MARYLAND STATE DEPARTMENT OF EDUCATION
Preparing World-Class Students

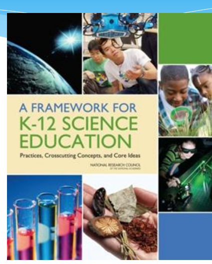
NGSS 101

Next Generation Science Standards
Adoption & Implementation

NEXT GENERATION SCIENCE STANDARDS
For States, By States

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?

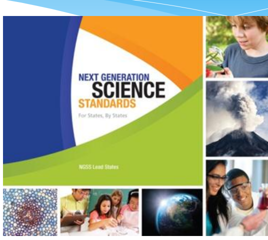


http://www.nap.edu/catalog.php?record_id=13165

2

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

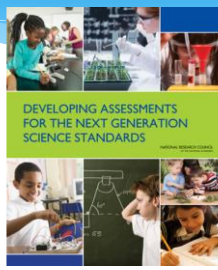


SCIENCE

3

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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Why, What, Who, When & Where

- ❖ Explain the reasons for building new science standards.
- ❖ Describe the process and timeline for constructing the Framework and the NGSS.
- ❖ Describe the structure of a standard within NGSS.
- ❖ Discuss the implications of the "shifts" in NGSS for teaching and learning.
- ❖ Examine instructional strategies that reflect the intent of NGSS.

NEXT GENERATION SCIENCE STANDARDS
For States, By States

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Why were the NGSS developed?

Goal

*For **all** students to:*

- Have appreciation for the beauty and wonder of science
- Have sufficient knowledge of science and engineering to engage in public discussions
- Be careful consumers of scientific information relevant to their daily lives
- Continue to learn about science outside school
- Have the skills to enter careers of their choice, including (but not limited to) science, engineering and technology.

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Data to Inform Action

TIMSS 2015

OECD PISA

NAEP NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

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The National Assessment of Educational Progress (NAEP)

* **NAEP** is the largest nationally representative and continuing assessment of what America's students know and can do in various subject areas.

NAEP NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS

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2009 NAEP Science Results

Grade 4

34%

of students perform at or above Proficient

Grade 8

30%

of students perform at or above Proficient

Grade 12

21%

of students perform at or above Proficient

National Assessment of Educational Progress (NAEP), 2009 Science Assessment, p. 8

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Program for International Student Assessment

- **PISA** is an international assessment that measures 15-year-old students' **reading, mathematics,** and **science literacy.**
- PISA also includes measures of general or **cross-curricular competencies,** such as **problem solving.**
- PISA emphasizes **functional skills** that students have acquired as they near the end of compulsory schooling.

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2009 PISA Science Results Grade 10

29%
of students scored at or above level 4—the level at which students can complete higher order tasks.

Highlights from PISA 2009, p. 26

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Trends in International Mathematics and Science Study

TIMSS provides reliable and timely data on the **mathematics** and **science** achievement of U.S. students compared to that of students in other countries.

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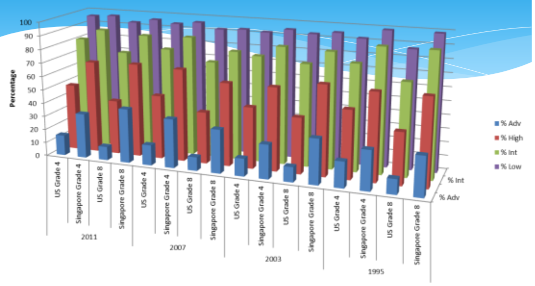
TIMSS Performance: US v. Singapore



