Moving Standards into Practice

Five Tools and Processes for Translating the NGSS for Instruction and Classroom Assessment

In Collaboration with BSCS and WestEd

MOVING NEXT GENERATION SCIENCE STANDARDS INTO PRACTICE:
A Project of the American Museum of Natural History
In Collaboration with WestEd and BSCS

Released in final form in April 2013, the *Next Generation Science Standards* have the potential to revolutionize science education in America, requiring "a different way of thinking about teaching and learning." Now is an opportune moment to prepare teachers for the new approaches to science instruction and assessment and to introduce them to the types of curriculum resources that will be needed to implement the NGSS successfully. More specifically—and in recognition of the complexity of the NGSS—there is a need for resources and professional development to support teachers so that they can translate the NGSS and adapt and align existing instructional materials and assessments with new performance expectations.

The American Museum of Natural History, with collaborators at WestEd and BSCS, propose to address this need, in partnership with teacher education and professional development providers across the country and with in-service teachers and school administrators as key participants. **The two-year project will design and field-test (1) a set of materials and tools for secondary science teachers; (2) a professional development process for teaching them how to use the tools; and (3) a leadership module aimed at science leaders (in-service facilitators, mentors, coaches) who will use this professional development process to work directly with teachers in applying the tools.**

Project Description
The Museum will work with two key 100Kin10 partners—the K–12 Alliance at WestEd and BSCS (Biological Sciences Curriculum Study)—to develop resources and professional development approaches through a collaborative, iterative process. These partners bring complementary expertise in designing instructional and assessment models, teacher professional development, and capacity building for teacher leaders. To ensure the resources meet on-the-ground needs and have broad applicability for teacher preparation, development, and retention, the design process will involve a diverse set of stakeholders—classroom teachers, school administrators, pre-service teacher educators, and professional development leaders. All materials generated by the project will be available online in PDF format at no charge. In addition, the Museum will present the ongoing and completed work at relevant meetings and conferences, including NSTA and the Council of State Science Supervisors (CSSS), and will leverage 100Kin10 channels to keep partners apprised of the project's progress as appropriate. Beyond the grant period, the Museum hopes to work with partners to create a dynamic and fully interactive version of the tools and professional development supports that can be accessed by educators through an online learning management environment via multiple access points.

Project deliverables include:

- A **set of materials and tools** for pre-service and in-service secondary science teachers to adapt or develop instructional materials (lessons and units) and assessment tasks aligned with the NGSS performance expectations, science practices, core ideas, and cross-cutting concepts with connections to the Common Core Standards in reading, writing, and math, as identified in the NGSS.
- A **professional development process for helping teachers use the tools** to adapt or develop instructional materials and assessment tasks based on NGSS content and performance expectations.
- A **leadership module** for science education leaders (in-service facilitators, mentors, coaches, pre-service faculty) who will work directly with pre-service and in-service teachers to use these tools.

Project Outcomes include:

- **Outcome 1*:* Increase in participants' *knowledge and understanding*** of NGSS components though the use of tools and a professional development process. Participants include both science education leaders and teachers.

- **Outcome 2*:* Increase participants' *ability to use* materials and tools** to adapt or develop lessons, units, and performance assessments aligned with the NGSS.
- **Outcome 3*:* Increase science education leaders' *ability to facilitate* a professional development process** for teachers to use materials and tools to adapt or develop lessons, units, and performance assessments aligned with the NGSS.
- **Outcome 4*:* A successful *collaborative, iterative design process*** resulting in a set of materials and tools, a professional development process for using them, and a leadership module that supports science education leaders working with teachers to use the process to adapt or develop instructional materials and performance tasks aligned with the NGSS.

Project activities will be conducted over a two-year period (October 2013 – September 2015) with an agile design process in Year 1 that is responsive to users' needs and full deployment in the field in Year 2 to learn how others use the tools and process.

Year 1: Design
The design process will be led by a six-member core design team comprising staff from the Museum, K–12 Alliance at WestEd, and BSCS. The team will meet six times during Year 1 and twice in Year 2. Senior Consultant Rodger Bybee and Assessment Consultant Chris Lazzaro (College Board) will contribute to the work of the design team. Teachers also will be actively involved in the iterative design process. Diverse groups of science teachers from the New York City area will be recruited to pilot test the tools to inform the development process. The design team will use the results from these teacher groups to create a prototype set of tools for field-testing in year 2. The pilot sessions will include after-school meetings and one-day workshops and will involve experienced teachers and new teachers—all from the New York City area.

