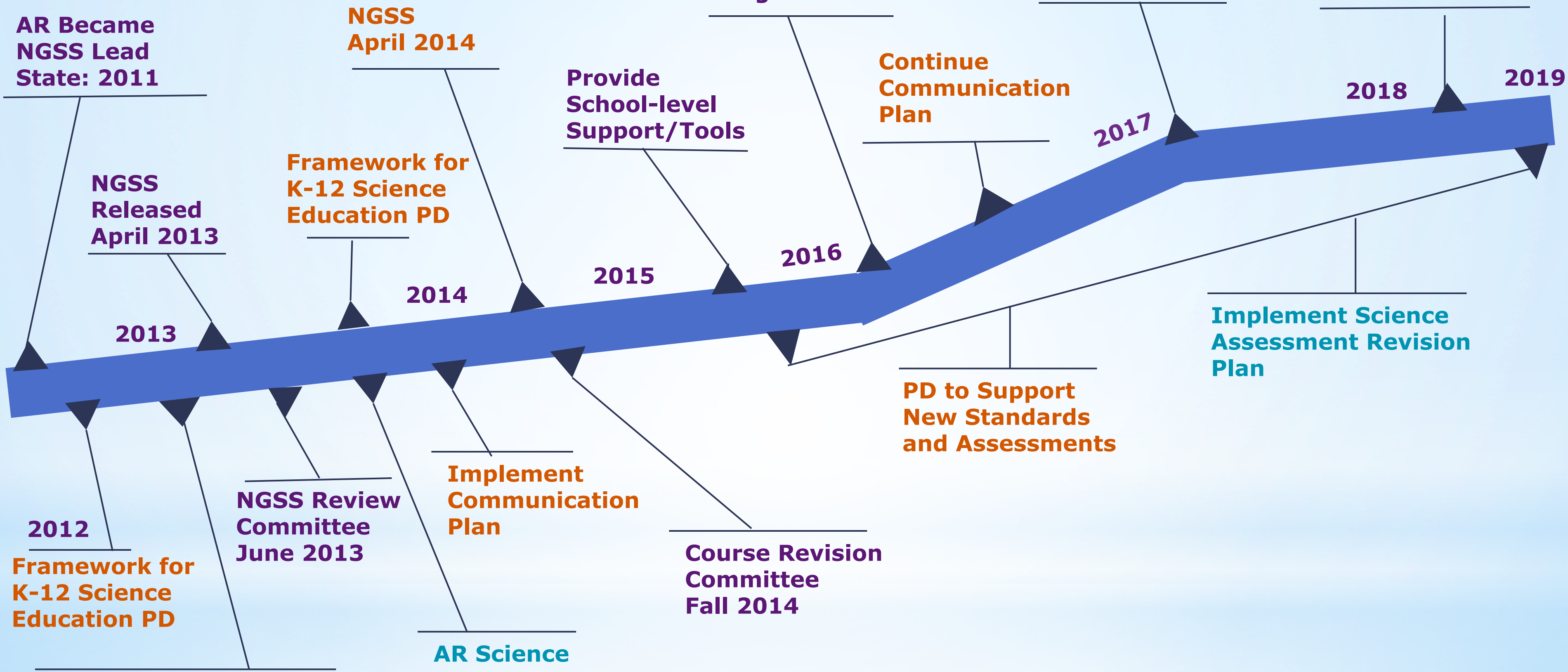
Arkansas Department of Education
Leadership Support Service

Planning for New Science Standards 2014

- Better understand the NRC *Framework* that the NGSS were based upon and the three domains of Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts.
- Be able to successfully navigate and read the NRC *Framework* as well as the Next Generation Science Standards
- Be able to better support students independent participation in Science and Engineering Practices
- Be able to identify and better integrate Crosscutting Concepts into current curriculum

