

The purposes of this document are to introduce principals to the Next Generation Science Standards (NGSS) and provide a general overview of the key instructional and conceptual shifts required by the NGSS. Principals have a critical role to play in the implementation process and this resource can be a guide for administrators working in states that have recently adopted new K-12 science standards, based on the NGSS.

## What are the NGSS?

The NGSS are standards with a purpose. The K-12 science content standards cover every grade and every scientific discipline, setting expectations for what students should know and be able to do in science.

A major difference between the NGSS and previous science standards is “three-dimensional” (3D) learning.

3D learning refers to the thoughtful and deliberate integration of three distinct dimensions: Scientific and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs).

Through 3D learning, the NGSS emphasize that science is not just a series of isolated facts. This awareness enables students to view science more as an interrelated world of inquiry and phenomena rather than a static set of science disciplines.

The NGSS represent a fundamental shift in science education and require a different approach to teaching science than has been done in the past. Looking ahead, teachers can use a range of strategies to engage students and create opportunities to demonstrate their thinking and learning.

## How will science education change with the NGSS?

### Science education will involve less:

1. Learning of ideas disconnected from questions about phenomena
2. Teachers providing information to the whole class
3. Teachers posing questions with only one right answer
4. Student reading textbooks and answering questions at the end of each chapter
5. Worksheets
6. Oversimplification of activities for students who are perceived to be “less able” to do science and engineering

### Science education will involve more:

1. Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
2. Students conducting investigations, solving problems, and engaging in discussions with teacher guidance
3. Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
4. Students reading multiple sources and developing summaries of information
5. Student writing of journals, reports, posters, and media presentations that offer explanations and arguments
6. Provision of supports so that *all* students can engage in sophisticated science and engineering practices

## What are key questions that principals should consider during implementation?

- What kind of professional development is available and how do I ensure my teachers and I have access to it? How do I know if it's high quality?
- What NGSS-aligned instructional materials do my teachers and students need and how do I make sure they get them? How do I know if the materials are high quality?
- What formative assessments are available to help teachers continually evaluate their students' learning?
- How can we connect the NGSS with work we are doing to improve teaching and learning in English language arts and math?

## What can principals do to support implementation?

- Focus on what the students are doing first and then think about what the teacher has designed to make that happen;
- Know the standards enough to identify and provide feedback on aspects of the three dimensions during classroom visits
- Engage teachers on how the three dimensions are incorporated into lessons.

## For more information about the NGSS

- <http://www.nextgenscience.org/>  
(Official Homepage of the NGSS)
- <http://www.nsta.org>  
(National Science Teachers Association)
- <http://stemteachingtools.org/>  
(STEM Teaching Tools)
- <http://www.nap.edu/read/18802/chapter/1>  
(National Research Council's Guide to Implementing the NGSS)

### Additionally, principals can:

- Build a long-term plan that focuses on the building's collective vision for science education (20)
- Elevate teacher leaders and support them as they work to help their colleagues (38-40)
- Find ways to provide high-quality, intensive professional learning to all teachers (41-46)
- Seek out professional learning for yourself (49)
- Connect what is happening with science in your building to other buildings in your district, state, or any NGSS-adopted state (70-73)
- Be critical consumers of any new curricula (56, 57)
- Provide leadership to develop or revise a system of assessment for measuring student learning in science (61-66)

*All parenthetical numbers above refer to pages in the National Research Council's Guide to Implementing the Next Generation Science Standards.*

### What are some common pitfalls that can undermine successful implementation?

- Expecting instruction to change overnight (35)
- Expecting teachers to do it alone (35)
- Asking "Which standard are you teaching today?" (58)
- Failing to communicate with parents and community about what is changing and why you are changing it (84)

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