

Maryland State DEPARTMENT OF
EDUCATION
Preparing World-Class Students

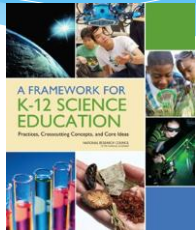
Assessing the Three Dimensions of the Next Generation Science Standards

ELEMENTARY SCIENCE
Career & College Readiness Conferences
Summer 2014



To what extent have you interacted with this document?

- A. I've read it thoroughly.
- B. I've skimmed it for general information.
- C. It's on my bookshelf.
- D. Huh?

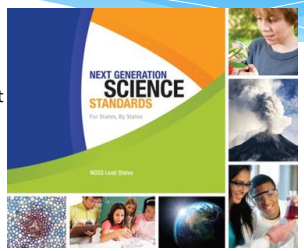



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How about this one?

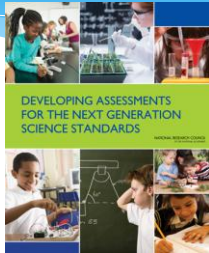
- A. I've read it thoroughly.
- B. I've skimmed it for general information.
- C. It's on my bookshelf.
- D. No clue

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Or this one?

- A. I've read it thoroughly.
- B. I've skimmed it for general information.
- C. It's on my bookshelf.
- D. It's the first time I've seen it.



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Outcomes

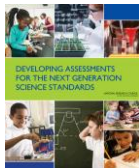
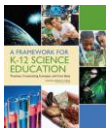
- * Review the process of developing NGSS
- * Discuss the implications of teaching and assessing in the three Dimensions of NGSS
- * Explore teaching and assessing through Science and Engineering Practices
- * Identify opportunities for formative assessment during instruction
- * Examine student activities for assessment tasks
- * Discuss the potential structure of an assessment system for science



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Developing Assessments for the Next Generation Science Standards

Committee on the Assessment of K-12 Science Proficiency



Board on Testing and Assessment and Board on Science Education National Academy of Sciences

What should assessment look like?



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Focus on Formative Assessment



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Assessment Designed to Guide Instruction

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they

- * use multiple practices in developing a particular core idea and
- * apply each practice in the context of multiple core ideas.

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The Assessment Challenge

- * The NGSS describe specific goals for science learning in the form of **performance expectations**, statements about what students should know and be able to do at each grade level.
- * Each performance expectation incorporates all three dimensions, and the NGSS emphasize the importance of the connections among scientific concepts.



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Assessment Challenge



2-PS1 Matter and its Interactions

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

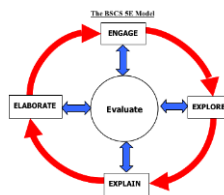
2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

It will not be feasible to assess all of the performance expectations for a given grade level during a single assessment occasion.

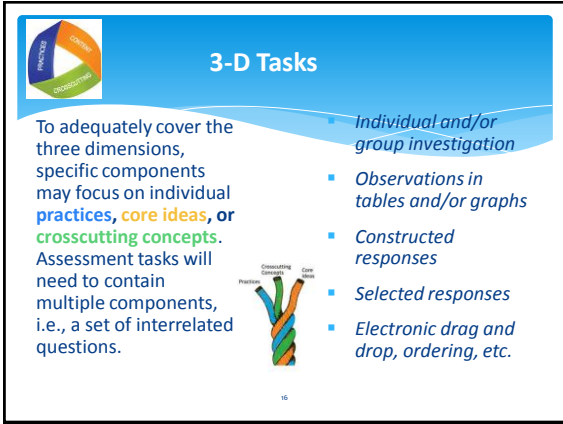
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Multiple assessments

Students will need multiple—and varied—assessment opportunities to demonstrate their competence on the performance expectations for a given grade level



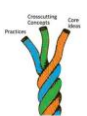
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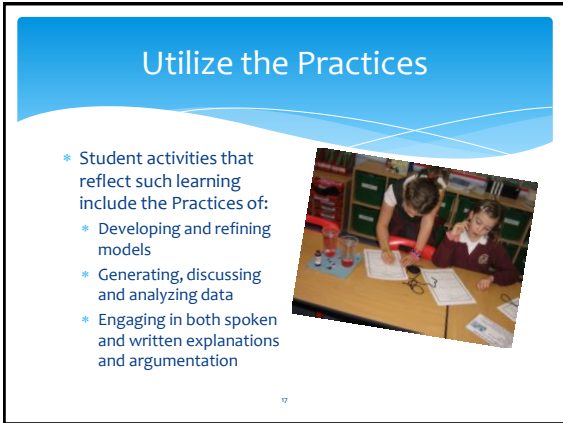
3-D Tasks

To adequately cover the three dimensions, specific components may focus on individual **practices, core ideas, or crosscutting concepts**. Assessment tasks will need to contain multiple components, i.e., a set of interrelated questions.