Goals and Housekeeping

Science Standards Timeline



2013

AR Became NGSS Lead State: 2011

NGSS Released April 2013

2012 Framework for K-12 Science Education PD

Curriculum and Instruction Aligned to AR Framework

NGSS Review Committee June 2013

2014

SBE Endorses NGSS April 2014

Framework for K-12 Science Education PD

AR Science Assessments Continue

Implement Communication Plan

Course Revision Committee Fall 2014

2015

Provide School-level Support/Tools

2016

Implementation Grades K–4 August 2016

Continue Communication Plan

PD to Support New Standards and Assessments

2017

Implementation Grades 5-8 August 2017

Implement Science Assessment Revision Plan

2018

Implementation High School August 2018

Assessment **Curriculum and Instruction** **Professional Development**

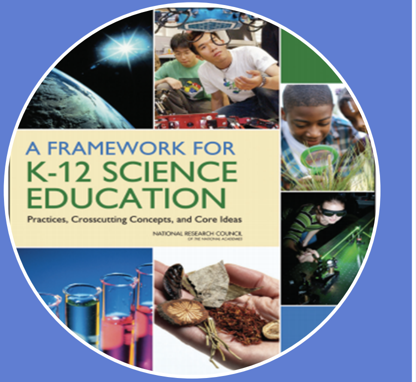
Next Steps in Arkansas

NGSS

Endorsed by SBE. AR K-12 Science Standards will be Written

LEADERSHIP SUPPORT SERVICE

Continue to teach the Arkansas Science Curriculum Framework



A FRAMEWORK FOR K-12 SCIENCE EDUCATION

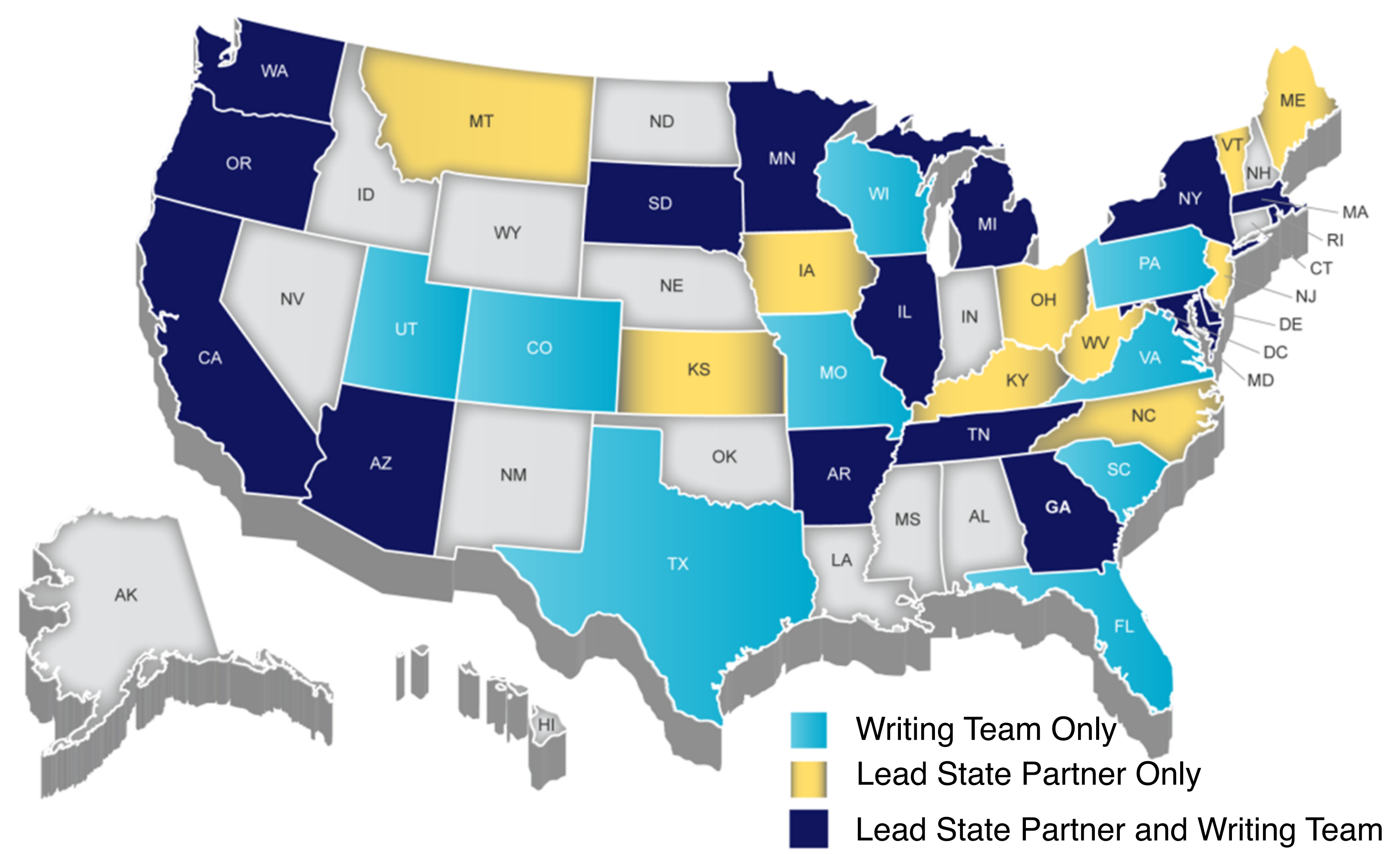
Practices, Crosscutting Concepts, and Core Ideas

NATIONAL RESEARCH COUNCIL

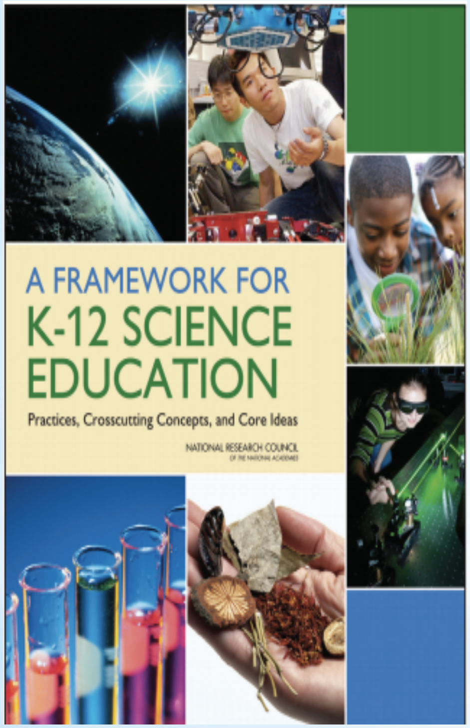
Become familiar with the Practices and Crosscutting Concepts - NGSS@NSTA and ADE 2 Day PD

Begin to incorporate the Practices and Crosscutting Concepts into your curriculum

How was Arkansas Involved in the development of the NGSS?



