

## Planning Professional Learning Using The NGSS Implementation Pathway Model

John Spiegel, Anthony Quan, and Yamileth Shimojyo

The Next Generation Science Standards (NGSS) have the ability to transform teaching and learning in the classroom. They will dramatically change how students experience science by shifting the focus from the memorization of facts to greater student engagement in the processes of science. The NGSS emphasizes learning in three dimensions: the Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. In addition, there are seven Conceptual Shifts, or Innovations, that have strong implications for teaching and learning. These shifts include the interconnected nature of science as practiced in the real world, the integration of science and engineering, the use of performance expectations, a focus on deeper understanding of content as well as application of content, and alignment to the Common Core State Standards. Teachers, who ultimately will be tasked with implementing the NGSS, cannot do so without extensive time to plan and engage in professional learning.

The California Department of Education is approaching the implementation of NGSS thoughtfully and is encouraging districts and teachers to do the same. They have drafted the *Next Generation Science Standards Implementation Plan for California*<sup>1</sup>, which outlines a phased approach in preparing for and implementing the NGSS (see Figure 1). This plan stresses the importance of “high quality professional learning opportunities for educators to ensure that every student has access to teachers who are prepared to teach to the levels of rigor and depth required by the CA NGSS.”<sup>2</sup>

**Figure 1: Phases of NGSS Implementation**

The draft *Next Generation Science Standards Implementation Plan for California* outlines the three phases of implementation as:

- The **Awareness** phase represents an introduction to the CA NGSS, the initial planning of systems implementation, and establishment of collaborations.
- The **Transition** phase is the concentration on building foundational resources, implementing needs assessments, establishing new professional learning opportunities, and expanding collaborations between all stakeholders.
- The **Implementation** phase expands the new professional learning support, fully aligns curriculum, instruction, and assessments, and effectively integrates these elements across the field.

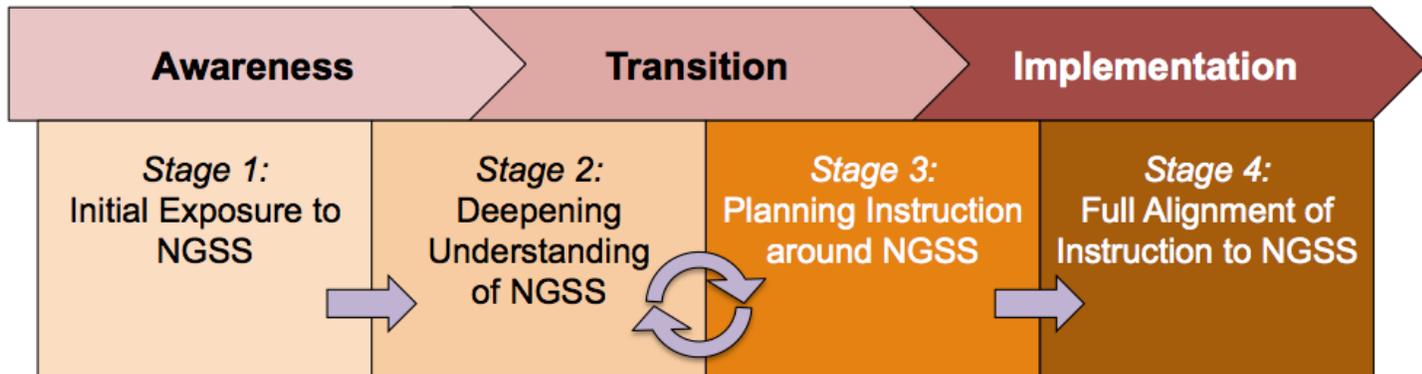
This past summer, during a leadership meeting of the Southern California Association of Science Specialists (SCASS), we discussed the question, “What do all teachers need to know and be able to do to demonstrate they are prepared to implement the NGSS?” Finding varied responses among ourselves, we agreed to work collaboratively to develop a model that would attempt to answer this question as well as provide specific outcomes which could be used to design professional learning for

<sup>1</sup> The proposal of this document can be found at <http://www.cde.ca.gov/pd/ca/sc/documents/implndrft072414wmrk.pdf>. A final version of this document is on the agenda for approval by the State Board of Education in November 2014.

<sup>2</sup> *Next Generation Science Standards Implementation Plan for California DRAFT*, page 12.

teachers. This work has been summarized in *The NGSS Implementation Pathway Model*<sup>3</sup> (see Figure 2), which identifies four stages: (1) Initial exposure to NGSS, (2) Deepening understanding of NGSS, (3) Planning instruction around NGSS, and (4) Full alignment of instruction to NGSS. These stages are related to the awareness, transition, and implementation phases outlined in the draft *Next Generation Science Standards Implementation Plan for California*.

**Figure 2. The NGSS Implementation Pathway Model**



Arrows in *The NGSS Implementation Pathway Model* represent a sequence of professional learning that teachers should have as they begin working with the Next Generation Science Standards. Of particular importance is the circular arrow between the stages of “Deepening Understanding of NGSS” and “Planning Instruction around NGSS”. These two stages are cyclical in nature. As teachers begin planning instruction aligned to the NGSS, time should be spent researching the *Framework for K-12 Science Education*<sup>4</sup> or other resources to deepen their personal understanding of the Conceptual Shifts as they consider the classroom implications of these Innovations. For example, a teacher planning an instructional sequence around a performance expectation that requires students to develop a model (Science and Engineering Practice #2) might need to further their own understanding of what a model is and how to help students develop and use a model.

