

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

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

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
- 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.