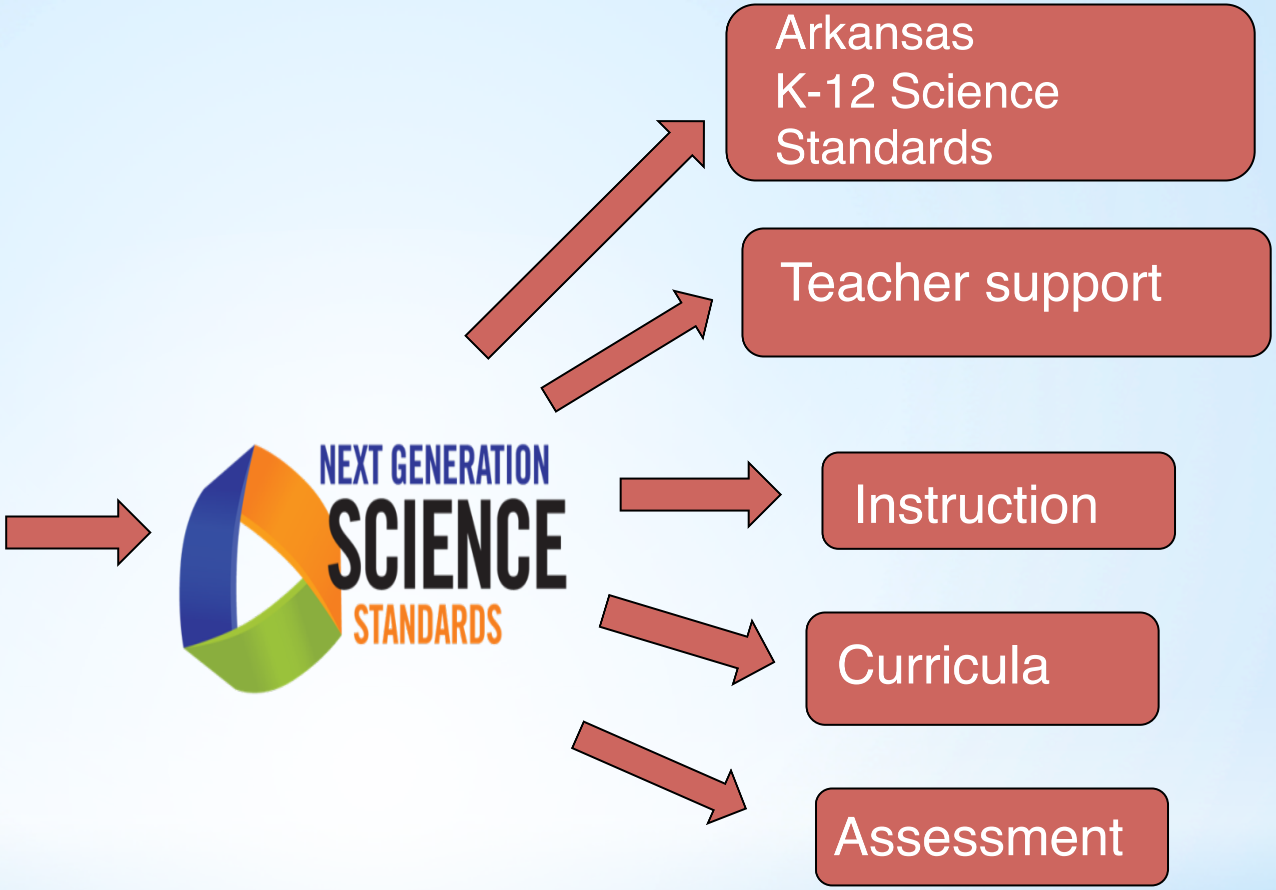
Transitions in Science Education



A FRAMEWORK FOR
K-12 SCIENCE
EDUCATION

Practices, Crosscutting Concepts, and Core Ideas

NATIONAL RESEARCH COUNCIL



NEXT GENERATION
SCIENCE
STANDARDS

Arkansas
K-12 Science
Standards

Teacher support

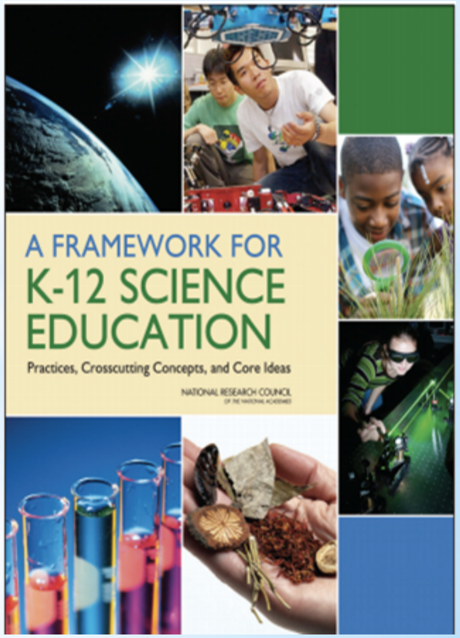
Instruction

Curricula

Assessment

Students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.

A Vision for K-12 Science Education



A FRAMEWORK FOR
K-12 SCIENCE
EDUCATION

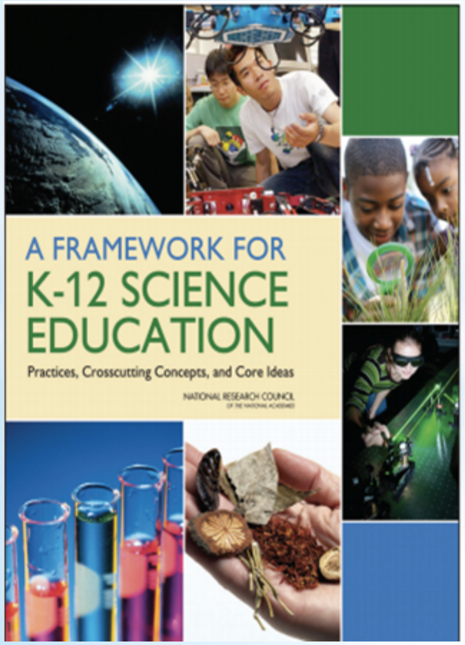
Practices, Crosscutting Concepts, and Core Ideas

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

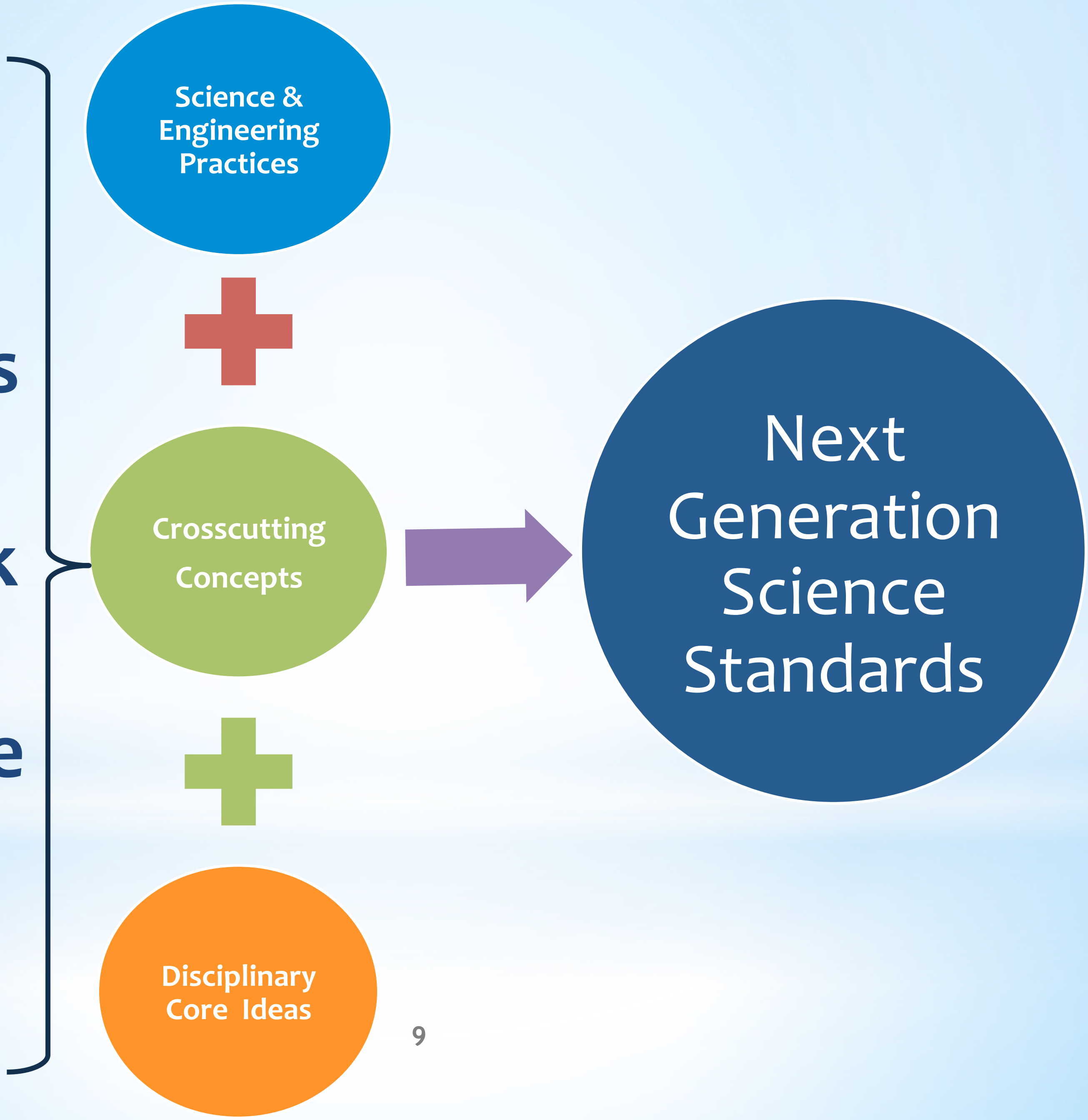
Goals for K-12 Science Education

The main goal of the Framework is to ensure that by the end of high school all students have some appreciation of science, the ability to discuss and think critically about science-related issues, and the skills to pursue careers in science or engineering.

