NSTA Guide for Leading a Study Group on

Next Generation Science Standards, Second Public Draft

In a process managed by Achieve, Inc., a non-profit education reform organization, 26 states, NSTA and AAAS are currently leading the development of Next Generation Science Standards (NGSS). The standards will undergo multiple reviews, including two public drafts. The first public draft was made available on May 11, 2012, and a second public draft will be available January 3-29, 2013. The science education community has the opportunity to review the document and provide input to Achieve and its writers. The final document is expected in the spring. NSTA encourages science educators to actively participate in the review process by taking the time to review this important document.

The January draft will be available online at www.nextgenscience.org, along with a survey/questionnaire to solicit feedback about the document. NSTA suggests educators form study groups with colleagues to have focused discussions about the draft. A study group is an excellent means to become familiar with the NGSS in preparation for implementation decisions and plans when the final document is released. In-depth discussions among peers also will prove valuable in providing informed feedback to Achieve. Whether you engage a small group of teachers from your school or reach out and plan a larger group review, a healthy dialogue among peers will prove valuable and informative.

NSTA has developed the following materials to help you plan and facilitate a group review:

- Check List: This handy check list will ensure you've attended to every detail that will help you successfully plan and facilitate an effective group meeting.

- Agendas: Two sample agendas provide guidance for facilitating a half-day meeting (3-4 hours) or a full-day meeting (~6 hours). Feel free to adjust the times that work for your meeting and schedule.

- Facilitator Guide: An effective facilitator will be important to keep your meeting running smoothly and effectively. We've provided guidance for moving through the agenda, allowing time for small team work, group reporting, and general feedback and discussion.

- Suggested Questions: NSTA offers a list of suggested questions developed independently from Achieve. The questions are intended to stimulate an in-depth study of the document around issues NSTA considers important. These questions are not necessarily the same ones asked on the survey/questionnaire from Achieve.

Planning the Meeting

Your first step is to decide the scope of your study group, which will determine the optimal number of participants. You may choose to take a broad comprehensive look at the whole NGSS document or focus on a smaller number of core ideas or specific grade levels.

It is desirable to have at least two people working as a team to review standards within a core idea. They could be grouped by grade level. If, for example, you held your meeting with middle school colleagues, you might have two people explore the life science, two the physical science, two the Earth and space science, and perhaps everyone spend time on the engineering. This allows participants the opportunity to focus their time looking closely at one area. At the elementary level, two people could focus on each grade level, or two individuals could explore adjacent grade levels.

If you are able to organize a larger group, you could create several teams to study multiple sections of the draft standards. To take a comprehensive look you would need two people each to study the elementary life, physical science, earth and space science, and all the engineering. This would be repeated for middle and high school, for a minimum of eighteen reviewers.

Assign participants to focus on specific standards based on their area of expertise or current teaching assignment. If science supervisors attend, you could assign them to areas where you lack the proper number of participants. Regardless of the size of the team, the emphasis should be on *depth* rather than *breadth*. It is much more important to have an in-depth exploration of a few sections of the document, rather than a limited look at many sections.

Next you will need to decide how long you and your participants can devote to the study group meeting. We've provided two sample agendas, one for a full day and another for a half day.

Once you've decided on the scope and meeting length, you need a location. It will be important to provide participants with wifi access so they have the opportunity to view the draft standards document online during the meeting. You will also need space and tables for participants to work in teams. Next, invite and prepare your participants.

Getting Familiar with the Framework

You should ask participants to be familiar with the standards document prior to your meeting. As we noted earlier, the document will be available online at www.nextgenscience.org. It is important that participants be familiar with the actual standards, as well as the background information and front matter provided by Achieve that explains the architecture and approach.

It's also important to first have a thorough understanding of the foundation for the new standards. The NGSS is based on *A Framework for K-12 Science Education*, released by the National Research Council and viewable online at www.nap.edu. The Framework describes the major practices, crosscutting concepts, and disciplinary core ideas that all students should be familiar with by the end of high school, and how these practices, concepts, and ideas should be developed across the grade levels. NSTA Press is also selling the document at www.nsta.org/sciencestore.
NSTA has produced a number of resources to help science educators better understand the framework and its dimensions, including The *NSTA Reader's Guide to a Framework for K-12 Science Education* and a number of articles published in NSTA member journals. These resources are available at www.nsta.org/ngss**.** NSTA Press also has assembled the Guide and the journal articles into one useful publication, *The NSTA Reader's Guide to A Framework for K–12 Science Education, Expanded Edition* (item #PB326X), available from the NSTA Science Store (www.nsta.org/sciencestore).

