for example, could become standard discussion for third-grade classes, when children are eight or nine years old. Powerful lobby groups are trying to derail this opportunity. All scientists should help to stop them.

The quality of Earth-science education in most US schools is abysmal. I say this as a former high-school Earth-science teacher. Unlike physics, chemistry and biology, Earth science is typically taught by those with no adequate training in the subject.

In 2013, new standards were released that could reinvigorate US science education. Called the Next Generation Science Standards (NGSS), they were developed by scientists, science-education researchers and state-education representatives. In the NGSS, Earth science is on an equal footing with life science and physical science, from kindergarten through to the 12th grade (age 17 or 18). High-school students would learn how to “use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate”. Imagine how well prepared the general public would be for making decisions about, and planning for, the impacts of climate change, nuclear waste disposal and investments in energy resources if they could “analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems”.

One truly exciting possibility about these standards relates to how they might be assessed. The testing movement has taken hold of US public education. Many state tests are predominantly multiple-choice, driving down the quality of classroom practice to memorization of facts and cookery-book laboratories. The NGSS will require new ways to assess both knowledge and scientific thinking. From a teacher’s perspective, this provides an opportunity to teach science well and to engage students in the process of science, knowing that the assessments will challenge students to think rather than recall.

Imagine that the conversations in

Washington DC moved beyond third-grade comprehension of daily weather versus average climate and focused on the complex economic impacts of climate change that we are already experiencing. This is possible if we put our efforts into adopting and implementing the NGSS appropriately across the country.

Under the US constitution, the federal government cannot tell states what to teach in schools. Each state must choose to adopt the NGSS, through approval by their boards of education or senate.

Currently, 13 states and Washington DC have adopted the NGSS; this covers about 14.5 million of the 50 million or so US students. However, state-level politics have blocked adoption in many cases. The National Center for Science Education, established to fight those who challenge the teaching of evolution and climate science across the United States,

has been monitoring bills and lawsuits associated with the NGSS. In Kansas, there was a lawsuit over adoption of the standards because teaching evolution and the Big Bang was said to promote atheistic viewpoints. In Wyoming, Michigan and West Virginia, adoption has been challenged over the inclusion of anthropogenic climate change.

Even in states that have adopted the NGSS, hurdles remain. Many districts are looking to infuse the Earth-science content into physics, chemistry and biology classes, rather than establish high-quality Earth-science courses. This decision benefits the district because those classes prepare students for college-level courses, boosting national rankings. The teachers of physics, chemistry and biology are often unprepared for teaching the Earth-science content. If the NGSS is to succeed, science teachers must be trained on the content and develop or adjust the curriculum.

When scientists learn that my research focus is geoscience education, they lament the state of science literacy in the world around them. Certainly, if you are a US scientist, you probably feel that. But please do not tell me about your child’s poorly prepared science teacher. Do not tell me that your undergraduate students are ill-prepared for college-level science.

Instead, tell me that you have asked your local school board how they are implementing the NGSS. Tell me that you have offered to run a workshop to teach your local teachers the Earth-science content they need. Tell me that your university department has written a letter to your state legislature on the importance of implementing Earth science in the NGSS to create a scientifically literate public prepared to make important decisions and pursue careers in high demand in your region. Stop complaining and do something. ■

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