An ambitious effort to refocus K-12 science education across the nation entered a new phase last week with the release of the first public draft of voluntary, “next generation” science standards.

Organizers say the standards aim not simply to provide a foundation of essential knowledge, but also to ensure that students apply that learning through scientific inquiry and the engineering-design process to deepen their understanding.

Twenty-six states, from California to Maine and from South Dakota to Georgia, are “lead state partners” in the effort and have worked on the draft in collaboration with a range of educators and experts.

Other top priorities in the document are promoting depth over breadth in science education, ensuring greater coherence in learning across grade levels, and helping students understand the cross-cutting nature of crucial concepts, such as energy and matter, that span scientific disciplines.

The hope, organizers say, is that most, if not all, states ultimately adopt the standards.

But such action is by no means a given. One complication may be the handling of evolution and climate change, issues that have been political flashpoints over the years and could make approval challenging in certain states.

Leaving those issues aside, officials in Texas and Virginia, two states that took a pass on the Common Core State Standards in English/language arts and mathematics, already signaled last week that their states were not planning to adopt the common science standards. The spokesman for the Virginia education department said, however, that when the Old Dominion next revises its science standards, in 2017, the common standards would be “reviewed” and “taken into account.”

The 26 lead states in developing the Next Generation Science Standards are not bound to adopt them, but have pledged to give “serious consideration” to doing so. Organizers say other states are interested in the effort and may well adopt the standards.

The other partners in the effort include the congressionally chartered National Research Council, which devised a framework to guide the standards, as well as the National Science Teachers Association, the American Association for the Advancement of Science, and Achieve, a nonprofit group that was also involved in the common-core project in English and math.

Major funding for developing the standards comes from the Carnegie Corporation of New York. (The foundation also underwrites coverage of district and high school reform in Education Week.)
The draft standards released May 11, a day after new science results from the National Assessment of Educational Progress showed some gains in achievement but most students still below the “proficient” level. («Most 8th Graders Fall Short on NAEP Science Test.» May 10, 2012.)

Public comments on the draft science standards must be submitted by June 1. A second chance for public review will come in the fall, with the goal of completing work by early next year.

Toward Understanding

Peter McLaren, a science and technology specialist for the department of education in Rhode Island, a lead state, and himself a member of the 41-member writing team for the standards, highlighted the draft’s focus on “doing” science.

“What first of all, it’s not just about what kids know; it’s about what they know and are able to do,” said Mr. McLaren, who also is the president of the Council of State Science Supervisors, an organization for science education officials. “It’s about using the practices of an engineer, a scientist, to gain a deeper understanding of the core knowledge.”

Chris Embry Mohr, a high school science teacher in Stanford, Ill., who also is on the writing team, said a key aspect of the standards is their “less is more” approach.

“One huge shift is moving away from covering everything, and instead doing what is essential and doing it very well,” she said.

Because of the timing of the release, comments on the draft from people not involved in the standards process were unavailable.

The development of science standards comes as nearly all states have adopted the common-core standards in English/language arts and math, and states are gearing up to implement them.

The science initiative is separate from that work, and is guided by the NRC framework that a panel of experts in science and science education completed last summer.

“What we’re trying to do with the standards is represent the work of the framework,” said Matt Krehbiel, a science education consultant for the state education department in Kansas, a lead state.

Detailed Guidelines

Like other states, Kansas has a review team with state officials, representatives from K-12 and higher education, and members of the scientific and business communities. That team reviewed two earlier drafts of the standards and provided extensive feedback.

Each standard in the draft is organized into a table for the given topic at each grade level or grade range. The table has three main sections: performance expectations, “foundation” boxes, and “connection” boxes that relate the core idea to other science standards, as well as to the common-core standards in English and math.

The foundation boxes expand upon and explain the performance expectations in relation to three dimensions: science and engineering practices,
disciplinary core ideas, and cross-cutting concept statements.

The standards target four disciplines: the physical sciences; life sciences; earth and space sciences; and engineering, technology, and the applications of science.

Mr. McLaren said making explicit connections to the common standards is critical, and he hopes those ties give science more prominence in the classroom, especially at the elementary level, where many experts believe the subject is often neglected amid the focus on reading and math under the federal No Child Left Behind Act.

“Elementary teachers have so much on their plate; by teaching these [science] standards, they also can amplify the common core,” he said.

Kathleen Porter-Magee, a senior director at the Thomas B. Fordham Institute, a think tank in Washington, said she welcomed the effort to craft science standards, but had not seen them yet.

In late January, Fordham issued a review of state science standards and found most of them wanting.

“The vast majority were mediocre to awful,” Ms. Porter-Magee said. “I am encouraged that there is a group of states that recognize the need to come together and hopefully do for science ... what was done for ELA and math.”

As comments on the draft filter in, it may become clearer what obstacles lie ahead for adoption of the science standards. One challenge may be the handling of matters such as teaching biological evolution and climate change.

Echoing the NRC framework, the standards document includes evolution as a core principle for understanding the life sciences. The draft is also explicit about the role humans play in climate change.

In language taken from the NRC framework, the draft says: “Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth’s mean surface temperature (‘global warming’).”

Some prominent Republicans in Congress and elsewhere have expressed skepticism about that conclusion. Former Massachusetts Gov. Mitt Romney, the presumptive GOP nominee for president, recently has taken what some observers have called conflicting stances on the issue, but he did say last year that he believed climate change was real and that human activity contributes to it.

“Evolution and climate change are two hot-button issues,” said Ms. Porter-Magee. “It could absolutely complicate matters” in terms of state adoption.

Stephen Pruitt, a vice president at Achieve who is overseeing the science-standards project, said he defers to the NRC framework on questions of science.

“The scientific community identified the science before we ever started,” he said. “The framework is really the foundation for all of this, so we’re not here to relitigate that.”