

# The Next Generation Science Standards: An Introduction

In *The Next Generation Science Standards: An Introduction*, you will start with the background and genesis of the standards and conclude with assessment of the three dimensions (3-D) of learning. In between, you will discover the relationship between *A Framework for K–12 Science Education* and the Next Generation Science Standards (NGSS), science learning progressions, 3-D learning and instruction, and engineering practices and design. Through the in-depth readings, video examples, and supplementary resources, you'll explore ways to begin implementing these standards and this revolutionary new mode of teaching science into your classroom, district, or state.

## Course Objectives

By the end of this course, you will be able to

### Module 1

- Understand the origins and development of the Next Generation Science Standards (NGSS).
- Analyze the relationship between *A Framework for K–12 Science Education* and the NGSS.
- Explore the implications of the new standards for your own classroom practice.

### Module 2

- Understand the philosophy of the three-part structure of the NGSS and analyze how these standards can address the achievement gap in science.
- Analyze a performance expectation, identify its three dimensions, and explain how a PE links with other PEs and the Common Core State Standards.

### Module 3

- Understand how the NGSS are built on the notion that learning is a developmental progression that reflects increasing sophistication of student thinking across grade levels.
- Analyze the progression of a disciplinary core idea in the context of increasing sophistication of student thinking.
- Analyze the progression of the science and engineering practices in the context of increasing sophistication of student thinking.

### Module 4

- Understand how the 5E Learning Model can be applied to the three-dimensional instruction of the NGSS.
- Understand how the concept of “bundling” performance expectations makes use of the three dimensions in the NGSS to design instruction that builds student proficiency.
- Use the approach of bundling performance expectations to plan a lesson sequence.

### Module 5

- Understand the practices unique to engineering and the engineering design process.
- Investigate the differences between engineering in the practices and within Engineering, Technology, and Application of Science to distinguish the work of scientists and engineers.
- Evaluate current classroom instruction in light of science and engineering practices in order to adapt an existing science lesson to the NGSS.

### Module 6

- Describe the components necessary to assess three-dimensional learning.
- Analyze and evaluate a sample assessment item for its ability to assess the three dimensions.

## Course Syllabus

<p><b>Module 1</b></p>	<p>Why the Next Generation Science Standards Now? Module Welcome</p> <ul style="list-style-type: none"> <li>• Reading: Why the Next Generation Science Standards Now?</li> <li>• Video: Next Generation Science Standards Introduction</li> <li>• Supplemental Reading: Professional Development Strategies for NGSS</li> <li>• Check for Understanding</li> <li>• Application: Turning the Framework/NGSS Spotlight on Your Classroom</li> <li>• Module Journal</li> </ul>
<p><b>Module 2</b></p>	<p>Understanding the Three-Dimensional Architecture of the NGSS Module Welcome</p> <ul style="list-style-type: none"> <li>• Reading 1: Using the Three Dimensions of the NGSS for Deeper Learning</li> <li>• Reading 2: Tips for Engaging Students in Scientific Thinking</li> <li>• Video: How to Read the Next Generation Science Standards</li> <li>• Check for Understanding</li> <li>• Application: Analyze an NGSS Performance Expectation</li> <li>• Module Journal</li> </ul>
<p><b>Module 3</b></p>	<p>Progressions: Building Understanding Over Time Module Welcome</p> <ul style="list-style-type: none"> <li>• Reading 1: A Tale of Two Generations Learning Science</li> <li>• Video: Minds of Our Own: Can We Believe Our Eyes?</li> <li>• Reading 2: <i>EL</i>—What Science Teaching Looks Like: An International Perspective</li> <li>• Check for Understanding</li> <li>• Application: Mapping Learning</li> <li>• Module Journal</li> </ul>
<p><b>Module 4</b></p>	<p>NGSS Implications for Science Instruction Plan Module Welcome</p> <ul style="list-style-type: none"> <li>• Reading 1: Informing Science Instruction with the NGSS</li> <li>• Video: Minds of Our Own: Lessons from Thin Air</li> <li>• Reading 2: Planning Instruction with the Next Generation Science Standards</li> <li>• Check for Understanding</li> <li>• Application: Bundling PEs for 3-D Instruction</li> <li>• Module Journal</li> </ul>

<b>Module 5</b>	<p>Engineering in the NGSS Module Welcome</p> <ul style="list-style-type: none"> <li>• Reading 1: Science and Engineering—Similarities and Differences</li> <li>• Reading 2: The Four Cs of Next Generation Engineering Standards</li> <li>• Videos: Scientific and Engineering Practices</li> <li>• Supplemental Reading: Planning and Delivering an Engineering-Infused Lesson</li> <li>• Check for Understanding</li> <li>• Application: Infusing Engineering into Lessons</li> <li>• Module Journal</li> </ul>
<b>Module 6</b>	<p>Assessing Three-Dimensional Science Learning Module Welcome</p> <ul style="list-style-type: none"> <li>• Reading 1: Assessing Three Dimensional Science Learning</li> <li>• Video: NSTA Forum:—The Future of Assessment with the NGSS</li> <li>• Reading 2: <i>EL</i>—Learning to Love Assessment</li> <li>• Check for Understanding</li> <li>• Application: Analyzing an Assessment for NGSS Compatibility</li> <li>• Module Journal</li> </ul>

## Resources

Achieve, Inc. (No date). About us. Retrieved from <http://achieve.org/about-us>

Achieve, Inc. (No date or est. 2012). How to read the next generation science standards.