~Brian Reiser (2011)



Three Dimensions of the Framework for K-12 Science Education



Science & Engineering Practices

+

Crosscutting Concepts

+

Disciplinary Core Ideas

→

Next Generation Science Standards

NGSS is Different

NEXT GENERATION SCIENCE STANDARDS
For States, By States

- Standards expressed as Performance Expectations.
- Combine core ideas, practices, and crosscutting concepts into a single statement of ***what is to be assessed***.
- Performance Expectations are not instructional strategies or objectives for a lesson.

Disciplinary
Core
Ideas

K-12 Core Ideas

- Physical Sciences
- Life Sciences
- Earth and Space Sciences
- Engineering, Technology, and Applications of Science

NGSS Matrix Organized by Disciplinary Core Ideas

NGSS@NSTA
STEM STARTS HERE
ngss.org/ngss

		Life Science	Earth & Space Science	Physical Science	Engineering
Elementary School	K	K-LS1 From Molecules to Organisms: Structures and Processes	K-ESS2 Earth's Systems K-ESS3 Earth and Human Activity	K-PS2 Motion and Stability: Forces and Interactions K-PS3 Energy	K-2-ETS1 Engineering Design
	1	1-LS1 From Molecules to Organisms: Structures and Processes 1-LS3 Heredity: Inheritance and Variation of Traits	1-ESS1 Earth's Place in the Universe	1-PS4 Waves and Their Applications in Technologies for Information Transfer	
	2	2-LS2 Ecosystems: Interactions, Energy, and Dynamics 2-LS4 Biological Evolution: Unity and Diversity	2-ESS1 Earth's Place in the Universe 2-ESS2 Earth's Systems	2-PS1 Matter and Its Interactions	
	3	3-LS1 From Molecules to Organisms: Structures and Processes 3-LS2 Ecosystems: Interactions, Energy, and Dynamics 3-LS3 Heredity: Inheritance and Variation of Traits 3-LS4 Biological Evolution: Unity and Diversity	3-ESS2 Earth's Systems 3-ESS3 Earth and Human Activity	3-PS2 Motion and Stability: Forces and Interactions	3-5-ETS1 Engineering Design
	4	4-LS1 From Molecules to Organisms: Structures and Processes	4-ESS1 Earth's Place in the Universe 4-ESS2 Earth's Systems 4-ESS3 Earth and Human Activity	4-PS3 Energy 4-PS4 Waves and Their Applications in Technologies for Information Transfer	
	5	5-LS1 From Molecules to Organisms: Structures and Processes 5-LS2 Ecosystems: Interactions, Energy, and Dynamics	5-ESS1 Earth's Place in the Universe 5-ESS2 Earth's Systems 5-ESS3 Earth and Human Activity	5-PS1 Matter and Its Interactions 5-PS2 Motion and Stability: Forces and Interactions 5-PS3 Energy	
Middle		MS-LS1 From Molecules to Organisms: Structures and Processes MS-LS2 Ecosystems: Interactions, Energy, and Dynamics MS-LS3 Heredity: Inheritance and Variation of Traits MS-LS4 Biological Evolution: Unity and Diversity	MS-ESS1 Earth's Place in the Universe MS-ESS2 Earth's Systems MS-ESS3 Earth and Human Activity	MS-PS1 Matter and Its Interactions MS-PS2 Motion and Stability: Forces and Interactions MS-PS3 Energy HS-PS4 Waves and Their Applications in Technologies for Information Transfer	MS-ETS1 Engineering Design
High School		HS-LS1 From Molecules to Organisms: Structures and Processes HS-LS2 Ecosystems: Interactions, Energy, and Dynamics HS-LS3 Heredity: Inheritance and Variation of Traits HS-LS4 Biological Evolution: Unity and Diversity	HS-ESS1 Earth's Place in the Universe HS-ESS2 Earth's Systems HS-ESS3 Earth and Human Activity	HS-PS1 Matter and Its Interactions HS-PS2 Motion and Stability: Forces and Interactions HS-PS3 Energy HS-PS4 Waves and Their Applications in Technologies for Information Transfer	HS-ETS1 Engineering Design

Learning Progression of Ideas Across Time

ESS1.C The history of planet Earth

K-2

Some events on Earth occur very quickly; others can occur very slowly

Grade 3-5

Certain features on Earth can be used to order events that have occurred in a landscape

Grade 6-8

Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history

Grade 9-12

The rock record resulting from tectonic and other geoscience processes as well as objects from the solar system can provide evidence of Earth's early history and the relative ages of major geologic formations

Activity #1: Think-Pair-Share: “What is *Core Idea?*” [5 minutes]

Step 1 Choose one of the following:

- Neutralization / Chemical Reactions
- Wave Frequencies / Electromagnetic Radiation
- Earthquakes / Plate Tectonics
- Phenotype / Heredity

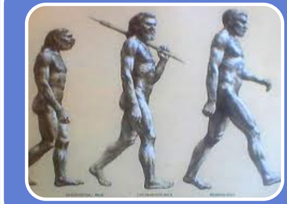
Step 2 Consider on your own: What are the differences between these two terms? Which is the core idea? Why?

Step 3 Share your ideas with your partner. How are your ideas similar? How are they different? Come to an agreement about which is the core idea and support your decision.

Some Big Shifts in the Core and Sub-Core Ideas

Earth and Human Activity

- Global Climate Change
- Human Impacts on Earth Systems



Biological Evolution: Unity and Diversity

- Evidence of Common Ancestry and Diversity
- Natural Selection

Waves and Their Applications in Technologies for Information Transfer

- Wave Properties
- Information Technologies and Instrumentation

Earth's Place in the Universe

- The Big Bang
- The History of Planet Earth

How well do you know your practices?

CCSS ELA, CCSS Math, and NGSS Practices

Science & Engineering Practices

Eight Practices - Appendix F

1. Asking questions (science) and defining problems (engineering)
2. Design and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Developing explanations (science) and designing solutions (engineering)
7. Engaging in argument
8. Obtaining, evaluating, and communicating information

Science &
Engineering
Practices

Eight Practices

- Note that in doing science or engineering, the practices are used iteratively and in combination; they are not linear steps to be taught in order