Year 2: Field Test
In the next phase of the project, the tools and professional development process will be fully deployed in a field test by several 100Kin10 partner organizations in a variety of contexts— in-service teacher professional development, teacher residency programs, induction programs, and pre-service teacher preparation. The purpose of the field test is to learn what others can do with the tools and professional development process in their respective programs. Systematic evaluation data collected and analyzed during the field test will reveal the extent to which others (mentors/coaches as well as new and experienced teachers) understand the NGSS and how they use the tools and process to adapt lessons/units to align with new standards and learning outcomes.

The project's **Advisory Board** will meet twice at the Museum in New York City to review the tools and processes and provide input on next steps. The Advisory Board comprises ten advisors: six national leaders in science education who represent the project's broader impact, two NYC teachers, and two NYC school administrators.

Field Test Participants agree to:
- Participate in the three-day summer leadership institute held at the Museum
- Identify a constituent group of secondary science teachers to work with on using the five NGSS tools
- Intend to implement all five NGSS tools as intended with teachers during the fall 2014 or spring 2015
- Plan to use the five NGSS tools with fidelity as presented at the summer leadership institute at the Museum
- Agree to provide feedback and artifacts from using the five NGSS tools with teachers to the evaluators

The **Summer Leadership Institute** to prepare professional development providers for the field test to learn about the five NGSS tools and processes for using each of them will take place at the American Museum of Natural History in New York City on **July 15, 16, 17, and 18, 2014**. Professional development leaders participating in the Summer Institute are encouraged to attend in teams of two with priority given to teams from NGSS adoption states and 100Kin10 partners.

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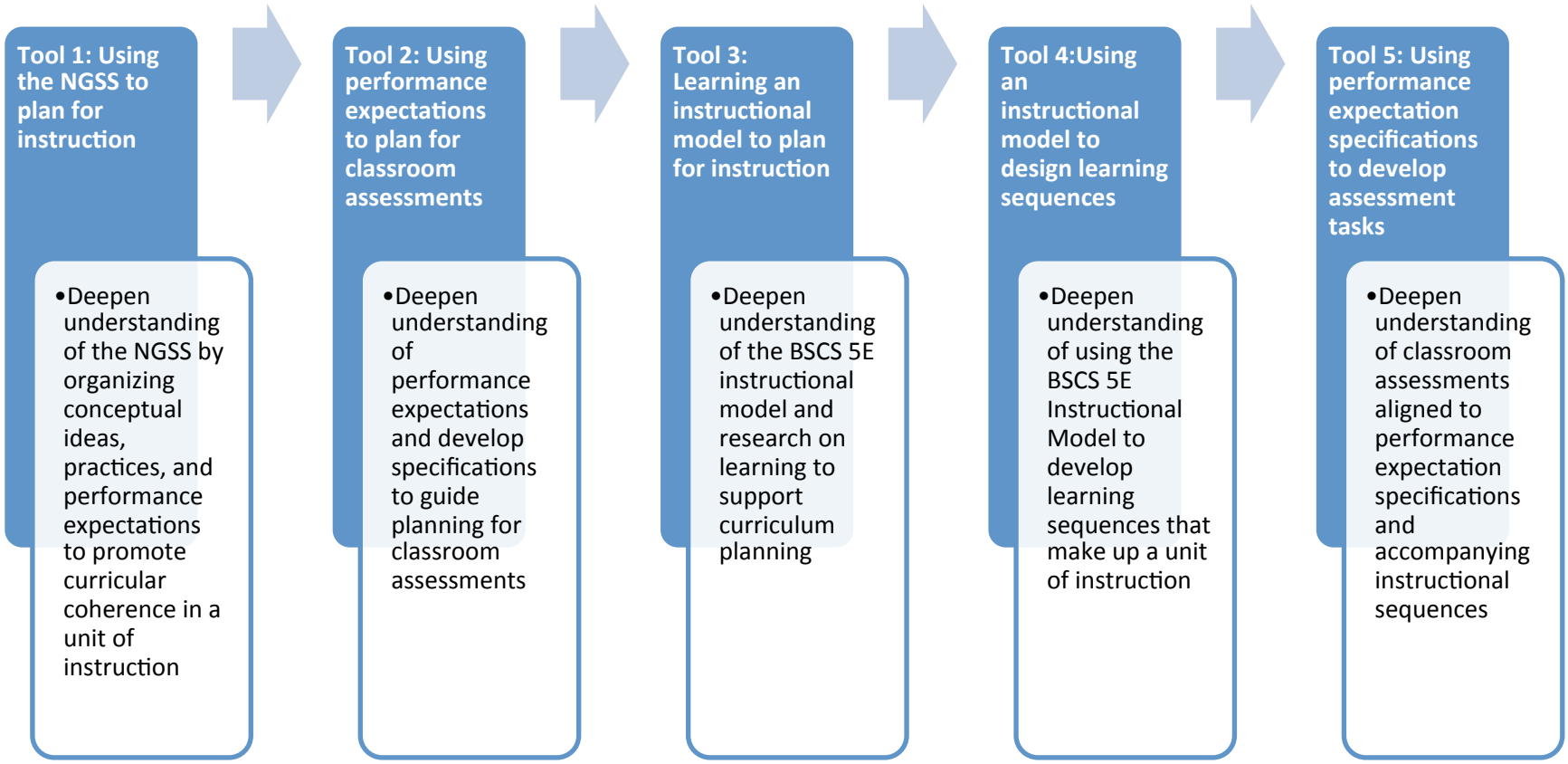
Five tools and processes for PD leaders/facilitators