**Figure 3. Stages in the NGSS Implementation Pathway Model**

| Stage 1<br>Initial Exposure to NGSS  | Stage 2<br>Deepening Understanding of NGSS   | Stage 3<br>Planning Instruction around NGSS  | Stage 4<br>Full Alignment of Instruction to NGSS                               |
|--|--|--|--|
| Teachers are beginning to learn and become familiar with the Conceptual Shifts (Innovations), the three dimensions of learning, and the performance expectations of the NGSS | Teachers engage in on-going research and the building of personal understanding of the Conceptual Shifts (Innovations), the three dimensions of learning, and the performance expectations of the NGSS | Teachers begin planning lessons and units aligned to the three dimensions and performance expectations of the NGSS, returning to the previous stage as needed to ensure coherence with the Conceptual Shifts (Innovations) of the NGSS | Teachers design and plan instruction aligned to NGSS curriculum and assessment |

<sup>3</sup> Adapted partially from the work of Harold Pratt in *The NSTA Reader's Guide to the Next Generation Science Standards*. 2013.

<sup>4</sup> The *Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* (NRC, 2012) can be found at [www.nap.edu/catalog.php?record\\_id=13165](http://www.nap.edu/catalog.php?record_id=13165).

|  |  |   |   |
|--|--|---|---|
| <p><i>Outcomes might include</i></p> <ul style="list-style-type: none"> <li>• Describe the Conceptual Shifts<sup>5</sup> (Innovations) of the NGSS and discuss implications for teaching and learning.</li> <li>• Identify the three-dimensions of the NGSS<sup>6</sup></li> <li>• Explain the anatomy and architecture of a NGSS standard</li> <li>• Identify NGSS resources for further study and information</li> </ul> | <p><i>Outcomes might include</i></p> <ul style="list-style-type: none"> <li>• Express how teaching and learning look in the NGSS</li> <li>• For any standard, identify each of the dimensions connected to the performance expectation</li> <li>• Describe what a Science and Engineering Practice and Crosscutting Concept would look like in their classroom, providing examples of how they might engage students in these dimensions</li> <li>• For a performance expectation, identify a possible performance task that would assess student learning around the performance expectation</li> </ul> | <p><i>Outcomes might include</i></p> <ul style="list-style-type: none"> <li>• Review grade level or subject area performance expectations</li> <li>• Take a current lesson/unit and translate it to the NGSS</li> <li>• Using the BSCS 5E Instructional Model or similar model, plan a learning cycle that integrates the three dimensions of the NGSS</li> <li>• Identify and describe a performance task that could be used in the classroom to assess student performance and understanding around a performance expectation or multiple performance expectations</li> </ul> | <p><i>Outcomes might include</i></p> <ul style="list-style-type: none"> <li>• Implement formative and summative assessments aligned to NGSS</li> <li>• Create curriculum maps or implement district curriculum guides</li> <li>• Implement NGSS adopted curriculum that is aligned to AIM, EQUIP, or similar rubrics</li> </ul> |
|--|--|---|---|

J. Spiegel and K. Bess (San Diego County Office of Education), Y. Shimojo (Riverside County Office of Education), A. Quan (Los Angeles County Office of Education). 2014.

A description of the four stages of *The NGSS Implementation Pathway Model* are described in Figure 3 as well as possible outcomes for personal or collaborative professional learning. The outcomes focus on implications for teaching and learning as teachers explore the Conceptual Shifts (Innovations), the three dimensions of the NGSS, and begin planning instruction around performance expectations.

To meet the outcomes identified in each stage of this model, teachers will need to dedicate significant effort in their own professional learning. Schools and districts will need to provide support and time for this learning to occur. It should be emphasized that all teachers in a school or district will not be at the same stage at any given time, thus there will be a need to differentiate professional learning for teachers in the coming months and years. In addition, the time needed to work through these stages should not be underestimated.

*The NGSS Implementation Pathway Model* is powerful in helping educators, administrators, and leaders of professional learning think about what teachers need to know and be able to do as they engage with the Next Generation Science Standards. We have found that this model has given us common language and outcomes as professional learning is developed. In addition, it has provided teachers with a tool to plan their own professional learning path. *The NGSS Implementation Pathway*

<sup>5</sup> The Conceptual Shifts (Innovations) are found in *Appendix A: Conceptual Shifts in the Next Generation Science Standards* at [www.nextgenscience.org](http://www.nextgenscience.org).

<sup>6</sup> The Three Dimensions of Learning are found in Appendix E, F, and G at [www.nextgenscience.org](http://www.nextgenscience.org) and Chapters 3-8 from *The Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* (NRC, 2012). can be found at [www.nap.edu/catalog.php?record\\_id=13165](http://www.nap.edu/catalog.php?record_id=13165).

*Model* is a valuable resource in support of the on-going work to move California closer in realizing the vision of NGSS for ALL students.

John Spiegel is the Science Coordinator at the San Diego County Office of Education. He can be reached at [john.spiegel@sdcoe.net](mailto:john.spiegel@sdcoe.net) or on Twitter at @sdngss.

Anthony Quan is the STEM Consultant at the Los Angeles County Office of Education. He can be reached at [quan\\_anthony@lacoedu.edu](mailto:quan_anthony@lacoedu.edu), on Facebook @Lacoe Stem, or on Twitter at @LacoeQuan.

Yamileth Shimojyo is the Science-STEM Coordinator at the Riverside County Office of Education. She can be reached at [yshimojyo@rcoe.us](mailto:yshimojyo@rcoe.us).