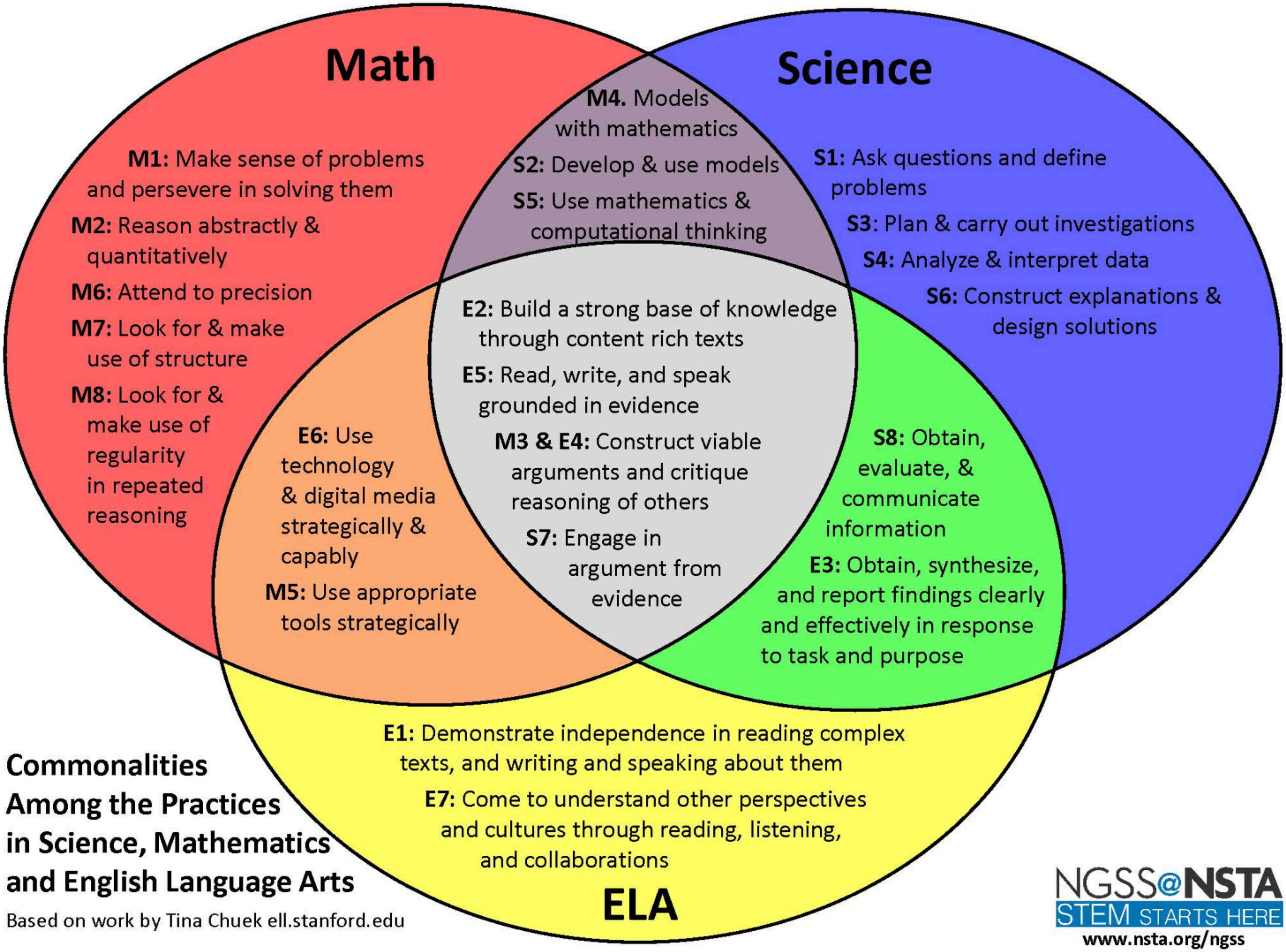
Arkansas Department of Education
Leadership Support Service

Analysis of ELA/Math/Science Practices

ELA Capacities	Mathematical Practices	Scientific and Engineering Practices
Demonstrate independence	Make sense of problems and persevere in solving them	Asking questions (for science) and defining problems (for engineering)
Build strong content knowledge	Reason abstractly and quantitatively	Developing and using models
Respond to the varying demands of audience, task, purpose, and discipline	Construct viable arguments and critique the reasoning of others	Planning and carrying out investigations
Comprehend as well as critique	Model with mathematics	Analyzing and interpreting data
Value evidence	Use appropriate tools strategically	Using mathematics, information and computer technology, and computational thinking
Use technology and digital media strategically and capably	Attend to precision	Constructing explanations (for science) and designing solutions (for engineering)
Come to understand other perspectives and cultures	Look for and make use of structure	Engaging in argument from evidence
	Look for and express regularity in repeated reasoning	Obtaining, evaluating, and communicating information

Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Chuek ell.stanford.edu



Math

M1: Make sense of problems and persevere in solving them

M2: Reason abstractly & quantitatively

M6: Attend to precision

M7: Look for & make use of structure

M8: Look for & make use of regularity in repeated reasoning

Science

S1: Ask questions and define problems

S3: Plan & carry out investigations

S4: Analyze & interpret data

S6: Construct explanations & design solutions

M4. Models with mathematics

S2: Develop & use models

S5: Use mathematics & computational thinking

E2: Build a strong base of knowledge through content rich texts

E5: Read, write, and speak grounded in evidence

M3 & E4: Construct viable arguments and critique reasoning of others

S7: Engage in argument from evidence

E6: Use technology & digital media strategically & capably

M5: Use appropriate tools strategically

S8: Obtain, evaluate, & communicate information

E3: Obtain, synthesize, and report findings clearly and effectively in response to task and purpose

E1: Demonstrate independence in reading complex texts, and writing and speaking about them

E7: Come to understand other perspectives and cultures through reading, listening, and collaborations