Facilitating the Meeting

NSTA has developed a list of Suggested Study Group Questions to focus the group discussion. A full-day meeting will allow time to be spent on all of the questions, and a half-day meeting will focus participants on a few of them. These questions are located at the end of this document. Participants should have a copy of them, either in hard copy or electronic form, as well as access to the NGSS draft. These resources are also located at the end of this guide.

The handy Facilitator Guide will lead you, or someone you designate, through your agenda (full-day or half-day) and ensure you allocate appropriate time for each set of questions.

Encourage participants to bring laptops to record notes and key points from their team discussions. The notes can be shared electronically with the facilitator and/or other group members. The facilitator can use them to summarize the group's feedback and input it onto the Achieve survey/questionnaire. It would be helpful to share the group report with participants.

Providing Feedback to Achieve

NSTA encourages teachers to form study groups because it is an excellent means of becoming familiar with the NGSS in preparation for implementation decisions and plans when the final document is released and adopted by states. It will also be valuable in providing informed feedback to Achieve via its online survey/questionnaire.

Both individuals and groups will be able to submit feedback on the online survey/questionnaire that will posted along with the draft standards document at www.nextgenscience.org. Study group facilitators can collect the group's opinions and discussions, summarize them, and use them to respond to the Achieve survey/questionnaire. Participants can also submit individual feedback on the Achieve survey. It's important to know that the survey is tied to an email address and individuals will only be able to respond to the survey once. If you are inputting feedback for your study group and you want to submit your own personal feedback, you will need to use another email address.

Check List for Planning an NGSS Study Group

- ✓ Determine scope of study group and select agenda
- ✓ Establish time and location
  Do you have wifi access?
- ✓ Select and invite participants
- ✓ Assign individuals to teams and assign teams to specific standards
- ✓ Prepare participants
  Be familiar with draft standards
  Send background reading/resources, agenda, and questions
- ✓ Facilitate meeting
- ✓ Collect group feedback and fill out Achieve survey/questionnaire or encourage members to provide individual feedback

Half-Day Sample Agenda

Leading a Study Group
Next Generation Science Standards, Second Public Draft

(Length: ~3-4 hours)

Introduction and Review of Day and Task (45 minutes)

Section I: Taking a Close Look at Performance Expectations (75 minutes)

- Clarity and Specificity
- Integrated Performance Expectations
- Coherence of Performance Expectation
- Achievability and Preparedness
- Instructional implications of the performance expectations

Section II: Progression Across all Grade Levels (45 minutes)
Divide the total group in half with each sub group doing two of the following four sets of questions

- Performance Expectation
- Scientific and Engineering Practices
- Disciplinary Core Ideas
- Crosscutting Concepts

Section III: Engineering Design (30 minutes)

Wrap Up (30 minutes)

Half-Day Facilitator Guide

Introduction and Review of Day and Task: (45 minutes)

All participants should be somewhat familiar with NGSS before attending the meeting. However, you may want to allow time to review the architecture, especially if you sense that participants need to be brought up to speed. This is a good time to discuss the process, the agenda for the day, and answer questions. It is also important to emphasize the importance of depth vs. breadth. We feel it's important to make an in-depth review of a few sections of the document, rather than a limited review of many sections. The half day meeting focuses on questions in section I, section II or III, and section IV.

Section I: Clarity, Integration, Coherence, Achievability, etc. (75 minutes)

If you are attempting to take a broad comprehensive look at the whole document and have a large team assembled, ask participants—working individually or in teams of two—to select one set of standards from the core ideas from one of the following; life, physical or earth/space sciences and one of the following grade spans (K-2, 3-5, 6-8, 9-12). It is not expected that the teams will be able to get through a large number of standards. Again, the focus should be depth rather than breadth. Eight people or teams would cover the three core ideas K-12. Of course, if you are focusing your review on a particular grade level or core idea, divide your groups accordingly. Try to make sure participants are in an area of expertise and experience so they are giving valid feedback

Have participants—individuals or teams of two—record their responses to be provided to the facilitator at the end of the meeting. Please ask them to note on their responses the specific core idea and grade spans they are addressing. It's helpful to make a notation of the code at the top of each standard.