TIMSS 2011 Science, p. 88-89, p. 116-117

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TIMSS Performance

United States v Singapore Benchmark Achievement

Grade 4	% Advanced		% High		% Intermediate		% Low	
	US**	Singapore*	US	Singapore	US	Singapore	US	Singapore
2011	15	33	49	68	81	89	96	97
2007	15	36	47	68	78	88	94	96
2003	13	25	45	61	78	86	94	95
1995	19	14	50	42	78	71	92	89
Grade 8	**% Advanced**		**% High**		**% Intermediate**		**% Low**	
	US***	Singapore*	US	Singapore	US	Singapore	US	Singapore
2011	10	40	40	69	73	87	93	96
2007	10	32	38	61	71	80	92	93
2003	11	33	41	66	75	85	93	95
1999	12	29	37	60	67	84	87	95
1995	11	29	38	64	68	91	87	99

* Rank = 1; ** Rank = 5; ***Rank = 9

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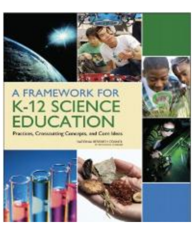
TIMSS 2011 Science, p. 88-89, p. 116-117

Where do you start when developing new standards?



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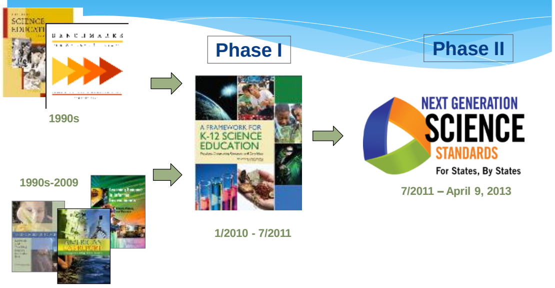
Building on the Past; Preparing for the Future



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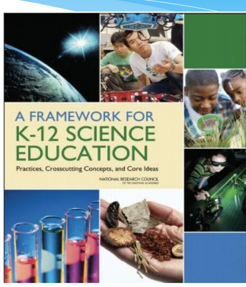
A New Vision of Science Learning that Leads to a New Vision of Teaching



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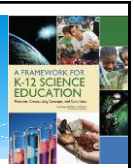
Vision for Science Education



"The framework is designed to help realize a vision for education in the sciences and engineering in which **(all) students**, over **multiple years** of school, **actively engage** in science and engineering **practices** and apply **crosscutting concepts** to deepen their understanding of the **core ideas** in these fields."

A Framework for K-12 Science Education pp. 8-9

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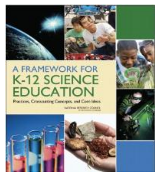
The framework is built on the notion of learning as a developmental progression.



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It is designed to help children continually build on and revise their knowledge and abilities, starting from their curiosity about what they see around them and their initial conceptions about how the world works.

Framework, p.11

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Who developed the NGSS?

NEXT GENERATION
SCIENCE
STANDARDS
For States, By States

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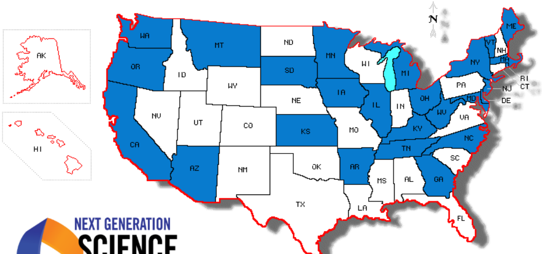
NGSS Lead States



NEXT GENERATION SCIENCE STANDARDS For States, By States

http://www.nextgenscience.org/maryland

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What does a standard look like in the NGSS?

NEXT GENERATION SCIENCE STANDARDS For States, By States

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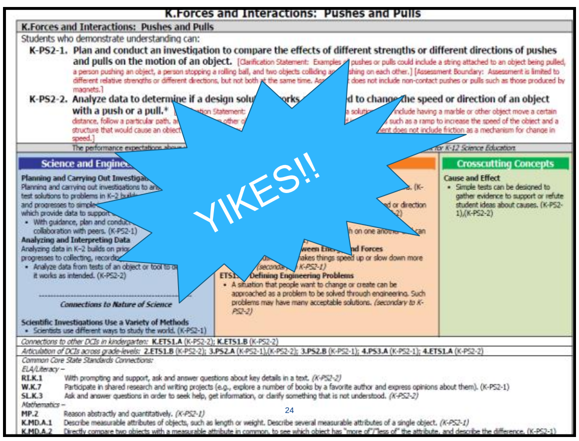

K.Forces and Interactions: Pushes and Pulls

K.Forces and Interactions: Pushes and Pulls

Students who demonstrate understanding can:

K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding a… …shing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. As… …does not include non-contact pushes or pulls such as those produced by magnets.]