ELA

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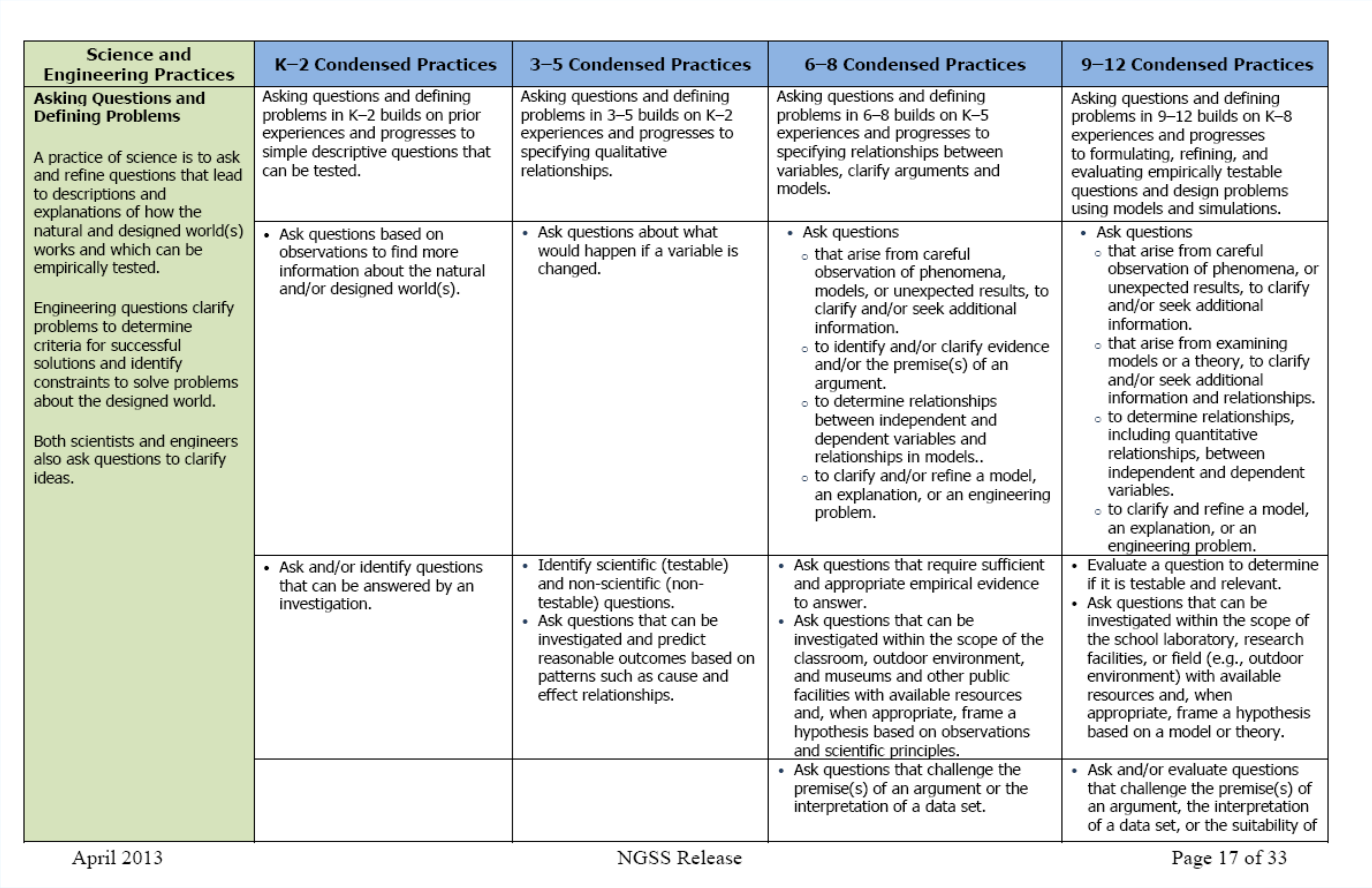
STEM STARTS HERE
www.nsta.org/ngss

Progression Appendix F: Asking Questions



Science and Engineering Practices	K–2 Condensed Practices	3–5 Condensed Practices	6–8 Condensed Practices	9–12 Condensed Practices
Asking Questions and Defining Problems A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested. Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. Both scientists and engineers also ask questions to clarify ideas.	Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.	Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.	Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, clarify arguments and models.	Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
	• Ask questions based on observations to find more information about the natural and/or designed world(s).	• Ask questions about what would happen if a variable is changed.	• Ask questions ◦ that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. ◦ to identify and/or clarify evidence and/or the premise(s) of an argument. ◦ to determine relationships between independent and dependent variables and relationships in models.. ◦ to clarify and/or refine a model, an explanation, or an engineering problem.	• Ask questions ◦ that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. ◦ that arise from examining models or a theory, to clarify and/or seek additional information and relationships. ◦ to determine relationships, including quantitative relationships, between independent and dependent variables. ◦ to clarify and refine a model, an explanation, or an engineering problem.
	• Ask and/or identify questions that can be answered by an investigation.	• Identify scientific (testable) and non-scientific (non-testable) questions. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.	• Ask questions that require sufficient and appropriate empirical evidence to answer. • Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.	• Evaluate a question to determine if it is testable and relevant. • Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory.
			• Ask questions that challenge the premise(s) of an argument or the interpretation of a data set.	• Ask and/or evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of

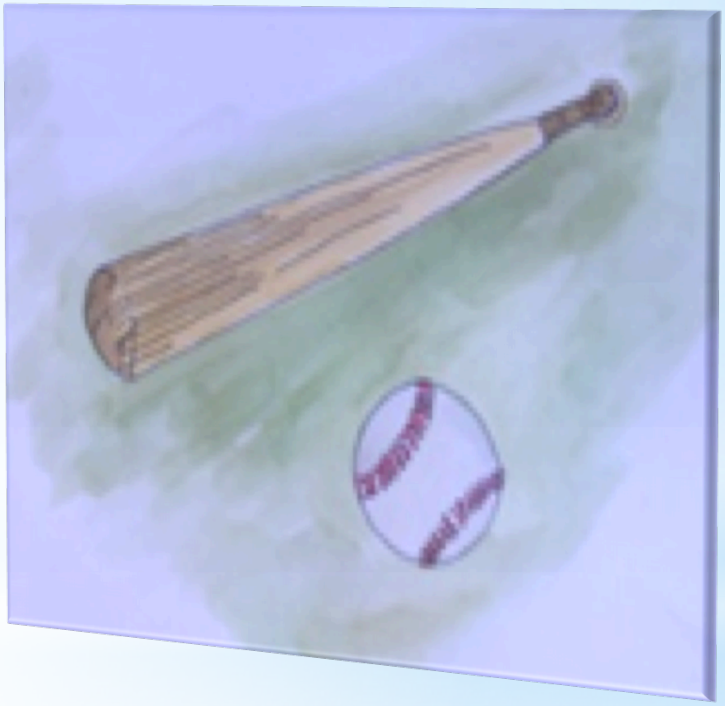
April 2013 NGSS Release Page 17 of 33

Crosscutting Concepts

Seven Crosscutting Concepts -Appendix G

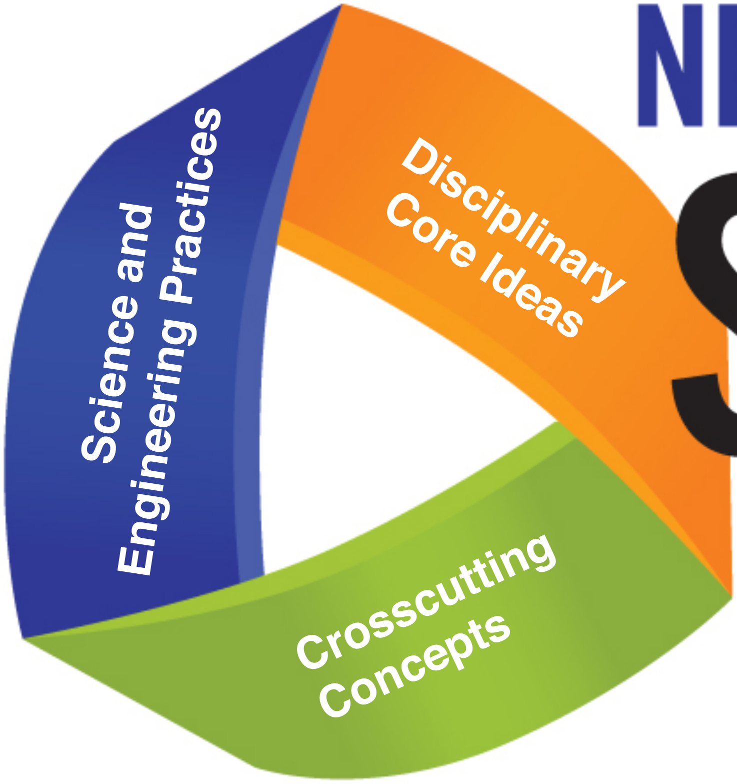
1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter: Flows, cycles, and conservation
6. Structure and function
7. Stability and change