Please stop at the end of this section to discuss and compare responses as a group across the various grade levels if you have multiple grade level participants. Otherwise, discuss the grade level reviewed. The facilitator or someone the facilitator designates should take notes and/or collect team notes electronically so there is a summary of the ideas and issues discussed. It's important to note any common threads or issues.

Section II: Progression Across all Grades (45 minutes)

Divide the total group in half with each sub group doing two of the following four sets of questions.

This section focuses on taking a look at performance expectations across multiple grade levels/span. Each individual or team of two should select two or three grade spans and review the set of performance expectations related the topic (A, B, C, or D) of each part of this section. Be sure to allow time at the end for the group to discuss and compare responses, and for you to take notes and summarize.

Section III: Engineering Design (30 minutes)

Note the engineering design disciplinary core ideas have been integrated into the core ideas of physical sciences, life sciences and Earth and space sciences. The performance expectations in which the engineering core ideas have been integrated are indicated with *

Ask participants—working individually or in teams of two—to return to the set of standards they were assigned in Section I and review the performance expectation where engineering core ideas have been integrated following the same procedure as above. Be sure to allow time at the end for the group to discuss and compare responses, and for you to take notes and summarize.

Wrap Up (30 minutes)

We recommend you allow at least a half hour at the end of the day for any general comments and new thoughts. Have the participants send their team notes to you, or someone you designate, if you are planning to provide a group response to the Achieve survey/questionnaire. Participants can also submit individual feedback on the survey. In any case, keeping good notes about each standard will be important. There will be another pubic release sometime this fall. You could ask your group if they might like to review them again at that time.

Full-Day Sample Agenda

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(Length: ~5.5–6 hours)

Introduction and Review of Day and Task (45 minutes)

Section I: Taking a Close Look at Performance Expectations (90 minutes)

- Clarity and Specificity
- Integrated Performance Expectations
- Coherence of Performance Expectation
- Achievability and Preparedness
- Instructional Implications of the Performance Expectations

Section II: Progression Across all Grade Levels (90 minutes – divided before and after lunch)

- Performance Expectation
- Scientific and Engineering Practices
- Disciplinary Core Ideas
- Crosscutting concepts

Lunch

Section III: Engineering Design (45 minutes)

Section IV: Nature of Science (45 minutes)

Wrap Up (30 minutes)

Full-Day Facilitator Guide

Introduction and Review of Day and Task: (45 minutes)

All participants should be somewhat familiar with NGSS before attending the meeting. However, you may want to allow time to review the architecture, especially if you sense that participants need to be brought up to speed. This is a good time to discuss the process, the agenda for the day, and answer questions. It is also important to emphasize the importance of depth vs. breadth. We feel it's important to make an in-depth review of a few sections of the document, rather than a limited review of many sections. The half day meeting focuses on questions in section I, section II or III, and section IV.

Section I: Clarity, Integration, Coherence, Achievability, Instructional Implications (90 minutes)

If you are attempting to take a broad comprehensive look at the whole document and have a large team assembled, ask participants—working individually or in teams of two—to select one set of standards from the core ideas from one of the following; life, physical or earth/space sciences and one of the following grade spans (K-2, 3-5, 6-8, 9-12). It is not expected that the teams will be able to get through a large number of standards. Again, the focus should be *depth* rather than *breadth*. Eight people or teams would cover the three core ideas K-12. Of course, if you are focusing your review on a particular grade level or core idea, divide your groups accordingly.

Have participants—individuals or teams of two—record their responses to be provided to the facilitator at the end of the meeting. Please ask them to note on their responses the specific core idea and grade spans they are addressing. It's helpful to make a notation of the code at the top of each standard.

Please stop at the end of this section to discuss and compare responses as a group across the various grade levels if you have multiple grade level participants. Otherwise, discuss the grade level reviewed. The facilitator or someone the facilitator designates should take notes and/or collect team notes electronically so there is a summary of the ideas and issues discussed.