K-PS2-2. Analyze data to determine if a design solu… …orks … …d to change the speed or direction of an object with a push or a pull.* […ation Statement: … …a solution… include having a marble or other object move a certain distance, follow a particular path, a… …other o… …such as a ramp to increase the speed of the object and a structure that would cause an object… …nent does not include friction as a mechanism for change in speed.]

The performance expectations above… …for *K-12 Science Education*.

Science and Enginee…

Planning and Carrying Out Investiga…
Planning and carrying out investigations to an… test solutions to problems in K–2 build… and progresses to simple… which provide data to support…
- With guidance, plan and conduct… collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior… progresses to collecting, recordi…
- Analyze data from tests of an object or tool to de… it works as intended. (K-PS2-2)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods
- Scientists use different ways to study the world. (K-PS2-1)

…s. (K-…
…ed or direction …2)
…h on one another… can…
…ween Energy and Forces
…makes things speed up or slow down more… *(seconda… K-PS2-1)*

ETS1.… Defining Engineering Problems
- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary to K-PS2-2)*

Crosscutting Concepts

Cause and Effect
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)

Connections to other DCIs in kindergarten: **K.ETS1.A** (K-PS2-2); **K.ETS1.B** (K-PS2-2)

Articulation of DCIs across grade-levels: **2.ETS1.B** (K-PS2-2); **3.PS2.A** (K-PS2-1),(K-PS2-2); **3.PS2.B** (K-PS2-1); **4.PS3.A** (K-PS2-1); **4.ETS1.A** (K-PS2-2)

Common Core State Standards Connections:

ELA/Literacy –

RI.K.1 With prompting and support, ask and answer questions about key details in a text. *(K-PS2-2)*

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. *(K-PS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(K-PS2-1)*

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. *(K-PS2-1)*

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

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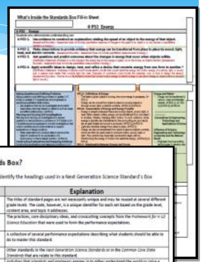
What’s Inside the Standards Box?

Exploring the Standards Box

- Read the explanation for each heading
- Write a heading in the box that best explains each section of the Standards Box.



What’s Inside the Standards Box?

Use the explanation provided to help identify the headings used in a Next Generation Science Standard’s Box

Headings	Explanation
Standard Title and Code	The titles of standard pages are not necessarily unique and may be reused at several different grade levels. The code, however, is a unique identifier for each set based on the grade level, content area, and topic it addresses.
Foundation Box	The practices, core disciplinary ideas, and crosscutting concepts from the *Framework for K-12 Science Education* that were used to form the performance expectations.
What is Assessed	A collection of several performance expectations describing what students should be able to do to master this standard.
Connection Box	Other standards in the *Next Generation Science Standards* or in the *Common Core State Standards* that are relate to this standard.
Science and Engineering Practices	Activities that scientists and engineers engage in to either understand the world or solve a problem.
Disciplinary Core Ideas	Concepts in science and engineering that have broad importance within and across disciplines as well as relevance in people’s lives.
Crosscutting Concepts	Ideas, such as *Patterns* and *cause and effect*, which are not specific to any one discipline but cut across them all.

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Title and Performance Expectations

4-PS3 Energy

Title and Code
The titles of standard pages are not necessarily unique and may be reused at several different grade levels . The code, however, is a unique identifier for each set based on the grade level, content area, and topic it addresses.