- Individual and/or group investigation
- Observations in tables and/or graphs
- Constructed responses
- Selected responses
- Electronic drag and drop, ordering, etc.




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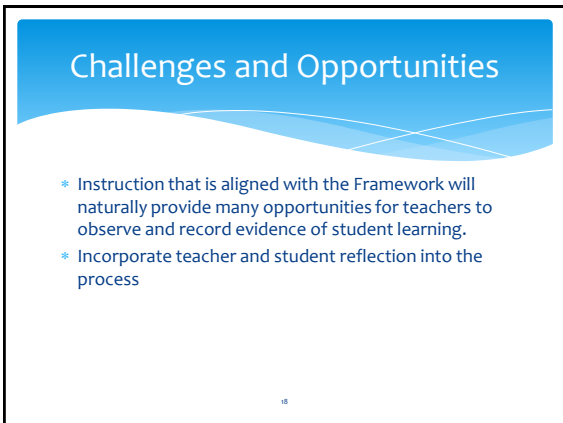


Utilize the Practices

- Student activities that reflect such learning include the Practices of:
 - Developing and refining models
 - Generating, discussing and analyzing data
 - Engaging in both spoken and written explanations and argumentation



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Challenges and Opportunities

- Instruction that is aligned with the Framework will naturally provide many opportunities for teachers to observe and record evidence of student learning.
- Incorporate teacher and student reflection into the process

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Performance Expectation

Students who demonstrate understanding can:

2-LS2-1

Plan and conduct an investigation to determine if plants need sunlight and water to grow.

[Assessment Boundary: Assessment is limited to testing one variable at a time.]

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Explore!

Use the magnifying glass app to observe chia seeds.

- Which “practices” are you using?
- What questions do you have about the chia seeds?
- What variables could students manipulate to investigate sprouting of the seeds?



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ID the Assessment Opportunities in the 5Es

- * Engage
- * Explore
- * Explain
- * Elaborate
- * Evaluate



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Assessment Opportunities?

5E	Practices	DCIs	Crosscutting
Engage			
Explore			
Explain			
Elaborate			
Evaluate			

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Assessment System

- * Performance assessment tasks developed within the classroom
- * Portfolio of classroom work samples with tasks specified by district and/or state
- * Units (curriculum materials and assessments) developed outside of the classroom (district and/or state)
- * Item banks of NGSS-aligned tasks, developed outside of the classroom, from which schools and teachers select



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Assessment System Challenges

- * A single, external large-scale assessment cannot cover the full breadth and depth of NGSS
- * Performance Expectations with suitable assessment tasks take time to administer and several will be required to adequately sample NGSS PE's
- * Some practices are difficult to assess, e.g., carry out an investigation, using conventional formats of external, on-demand assessments

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NGSS Main Messages

- * New types of assessment are needed
- * State monitoring assessments must move beyond traditional forms
- * NGSS assessment should start with the needs of classroom teaching and learning
- * States must create coherent systems of assessment that can support both classroom learning and policy monitoring functions

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Outcomes

- * Reviewed the process of developing NGSS
- * Discussed the implications of teaching and assessing in the three Dimensions of NGSS
- * Explored teaching and assessing through Science and Engineering Practices
- * Identified opportunities for formative assessment during instruction
- * Discussed the structure of an assessment system for science

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Resources

**A Framework for K-12 Science Education:
Practices, Crosscutting Concepts, and Core Ideas (2012)**
http://www.nap.edu/catalog.php?record_id=13165#

Developing Assessments for the Next Generation Science Standards
http://www.nap.edu/download.php?record_id=18409

NSTA
<http://ngss.nsta.org/access-standards/>

NAEP Released Items
<http://nces.ed.gov/nationsreportcard/itmrlsx/default.aspx>

TIMSS Released Items
<http://nces.ed.gov/timss/educators.asp>

PISA Released Items
<http://nces.ed.gov/surveys/pisa/educators.asp>

Exit Slip

* Write two statements that describe the implications for assessing student understanding in YOUR classroom.

- 1) Ah-hah! statement
- 2) Action(s) statement



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