Retrieved from <http://vimeo.com/41704037#>

Achieve & NSTA. (2014, April 10). Educators evaluating the quality of instructional products

(EQulP) rubric. Washington, DC: Achieve, Inc. Retrieved from <http://www.nextgenscience.org/sites/ngss/files/EQulP%20Rubric%20for%20Science%20052714.pdf>

Anderson, P. (2013). Next generation science standards introduction. Boz-

emanscience.com. Retrieved from <http://www.bozemanscience.com/next-generation-science-standards-introduction>

Anderson, P. (2013, Jan. 2). Practice 1: Asking questions and defining problems [Online video].

Retrieved from <http://www.bozemanscience.com/ngs-asking-questions-defining-problems>

- Banko, W., Grant, M. L., Jabot, M. E., McCormack, A. J., and O'Brien, T. (2013). *Science for the next generation: Preparing for the new standards*. Arlington, VA: NSTA Press.
- Bybee, R., Taylor, J. A., Gardner, A., Van Scotter, P., Carlson, J., Westbrook, A., and Landes, N. (2006). *The BSCS 5E instructional model: origins and effectiveness*. Colorado Springs, CO: BSCS.
- Bybee, R. W. (2013). *Translating the NGSS for classroom instruction*. Arlington, VA: NSTA Press.
- Geocarls, C., and Green, R. (2013). Tips for engaging students in scientific thinking. *ASCD Express*, 8(21). Alexandria, VA: ASCD.
- Harvard–Smithsonian Center for Astrophysics. (1997). *Minds of our own: Can we believe our eyes?* [program 1] Retrieved from <http://www.learner.org/resources/series26.html?pop=yes&pid=76>
- Harvard–Smithsonian Center for Astrophysics. (1997). *Minds of our own: Lessons from thin air* [program 2]. Retrieved from [http://www.learner.org/vod/vod\\_window.html?pid=77](http://www.learner.org/vod/vod_window.html?pid=77)
- Krajcik, J. (2014, April 25). How to select and design materials that align to the next generation science standards. Arlington, VA: NSTA. Retrieved from <http://nstacommunities.org/blog/2014/04/25/equip/>
- Krajcik, J. S., Codere, S., Dahsah, C., Bayer, R., and Mun, K. (2014). Planning instruction to meet the intent of the next generation science standards. *Journal of Science Teacher Education*, 25(2).
- National Research Council. (2012). *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: The National Academies Press. Retrieved from <http://www.doe.in.gov/sites/default/files/curriculum/next-generation-science-standards-framework-science-education.pdf>
- National Research Council. (2014). *Developing assessments for the next generation science standards*. Washington, DC: The National Academies Press.
- National Science Teachers Association. Panel Discussion: The Future of Assessment with NGSS. NSTA National Conference [video]. NSTA Conference, Boston, April 5, 2014.
- NGSS Lead States. (2013). *Next generation science standards: For states, by states*. Washington, DC: The National Academies Press.

- Popham, W. James. (2007). All about accountability: The lowdown on learning progressions. *Educational Leadership*, 64(7), 83–84.
- Reiser, B. (2013). What Professional Development Strategies Are Needed for Successful Implementation of the Next Generation Science Standards? Background paper for the Invitational Research Symposium on Science Assessment in Washington, DC, Sept. 24-25, 2013. Retrieved from <http://www.k12center.org/rsc/pdf/reiser.pdf>
- Roth, K., and Garnier, H. (2006). What science teaching looks like: An international perspective. *Educational Leadership*, 64(4), 16–23. Alexandria, VA: ASCD.
- Tomlinson, C. (2007). Learning to love assessment. *Educational Leadership*, 65(4), 8–13. Alexandria, VA: ASCD.
- Truesdell, P. (2014). Engineering essentials for STEM instruction: How do I infuse real-world problem-solving into science, technology, and math? (ASCD Arias™) Alexandria, VA: ASCD.
- Vick, M. (2014). The four cs of next generation engineering standards. *ASCD Express*, 9(9). Alexandria, VA: ASCD.
- Vilorio, D. (2014). Stem 101: Intro to tomorrow's jobs. *Occupational Outlook Quarterly*. Washington, DC: Bureau of Labor Statistics. Retrieved from <http://www.bls.gov/opub/ooq/2014/spring/art01.pdf>
- Young, E. (2014, June 20). Personal communication.