What is Assessed
A set of performance expectations describing what students should know and be able to do to master this standard

4-PS3 Energy

Students who demonstrate understanding can:

4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.[1] [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

A Closer Look at a Performance Expectation

K-LS1 From Molecules to Organisms: Structures and Processes

K-LS1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) --- *Connections to Nature of Science* **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world. (K-LS1-1)	**LS1.C: Organization for Matter and Energy Flow in Organisms** • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)	**Patterns** • Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1)

Note: Performance expectations combine practices, core ideas, and crosscutting concepts into a single statement of ***what is to be assessed***.

They are not instructional strategies or objectives for a lesson.

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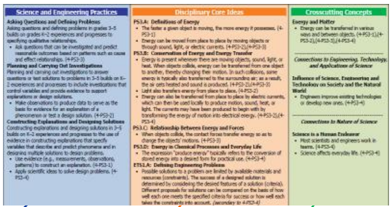
Foundation Box



Foundation Box
The practices, core disciplinary ideas, and crosscutting concepts from the *Framework f or K-12 Science Education* that were used to form the performance expectations

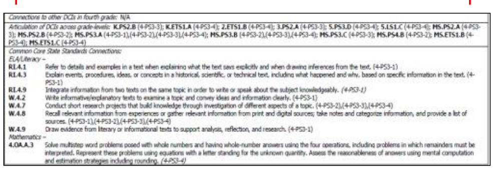
Scientific & Engineering Practices
Activities that scientists and engineers engage in to either understand the world or solve a problem

Disciplinary Core Ideas
Concepts in science and engineering that have broad importance within and across disciplines as well as relevance in people's lives.

Crosscutting Concepts
Ideas, such as *Patterns* and *Cause and Effect*, which are not specific to any one discipline but c... ...... them all.

The Connection Box

Connection Box
Other standards in the *Next Generation Science Standards* or in the *Common Core State Standards* that are related to this standard



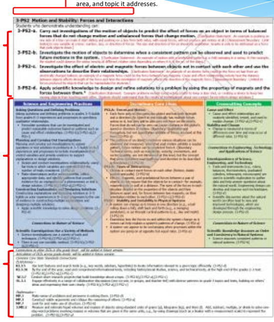
Inside the NGSS Box

Title and Code
The titles of standard pages are not necessarily unique and may be reused at several different grade levels. The code, however, is a unique identifier for each set based on the grade level, content area, and topic it addresses.

What is Assessed
A collection of several performance expectations describing what students should be able to do to master this standard

Foundation Box
The practices, core disciplinary ideas, and crosscutting concepts from the *Framework for K-12 Science Education* that were used to form the performance expectations

Connection Box
Other standards in the *Next Generation Science Standards* or in the *Common Core State Standards* that are related to this standard



Based on the January 2013 Draft of NGSS

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How is content articulated in the NGSS?

NEXT GENERATION SCIENCE STANDARDS

For States, By States

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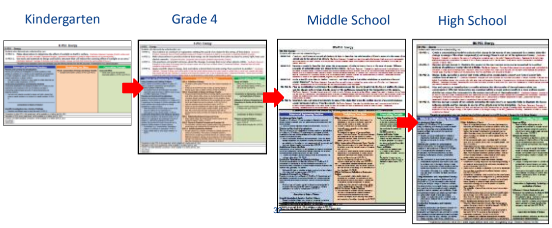
Review and discuss the progression of energy standards with a partner or your team.



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Partner/Group Review and Discussion

NEXT GENERATION SCIENCE STANDARDS

Questions to explore with a partner or team

- How do the standards for Energy build coherently K-HS?
- How does the cognitive rigor progress K-HS?
- What are the opportunities for integration with CCSS and STEM?

Core Idea: Energy			
Coherence *How do the Core Ideas progress K-12*	Cognitive Rigor	Integration with CCSS Math and Literacy	Integration with STEM
Evidence:	Evidence:	Evidence:	Evidence:
What are the implications of NGSS for planning and teaching in your school?			

