With the release of the Next Generation Science Standards (NGSS), at least 26 states will be examining them very carefully to determine whether they should provide the foundation for their state’s grade K-12 science education program. As state board of education members approach the standards, a number of questions bear asking as they seek to determine what the NGSS will really mean for their states. How much of a change are they from previous standards? Are they better and more rigorous than previous standards? What will they mean for professional development, preservice training, and science assessments?

Some information and answers to these questions can only be made at the state or local levels, while others are already known. This and NASBE’s next Policy Update in its NGSS series will attempt to clarify many of these issues. This Update specifically discusses questions around how much of the NGSS is to be adopted, how much of a change are they from previous standards, and curriculum and instructional materials. Knowing what is different about the NGSS from current science standards will assist in being able to make decisions about their adoption.

**Issues to Consider**

How much of the NGSS must be adopted by states? With the Common Core, states were required to adopt them as written in full. States could also add up to 15 percent more if they chose. The NGSS also recommends adopting them as written in full – however, the organizations behind the NGSS do not say anything about whether or not more can be added. This may imply that states can add topics, but the design of the NGSS creates a coherence to the standards that was not evident in previous standards. The architecture of the NGSS connects three dimensions of science into each standard and connects ideas vertically in a progressively more complex fashion through the grades, as well as connects concepts that have universal meaning in science horizontally across the NGSS to other ideas both in and outside of science. This makes it difficult to add topics while maintaining coherency.

For example, the scientific and engineering practices are developed vertically through the grades and are integrated with each other—these eight practices do not operate in isolation. Rather, they tend to unfold sequentially, and even overlap. The practice of asking questions may lead to the practice of modeling or planning and carrying out an investigation, which in turn may lead to analyzing and interpreting data.” 1 The cross-cutting concepts increase in complexity and sophistication across the grades. “They provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas.” 2 The disciplinary core ideas also add coherence by providing progressions of ideas vertically and connections to ideas horizontally within the same grade span. 3 Finally, the NGSS designers adhered to the integrity of the National Research Council’s *A Framework for K-12 Science Education.* 4

How different the NGSS are from previous standards is another important consideration. One of the differences, as described above, is the internal integration promoting the coherence of science as a discipline. Another difference is how the standards are written. The NGSS are written in the form of student performance expectations rather than as statements of knowledge that students should know. This change can clearly be seen in a side-by-side comparison of previous national science standards and the NGSS. (See Chart 1 on page 2.)

Several other things also stand out in this comparison, including the use of verbs affirming students are expected to do something to demonstrate their knowledge, not just know it. Compared to earlier science standards that focused more on informational recall, the NGSS are encouraging students to do science. The importance of using language skills to demonstrate what students have learned in science is included throughout the standards. The
The move to scientific and engineering practices and use of cross cutting concepts is also new and materials will need to address these as integrated concepts within science not as stand-alone topics. There are fewer science ideas expressed in the NGSS, so curricular materials will need to adjust to this change. The explicit nature of the NGSS's student performance expectations adds a complexity to science that should be looked for in curriculum materials. The NGSS requires students to acquire and apply their knowledge, understand how big ideas thread through science and how these concepts and ideas help further an understanding of the natural and built world. This will require new thinking about curriculum and it may open opportunities for OER (open education resource) materials or digital materials as they can change more quickly; however the quality of them is as important as the alignment to the NGSS whether text or digitally based than matching up learning objectives.

The next NGSS Policy Update will review the issues of graduation requirements, professional development needs, certification and preservice development and science assessments.

Resource


Endnotes