Translating the NGSS into Practice

Five tools and processes for professional development leaders/facilitators

The *Next Generation Science Standards* (NGSS) challenges teachers to think deeply about learning and teaching with the goal of developing a clear vision of science education that is coherent, focused, and rigorous. The five tools and processes described below are designed to help professional development (PD) leaders work with teachers on curriculum, instruction, and assessment as they achieve this vision.

Through the use of all five tools and processes, PD leaders introduce teachers to the NGSS and *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* At the heart of the tools and processes is the organization of ideas, practices, and performance expectations into multiple instructional sequences. This is followed by a more in-depth plan for one instructional sequence and assessment task to provide evidence of student learning focused on a performance expectation. These processes help teachers plan for conceptual coherence.

Five NGSS Tools and Processes

Purpose	**Description**
Tool 1: ***Using the NGSS to plan a unit of instruction*** **Purpose:** Deepen understanding of the NGSS by organizing conceptual ideas, practices, and performance expectations to promote curricular coherence in a unit of instruction **Time:** 8 hours (two 4-hour sessions)	**Process:** Participants plan a unit of instruction using NGSS card sets and consider what students would be expected to learn related to a given topic. Card sets s include component ideas and elements from a disciplinary core idea; performance expectations; science and engineering practices; connections to nature of science; connections to engineering, technology, and applications of science; and connections to mathematics and English language arts/literacy common core. Throughout the process, participants read selections from *A Framework for K-12 Science Education* and *The Next Generation Science Standards Volumes 1 & 2.* **Product:** A plan for a unit of instruction that is organized with component ideas, science and engineering practices, cross-cutting concepts, and performance expectations focused on a given disciplinary core idea **Tool Components:** ▪ Template for creating an NGSS-aligned plan for a unit of instruction ▪ Guide to navigating the NGSS and card sets **PD Resources:** ▪ Powerpoint Slides and Facilitation Guide ▪ Electronic versions of the tool components and other materials ▪ Examples of work products from using tool and process