Discuss and Record your observations:

- How do the standards build coherently K-HS?
- How do core ideas progress K-12.
- How does the cognitive rigor progress K-HS?
- What are the opportunities for integration with ELA, Math, and STEM?

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What are the three dimensions of learning in the NGSS?

NEXT GENERATION SCIENCE STANDARDS
For States, By States

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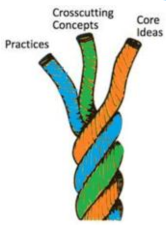
Three Dimensions Intertwined



- The NGSS are written as Performance Expectations
- NGSS will require contextual application of the three dimensions by students.

http://www.nextgenscience.org/2ls2-ecosystems-interactions-energy-dynamics

NEXT GENERATION SCIENCE STANDARDS For States, By States

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Dimension 1
Science and Engineering Practices

- Behaviors that scientists engage in as they investigate, build models, analyze data and communicate information
- “Practices” rather than “skills” since knowledge and skills are required that are specific to each practice.
- Engineering involves solving a problem through design.
- Engineering practices make STEM relevant to students.

Framework, pp. 41-82

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Asking Questions. . .

Why are there seasons?

Why did the structure collapse?

How is electric power generated?

What do plants need to survive?

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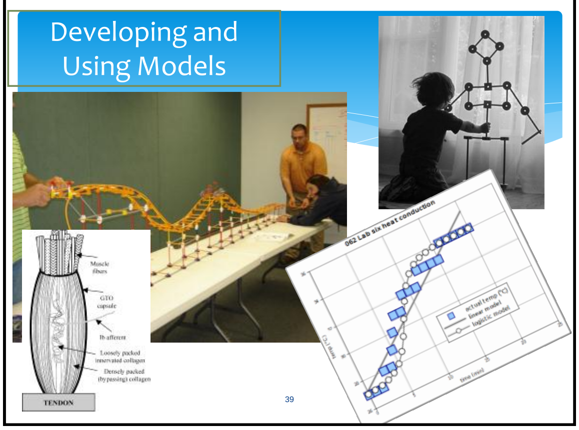
. . . Defining Problems

Developing and Using Models



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Planning and Carrying Out Investigations

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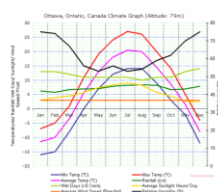
Analyzing and Interpreting Data



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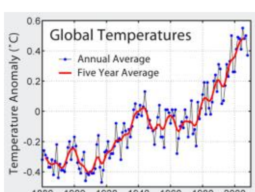
Using Mathematics and Computational Thinking



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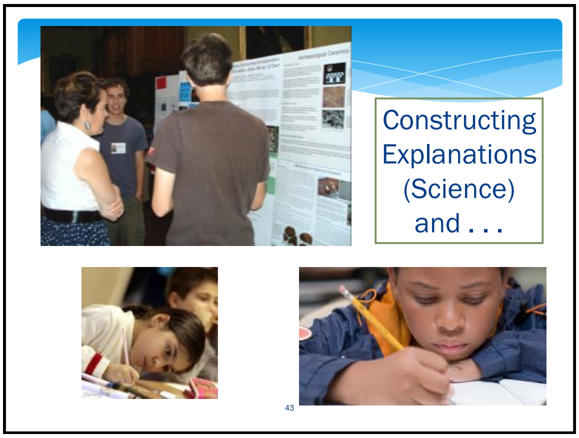
Constructing Explanations (Science) and . . .
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. . . Designing Solutions (Engineering)
44