Section II: Progression Across All Grades (90 minutes)

This section focuses on taking a look at performance expectations across multiple grade levels/span. Each individual or team of two should select two or three grade spans and review the set of performance expectations related the topic (A, B, C, or D) of each part of this section. Be sure to allow time at the end for the group to discuss and compare responses, and for you to take notes and summarize.

Section III: Engineering Design (45 minutes)

Note the engineering design disciplinary core ideas have been integrated into the core ideas of physical sciences, life sciences and Earth and space sciences. The performance expectations in which the engineering core ideas have been integrated are indicated with *.

Ask participants—working individually or in teams of two— to return to the set of standards they were assigned in Section I and review the performance expectation where engineering core ideas have been integrated following the same procedure as above. Be sure to allow time at the end for the group to discuss and compare responses, and for you to take notes and summarize.

Section IV: Nature of Science (45 minutes)

In the review of the May 2012 Public Draft of NGSS, NSTA recommended that:
The NGSS should include a section on *Connections to the Nature and History of Science* in a manner similar to the *Connections to Engineering, Technology, and Applications of Science*.
The writers have made nature of science more prominent in the performance expectations by inserting nature of science in both the practices and crosscutting concepts.

Ask participants—working individually or in teams of two— to return to the set of standards they were assigned in Section I and review the practices and crosscutting concepts where nature of science ideas have been integrated following the same procedure as above. Be sure to allow time at the end for the group to discuss and compare responses, and for you to take notes and summarize.

Wrap Up (30 minutes)

We recommend you allow at least a half hour at the end of the day for any general comments and new thoughts. Have the participants send their team notes to you, or someone you designate, if you are providing a group response to the Achieve survey/questionnaire. Participants can also submit individual feedback. In any case, keeping good notes about each standard will be important. There will be another pubic release some time over the summer or fall. You could ask your group if they might like to review them again at that time.

With time for a sack or catered lunch and a few extra minutes for miscellaneous business, this review session is five and a half to six hours in length. Please make adjustments as needed.

NSTA Suggested Study Group Questions

Next Generation Science Standards Second Public Draft

The questions in Section I require participants to focus on a set of standards. Please specify the standards you are reviewing using the code at the top of the page for each standard.

Section I. Taking a Close Look at One Set of Performance Expectations

A. Clarity and Specificity

To answer these questions, think about whether the performance expectations are clear and specific enough for a classroom teacher to understand the outcome expected and assess whether a student has met the outcomes specified. Base your answer on all of the information provided, including the stem, performance expectations, and foundation boxes.

- Do you have clear idea of what students must know and be able to do?
- How open to interpretation are the performance expectations?
- Is it clear what is and is not included?

B. Integration of the Three Dimensions in the Performance Expectations

Each performance expectation contains a scientific or engineering practice, a core idea, and a crosscutting concept. Successful completion of a given performance expectation indicates that a student has achieved the practices, core ideas, and crosscutting concepts that it is based on.

- In what ways can the inclusion of all three components in a single expectation lead to improved learning of the core idea? Be as specific as you can.
- Is there a clear connection between the performance expectations and the practices, core ideas, and crosscutting concepts in the foundation box?
- Is it reasonable to assume that a student who has successfully completed the performance expectations has achieved mastery of the core ideas, practices, and crosscutting concepts?

C. Coherence of Performance Expectations

To answer these questions, consider whether all of the performance expectation outcomes would make sense in the same instructional unit. Use examples to clarify your response.

- Is the set of performance expectations conceptually coherent?
- Do they all define a cohesive and related set of ideas or outcomes?
- Are any of the performance expectations out of place?

D. Achievability and Preparedness

To answer these questions, think about what students need to know and be able to do to be successful in life and also consider the time and effort needed to help all students achieve the stated expectations.

- Would students who achieve the task described in the performance expectations be prepared for success at college and/or in their careers?
- Are the tasks described in the performance expectations reasonable expectations for all students?
- Are the practices described in the foundation box reasonable expectations for all students?
- Are the disciplinary core ideas described in the foundation box reasonable expectations for all students?
- Are the crosscutting concepts described in the foundation box reasonable expectations for all students?
- How much instructional time (days) will be required to meet all the performance expectations in this set?