- Helps students explicitly identify Crosscutting Concepts
- Gives students a visual way to recognize and work with the crosscutting concepts
- Allows students to focus on the "Big Ideas" in science



*CrossCutSymbols

http://crosscutsymbols.weebly.com/



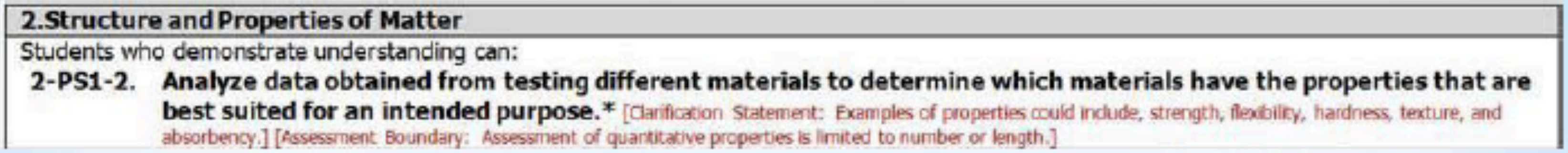
Science and Engineering Practices

Disciplinary Core Ideas

Crosscutting Concepts

NEXT GENERATION SCIENCE STANDARDS

Performance Expectation

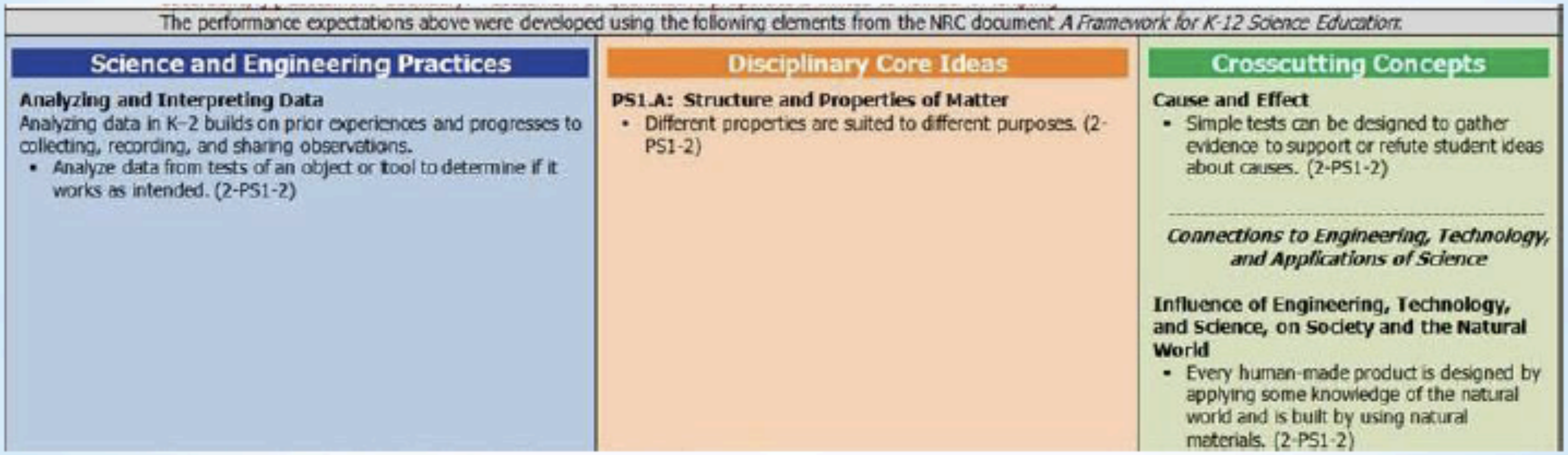


2.Structure and Properties of Matter

Students who demonstrate understanding can:

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.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative properties is limited to number or length.]

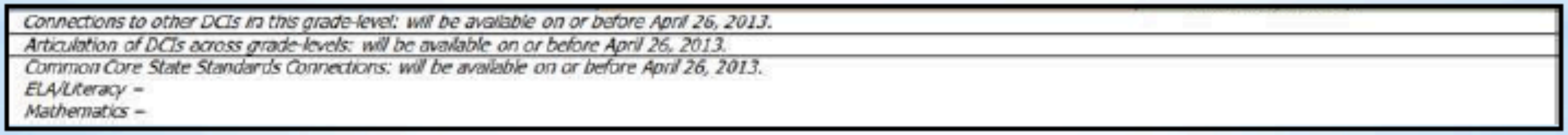
Foundation Boxes



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. - Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)	**PS1.A: Structure and Properties of Matter** - Different properties are suited to different purposes. (2-PS1-2)	**Cause and Effect** - Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science, on Society and the Natural World** - Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials. (2-PS1-2)