Engaging in Argument from Evidence

Obtaining, Evaluating, and Communicating Information

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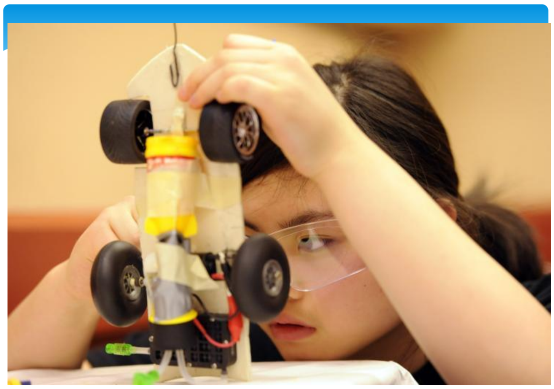

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Dimension 2
Crosscutting Concepts

- Have application across all domains of science
- Provide an organizational schema for interrelating knowledge from various science fields
- Include:
  (1) Patterns, similarity, and diversity;
  (2) Cause and effect;
  (3) Scale, proportion and quantity;
  (4) Systems and system models;
  (5) Energy and matter;
  (6) Structure and function;
  (7) Stability and change

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Dimension 3
Disciplinary Core Ideas

- Focus K–12 science curriculum, instruction and assessments on the most important aspects of science
  - Broad importance or key organizing principle
  - Key tool for understanding complex ideas
  - Connected to personal or societal concerns
  - Teachable and learnable at multiple grades

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Disciplinary Core Ideas

Physical Science
PS1: Matter & Interactions

PS2: Motion & Stability: Forces and Interactions

PS3: Energy

PS4: Waves and Their Applications in Technologies for Information Transfer

Life Science
LS1: From Molecules to Organisms

LS2: Ecosystems: Interaction, Energy & Dynamics

LS3: Heredity: Inheritance and Variation of Traits

LS4: Biological Evolution: Unity & Diversity

Earth & Space Science
ESS1: Earth's Place in the Universe

ESS2: Earth's Systems

ESS3: Earth & Human Activity

Engineering Design
ETS1: Engineering Design

Influence of Science, Engineering, and Technology on Society and the Natural World

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Current State Science Standard Sample

Inquiry Standards

Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities utilizing safe laboratory procedures.

Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.

Content Standards

Distinguish between atoms and molecules.

Recognize that there are more than 100 elements and some have similar properties as shown on the Periodic Table of Elements.

Identify and demonstrate the Law of Conservation of Matter.

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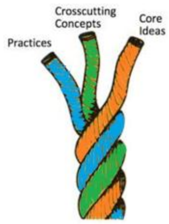
Three Dimensions Intertwined



- The NGSS are written as Performance Expectations
- NGSS will require contextual application of the three dimensions by students.

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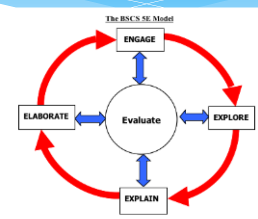
The 5E Instructional Model

- Appropriate for lessons or units
- Activates prior knowledge
- Student-centered
- Multiple opportunities to explore
- Connects to real world scenarios
- Assessment opportunities in each E



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Elementary School

- **Engage:** Students are given an example of a plant or animal and tell where it lives.
- **Explore:** teams of two students visit the school yard to answer: "How many different plants and animals can you observe?"
- **Explain:** student present their findings from the trip
- **Elaborate:** students are asked to collect pictures of three different organisms, display the pictures and describe their habitats
- **Evaluate:** Students are given pictures of plants and animals in different habitats; describe the plants and animals and describe how their actions are like scientists.

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Performance Expectation?

5E	Practices	DCIs	Crosscutting
Engage			
Explore			
Explain			
Elaborate			
Evaluate			

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Three dimensions (ES)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1) ----- *Connections to Nature of Science* **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world. (2-LS4-1)	**LS4.D: Biodiversity and Humans** • There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)	

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Middle School

- **Engage:** describe characteristics of two fossil brachiopods to see if changes occurred; supply evidence to support claim
- **Explore:** measure and graph characteristics of two populations; propose explanations for variations
- **Explain:** present explanations and evidence
- **Elaborate:** Students review images of embryological development for similarities; research the similarities of related organisms and how they evolved
- **Evaluate:** students answer questions about variation in a population of cheetahs and describe how variation results in some individuals surviving and reproducing

