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Improving Education Standards

THIS MONTH, ACHIEVE, AN ORGANIZATION ESTABLISHED BY THE 50 U.S. STATE GOVERNORS to improve academic standards and testing, will begin finalizing its draft document (released in January 2013) of the Next Generation Science Standards (NGSS).* This document aims to establish new common standards for science education for students aged 5 to 18 in the United States, and it explicitly builds on the U.S. National Academies' 2011 Framework for K-12 Science Education.† The Framework put forth a vision of science education that is notable for emphasizing student participation in key science and engineering practices, such as asking questions and defining problems; developing and using models; engaging in argument from evidence; and learning cross-cutting concepts such as energy and matter, cause and effect, and structure and function. To allow room for these in the school day, the Framework stressed the importance of minimizing the number of disciplinary core ideas that standards require to be taught. Now that the NGSS document has entered its final revision stage, it is important to ask how well these standards match the powerful vision for them that was laid down by the Framework.

There is much to be commended in the draft. In particular, its emphasis on science and engineering practices could lay the groundwork for productive shifts toward helping students understand how science helps us make sense of the natural world, instead of just what science has learned. But the sheer volume of content referenced in the Framework moves to the foreground in the NGSS draft and threatens to undermine this promise. Any emphasis on practices requires a science-rich conceptual context, and certainly the core ideas and cross-cutting concepts presented are useful here. However, the draft contains a vast number of core disciplinary ideas and sub-ideas, leaving little or no room for anything else. In the three grades of middle school (ages 11 to 13) alone, the NGSS draft specifies more than twice the disciplinary content than did the 1996 National Science Education Standards. Thus, before finalizing the new standards, we urge Achieve to quickly convene small groups of the nation's best teachers at the primary, middle-school, and high-school levels. Although teachers have been involved in the writing effort, their new charge should be to bring ground truth to the NGSS by determining the maximum number of disciplinary core ideas that can be covered in a single school year, while still leaving time for a productive focus on practices and cross-cutting ideas. And scientists should immediately be charged with prioritizing the disciplinary core ideas in the current draft (and their performance expectations) to reduce them to a more feasible number.

The welcome shift in priorities to teaching science and engineering practices along with the content brings an assessment challenge. The NGSS draft document addresses this challenge by delineating many performance expectations. However, current measurements and approaches do not allow these types of performances to be assessed easily; it is much more difficult to evaluate the quality of such engagement than to determine the accuracy of an explanation or a word definition. Urgently needed is a vigorous R&D agenda that pursues new methods of and approaches to assessment. This will be difficult but critically important long-term work. A systematic commitment to the wrong quantitative measures, such as the inexpensive multiple-choice testing of factoids, may well result in the appearance of gains at the tremendous cost of suppressing important aspects of learning, attending to the wrong things in instruction, and conveying to students a distorted view of science. Outstanding scientists must be willing to work side by side with measurement specialists and science educators to develop methods for evaluating what is important to measure, after completing the short-term task of prioritizing and reducing the number of disciplinary core concepts in the new standards.

– Janet Coffey and Bruce Alberts

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*www.nextgenscience.org/next-generation-science-standards.
†http://www7.nationalacademies.org/bose/Standards_Framework_Homepage.html.

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