E. Instructional Implications of the Performance Expectations

The intent of the performance expectations is to describe what students should be able to do at the end of instruction. They are not meant to specify what students should do as part of instruction. However, some readers have interpreted them that way.

- Do the performance expectations seem to prescribe specific instructional sequences and instructional strategies? Why or why not?
- Do you think that performance expectations should prescribe specific instructional sequences and instructional strategies? Why or why not?

Section II. Checking for Progression Across All Grades

The following discussion questions require participants to look across multiple sets of performance expectations at several different grade levels/spans. Skim the standards to find relevant sections and then review those sections in more detail to answer the questions.

A. Performance Expectations

For these questions, focus on the sections that deal with a single topic, such as *Structure and Properties of Matter.*

- Do the performance expectations at each grade level build on those of earlier grades and properly prepare students for the performance expectations at latter grades?
- Are the tasks described in the performance expectations at each grade level reasonable expectations for all students at that grade level/span? Should any of the performance expectations move up or down in the progression?

B. **Scientific and Engineering Practices**

For these questions, focus on the sections that deal with a single practice such as *Developing and Using Models.*

- Do the practices at each grade level build on those of earlier grades and properly prepare students for the performance expectations at latter grades?
- Are the practices at each grade level reasonable expectations of all students at that grade level? Should any of the practices move up or down in the progression?
- Are the practices represented with enough frequency in each grade level/span so that students will have the opportunity to master the practice by the end of that grade span?

C. **Disciplinary Core Ideas**

For these questions, focus on the sections that deal with a single topic, such as the *Structure and Properties of Matter*

- Do the disciplinary core ideas at each grade level build on those of earlier grades and properly prepare students for the performance expectations at latter grades?
- Are the disciplinary core ideas at each grade level/span reasonable expectations of all students at that grade level? Should any of the practices move up or down in the progression?

D. **Crosscutting Concepts**

For these questions, focus on the sections that deal with a single crosscutting concept, such as *Patterns*.

- Do the crosscutting concepts at each grade level build upon those of earlier grades and properly prepare students for the crosscutting concepts at later grades?
- Are the crosscutting concepts at each grade level/span reasonable expectations for all students at that grade level? Should any of the crosscutting concepts move up or down in the progression?
- Are the crosscutting concepts represented with enough frequency so that students will understand them as "crosscutting" all the disciplines within science, and not relevant to just some areas of science (life science, Earth science, physical science)?
- Will students recognize and see the pervasive and useful nature of the concept as a result of their inclusion in the instruction?

Section III. Engineering Design

The engineering design disciplinary core ideas have been integrated into the other three core ideas. The performance expectations that have been integrated are indicated with *. For these questions, focus on a particular set of core ideas for physical, life, or earth and space sciences or one or two grade levels as you did in Section I and review those performance expectations that are indicated with *.

- In examining the draft, is it obvious that the engineering disciplinary core ideas have been incorporated into the performance expectations in life, Earth, and physical science?
- Does incorporating the engineering disciplinary core ideas into sets of performance expectations in life, earth and space and physical sciences—rather than a stand-alone set of

performance expectations—make it more likely or less likely that concepts about engineering design will be addressed during instruction in science?
- Does incorporating the engineering core ideas into sets of performance expectations in life, Earth and space, and physical sciences reduce the flexibility (and/or narrow the choices) that teachers have in planning curriculum and instruction?

Section IV. Nature of Science

In the review of the May 2012 Public Draft of NGSS, NSTA recommended that:
The NGSS should include a section on *Connections to the Nature and History of Science* in a manner similar to the *Connections to Engineering, Technology, and Applications of Science*.

The nature of science has been included in both the practices and crosscutting concepts.
For these questions, focus on a particular set of core ideas for physical, life or earth and space sciences or one or two grade levels as you did in Section I and review those performance expectations that include nature of science ideas.

- Does the material in the sections on practices and crosscutting concepts adequately address what students should know about the nature of science?
- Is the description of what students are to know about the nature of science at each grade level appropriate for students in that grade?
- In examining the draft, is it obvious that the performance expectations adequately address the nature of science statements in the foundation box?