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High School

- **Engage:** view images of the "arms" of organisms, and attempt to identify their habitat; discuss adaptations.
- **Explore:** review slides of the Galapagos Islands and examine data on beak depth and tarsal length in finches. How could variation in beak depth help or harm finches?
- **Explain:** read and discuss Darwin's description of natural selection.
- **Elaborate:** examine morphological features of apes and humans. Students build models to compare DNA codes for proteins to determine relatedness of organisms.
- **Explain:** describe findings and predict relationships to ancestor
- **Evaluate:** use graphical evidence for natural selection to construct an explanation for adaptation of populations

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What shifts are necessary for teaching and learning in the NGSS?

NEXT GENERATION SCIENCE STANDARDS For States, By States

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Conceptual Shifts in the NGSS

1. K-12 science education should reflect the interconnected nature of science as it is practiced and experienced in the real world.
2. The Next Generation Science Standards are student performance expectations – **NOT** curriculum.
3. The science concepts build coherently from K-12.
4. The NGSS focus on deeper understanding of content as well as application of content.
5. Science and Engineering are integrated in the NGSS from K–12.
6. NGSS content is focused on preparing students for college, careers, and citizenship.
7. The NGSS and Common Core State Standards (English Language Arts and Mathematics) are **Aligned.**

NEXT GENERATION SCIENCE STANDARDS For States, By States

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Maryland and the NGSS: Where are We Going?

Maryland State Department of EDUCATION
Preparing World-Class Students

NEXT GENERATION SCIENCE STANDARDS
For States, By States

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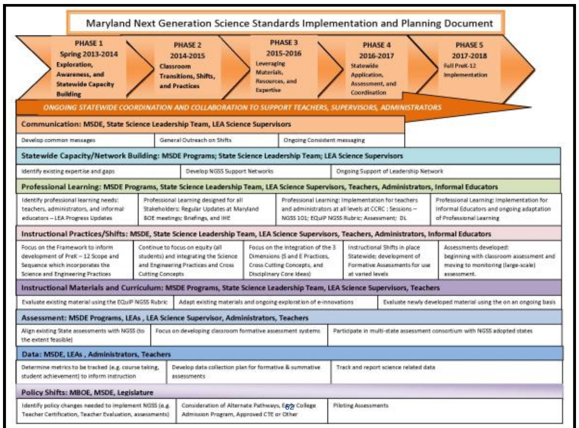

Maryland Next Generation Science Standards Implementation and Planning Document

PHASE 1 Spring 2013-2014 Exploration, Awareness, and Statewide Capacity Building
PHASE 2 2014-2015 Classroom Transitions, Shifts, and Practices
PHASE 3 2015-2016 Leveraging Materials, Resources, and Expertise
PHASE 4 2016-2017 Statewide Application, Assessment, and Coordination
PHASE 5 2017-2018 Full PreK-12 Implementation

ONGOING STATEWIDE COORDINATION AND COLLABORATION TO SUPPORT TEACHERS, SUPERVISORS, ADMINISTRATORS

Communication: MSDE, State Science Leadership Team, LEA Science Supervisors

Develop common messages	General Outreach on Shifts	Ongoing Consistent messaging

Statewide Capacity/Network Building: MSDE Programs; State Science Leadership Team; LEA Science Supervisors

Identify existing expertise and gaps	Develop NGSS Support Networks	Ongoing Support of Leadership Network

Professional Learning: MSDE Programs, State Science Leadership Team, LEA Science Supervisors, Teachers, Administrators, Informal Educators

Identify professional learning needs: teachers, administrators, and informal educators – LEA Progress Updates	Professional Learning designed for all Stakeholders: Regular Updates at Maryland BOE meetings; Briefings, and IHE	Professional Learning: Implementation for teachers and administrators at all levels at CCRC : Sessions – NGSS 101; EQuIP NGSS Rubric; Assessment; DL	Professional Learning: Implementation for Informal Educators and ongoing adaptation of Professional Learning