Purpose	Description
Tool 2: ***Using performance expectations to plan for classroom assessments*** **Purpose:** Deepen understanding of performance expectations and develop specifications to guide planning for classroom assessments **Time:** 4 hours	**Process:** Participants identify specifications based on a performance expectation that will later guide the development of an assessment task through which students will demonstrate their learning for one part of a unit of instruction. Throughout the process, participants read selections from *Developing Assessments for the Next Generation Science Standards.* **Product:** Evidence of learning specifications and to guide the design of an assessment task that aligns with a performance expectation and assesses a learning sequence in a unit of instruction **Tool Components:** ▪ Template for writing an evidence of learning statement and assessment specifications for a performance expectation ▪ Template for the capturing the evidence of learning statement and assessment specifications for parts of a unit of instruction ▪ Guide to navigating the NGSS and card set for a performance expectation ▪ Definitions of assessment claim, evidence of learning statement, and assessment specifications **PD Resources:** ▪ Powerpoint Slides and Facilitation Guide ▪ Electronic versions of the tool components and other materials ▪ Examples of work products from using tool and process
Tool 3: ***Learning an instructional model to design learning sequences*** **Purpose:** Deepen understanding of the BSCS 5E instructional model and research on learning to support curriculum planning **Time:** 4 hours	**Process:** Participants are introduced to the BSCS 5E instructional model and some of the research and learning theory upon which it is based. They read and compare classroom scenarios and sequence descriptions of the concepts learned and what students and teachers do during each phase of the 5Es for one instructional sequence. During the process, participants read selections about the BSCS 5E Instructional Model, findings from *How People Learn* and principles from *How Students Learn Science in the Classroom*, and from *A Framework for K-12 Science Education.* **Product:** A sequence of concepts and practices and description of what students and teachers do related to a disciplinary core idea and performance expectation. **Tool Components:** ▪ BSCS 5E Instructional Model: Brief Description of Each Phases ▪ BSCS 5E Instructional Model: What Students Do ▪ BSCS 5E Instructional Model: What Teachers Do ▪ Guide to Navigating the NGSS **PD Resources:** ▪ Powerpoint Slides and Facilitation Guide ▪ Electronic versions of the tool components and other materials ▪ Examples of work products from using tool and process

Purpose	Description
Tool 4: ***Using an instructional model to design learning sequences*** **Purpose:** Deepen understanding of using the BSCS 5E Instructional Model to develop learning sequences that make up a unit of instruction **Time:** 8 hours (two 4-hour sessions)	**Process:** Participants use the unit of instruction in Tool 1 to develop an outline for one part of a unit of instruction. They base their outline on the BSCS 5E Instructional Model. During the process, participants read selections from *A Framework for K-12 Science Education* and *The Next Generation Science Standards Volumes 1 & 2.* **Product:** An outline for an instructional sequence describing the concepts and practices learned from the NGSS dimensions and describing what students and teachers do during each phase of the BSCS 5E Instructional Model. **Tool Components:** ▪ Template for developing and recording the 5E outline ▪ BSCS 5E Instructional Model resources from Tool 3 ▪ Guide to Navigating the NGSS **PD Provider Resources:** ▪ Powerpoint Slides and Facilitation Guide ▪ Electronic versions of the tool components and other materials ▪ Examples of work products from using tool and process
Tool 5: ***Using performance expectation specifications to develop assessment tasks*** **Purpose:** Deepen understanding of classroom assessments aligned to performance expectation specifications and accompanying instructional sequences **Time:** 4 hours	**Process:** Participants use the performance expectation and assessment specifications developed as part of Tool 2 to create an assessment task as the summative evaluation of an instructional sequence. During the process, participants read selections from *Developing Assessments for the Next Generation Science Standards.* **Product:** An assessment task aligned to a performance expectation and accompanying instructional sequence **Tool Components:** ▪ Template for developing and recording the assessment task ▪ Protocol for examining student work ▪ Guide to Navigating the NGSS **PD Provider Resources:** ▪ Powerpoint Slides and Facilitation Guide ▪ Electronic versions of the tool components and other materials ▪ Examples of work products from using tool and process

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NGSS Leadership Institute Participants
Field Test Sites

Rhode Island	Team of 4	Providence Public Schools Roger Williams Zoo Save the Bay
Washington	Team of 3	Washington State LASER Alliance Pacific Northwest National Laboratory
California	Team of 5	K-12 Alliance California Science Project Two County Offices of Education
Kentucky	Team of 5	Louisville Public Schools KY State Science Network
Illinois	Team of 5	Chicago Public Schools Loyola University
Washington DC	Team of 6	Washington, DC Public Schools César Chávez Public Charter School Friendship Public Charter School Office of the State Superintendent of Education, Government of the District of Columbia Environmental Education Consortium
New York City	Team of 3	New Visions for Public Schools
	Team of 3	Urban Advantage
New Jersey	Team of 3	Rider University Princeton University Montclair State University