Instructional Practices/Shifts: MSDE, State Science Leadership Team, LEA Science Supervisors, Teachers, Administrators, Informal Educators

Focus on the Framework to inform development of PreK – 12 Scope and Sequence which incorporates the Science and Engineering Practices	Continue to focus on equity (all students) and integrating the Science and Engineering Practices and Cross Cutting Concepts	Focus on the integration of the 3 Dimensions (S and E Practices, Cross Cutting Concepts, and Disciplinary Core Ideas)	Instructional Shifts in place Statewide: development of Formative Assessments for use at varied levels	Assessments developed: beginning with classroom assessment and moving to monitoring (large-scale) assessment.

Instructional Materials and Curriculum: MSDE Programs, State Science Leadership Team, LEA Science Supervisors, Teachers

Evaluate existing material using the EQuIP NGSS Rubric	Adapt existing materials and ongoing exploration of e-innovations	Evaluate newly developed material using the on an ongoing basis

Assessment: MSDE Programs, LEAs , LEA Science Supervisor, Administrators, Teachers

Align existing State assessments with NGSS (to the extent feasible)	Focus on developing classroom formative assessment systems	Participate in multi-state assessment consortium with NGSS adopted states

Data: MSDE, LEAs , Administrators, Teachers

Determine metrics to be tracked (e.g. course taking, student achievement) to inform instruction	Develop data collection plan for formative & summative assessments	Track and report science related data

Policy Shifts: MBOE, MSDE, Legislature

Identify policy changes needed to implement NGSS (e.g. Teacher Certification, Teacher Evaluation, assessments)	Consideration of Alternate Pathways, Early College Admission Program, Approved CTE or Other	Piloting Assessments

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Phase I: Spring 2013-2014

Exploration
Awareness
State capacity-building
- Teachers
- LEA Science Supervisors
- State Science Leadership Team
- MSDE staff

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Phase 2: 2014-2015

Classroom transitions, K-12
- Map scope and sequence
- Incorporate Engineering Practices

Shifts in instruction
- Integrate the three Dimensions
- Focus on teaching through the Science and Engineering Practices
- Incorporate formative assessment tasks
- Continue to evaluate instructional resources using the EQuIP rubric

Identify possible policy changes to implement NGSS

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Phase 3: 2015-2016

Classroom transitions, K-12
- Refine scope and sequence
- Articulate Performance Expectations among grades and courses
- Refine formative assessment tasks
- Continue to evaluate, incorporate and refine instructional resources using the EQuIP rubric

Provide professional learning opportunities for teachers and administrators

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Phase 4: 2016-2017

Ongoing support of leadership network
- Professional learning
- Assessment development
  - Multistate consortium with NGSS states
  - State-level assessment system
- Data collection: courses, student achievement

Policy changes
- Course credit requirements
- Teacher evaluation

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Phase 5: 2017-2018

Full PreK-12 implementation

- Scope and sequence appropriate for all LEAs
- High school credit requirements in place
- Assessment system in place
- Instructional resources and strategies aligned with NGSS
- Professional learning for pre-service and new teachers
- Data reporting, storage and retrieval system in place

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Outcomes

- Explained the reasons for building new science standards.
- Described the process and timeline for constructing the Framework and the NGSS.
- Described the structure of a standard within NGSS.
- Discussed the implications of the “shifts” in NGSS for teaching and learning.
- Examined instructional strategies that reflect the intent of NGSS.

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Exit Slip

- Write a message that describe the implications of the NGSS for teaching and learning in YOUR classroom.
  - Tweet
  - Message
  - Facebook

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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/

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Next Generation Science Standards
www.nextgenscience.org

National Academy of Sciences
http://sites.nationalacademies.org/dbasse/bose/framework_k12_science/index.htm

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