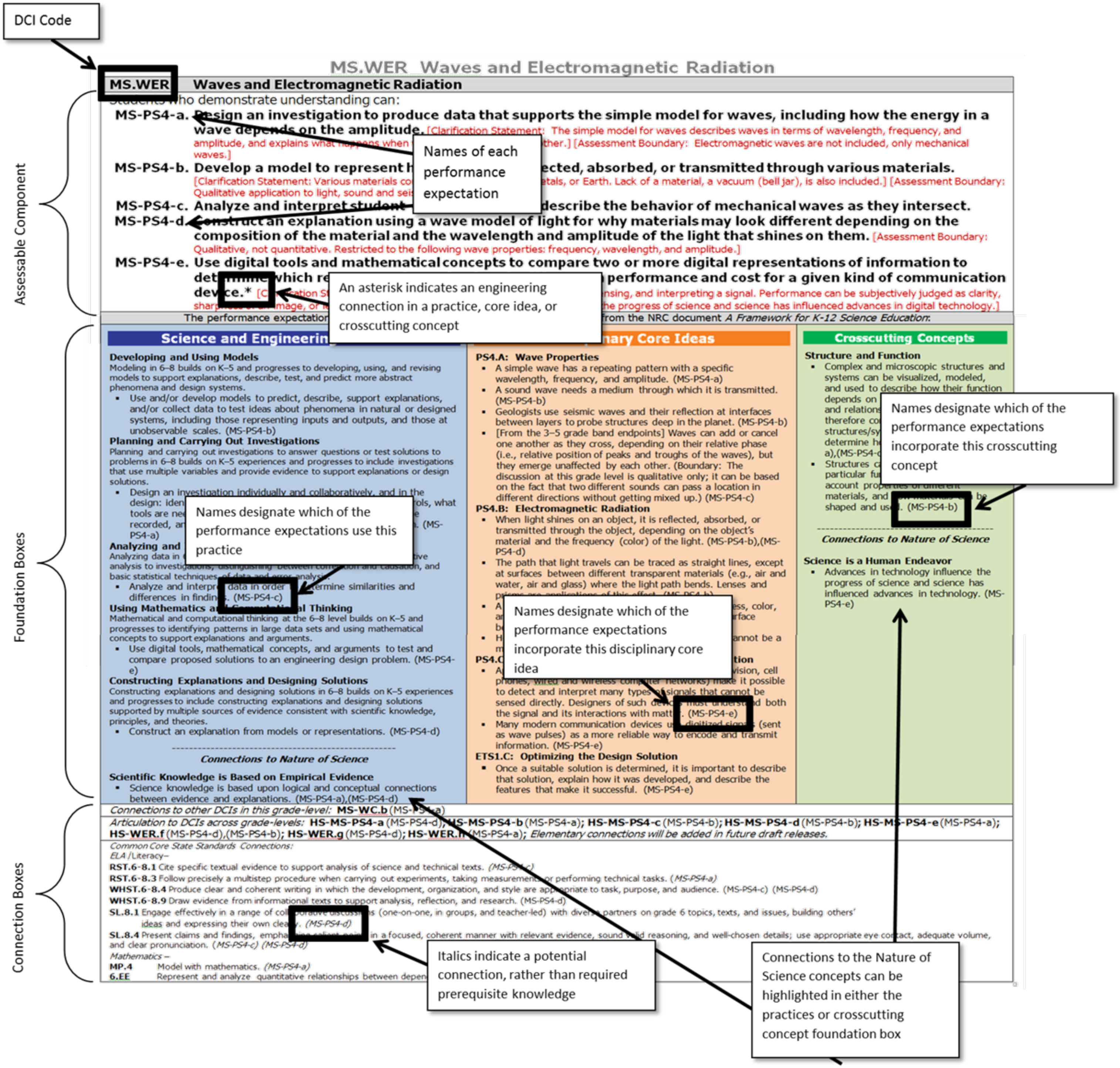
Connection Boxes



Connections to other DCIs in this grade-level: will be available on or before April 26, 2013.

Articulation of DCIs across grade-levels: will be available on or before April 26, 2013.

Common Core State Standards Connections: will be available on or before April 26, 2013.
ELA/Literacy –
Mathematics –



MS.WER Waves and Electromagnetic Radiation

MS.WER **Waves and Electromagnetic Radiation**

…who demonstrate understanding can:

MS-PS4-a. **…esign an investigation to produce data that supports the simple model for waves, including how the energy in a wave depends on the amplitude.** [Clarification Statement: The simple model for waves describes waves in terms of wavelength, frequency, and amplitude, and explains what happens when … …ther.] [Assessment Boundary: Electromagnetic waves are not included, only mechanical waves.]

MS-PS4-b. **Develop a model to represent h… …ected, absorbed, or transmitted through various materials.** [Clarification Statement: Various materials co… …tals, or Earth. Lack of a material, a vacuum (bell jar), is also included.] [Assessment Boundary: Qualitative application to light, sound and sei…

MS-PS4-c. **Analyze and interpret student… …describe the behavior of mechanical waves as they intersect.**

MS-PS4-d. **…onstruct an explanation using a wave model of light for why materials may look different depending on the composition of the material and the wavelength and amplitude of the light that shines on them.** [Assessment Boundary: Qualitative, not quantitative. Restricted to the following wave properties: frequency, wavelength, and amplitude.]

MS-PS4-e. **Use digital tools and mathematical concepts to compare two or more digital representations of information to det… which re… …performance and cost for a given kind of communication dev…ce.*** [C… …ation St… …nsing, and interpreting a signal. Performance can be subjectively judged as clarity, sharp… …mage, or … …he progress of science and science has influenced advances in digital technology.]

The performance expectation… …from the NRC document *A Framework for K-12 Science Education*.

Science and Engineerin…

Developing and Using Models
Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to support explanations, describe, test, and predict more abstract phenomena and design systems.

- Use and/or develop models to predict, describe, support explanations, and/or collect data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales. (MS-PS4-b)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

- Design an investigation individually and collaboratively, and in the design: iden… …ols, what tools are ne… …e recorded, a… …(MS-PS4-a)

Analyzing and …
Analyzing data in … …tive analysis to investig… …n, and basic statistical techniques…

- Analyze and interpr… data in order … …ermine similarities and differences in findin… (MS-PS4-c)

Using Mathematics a… …al Thinking
Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- Use digital tools, mathematical concepts, and arguments to test and compare proposed solutions to an engineering design problem. (MS-PS4-e)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct an explanation from models or representations. (MS-PS4-d)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS4-a),(MS-PS4-d)

…nary Core Ideas

PS4.A: Wave Properties

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-a)
- A sound wave needs a medium through which it is transmitted. (MS-PS4-b)
- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (MS-PS4-b)
- [From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (MS-PS4-c)

PS4.B: Electromagnetic Radiation

- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-b),(MS-PS4-d)
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. Lenses and pr… …(MS-PS4-b)
- A… …ess, color, a… …rface b…
- H… …annot be a m…

PS4.C… …tion

- A… …vision, cell phones, wired and wireless com… …networks) make it possible to detect and interpret many types … signals that cannot be sensed directly. Designers of such dev… …d both the signal and its interactions with matt… (MS-PS4-e)
- Many modern communication devices u… … (sent as wave pulses) as a more reliable way to encode and transmit information. (MS-PS4-e)

ETS1.C: Optimizing the Design Solution

- Once a suitable solution is determined, it is important to describe that solution, explain how it was developed, and describe the features that make it successful. (MS-PS4-e)

Crosscutting Concepts

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on … and relations… therefore co… structures/sy… determine h… a),(MS-PS4-…
- Structures c… particular fu… account prop… materials, and … be shaped and us… (MS-PS4-b)

Connections to Nature of Science

Science is a Human Endeavor

- Advances in technology influence the progress of science and science has influenced advances in technology. (MS-PS4-e)

Connections to other DCIs in this grade-level: **MS-WC.b** (MS-P…a)

Articulation to DCIs across grade-levels: **HS-MS-PS4-a** (MS-PS4-d); **…S-MS-PS4-b** (MS-PS4-a); **HS-MS-PS4-c** (MS-PS4-b); **HS-MS-PS4-d** (MS-PS4-b); **HS-M…-PS4-e** (MS-PS4-a); **HS-WER.f** (MS-PS4-d),(MS-PS4-b); **HS-WER.g** (MS-PS4-d); **HS-WER.…** (MS-PS4-a); *Elementary connections will be added in future draft releases.*

Common Core State Standards Connections:
ELA /Literacy–
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. *(MS-PS…c)*
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurement… or performing technical tasks. *(MS-PS4-a)*
WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are app…priate to task, purpose, and audience. (MS-PS4-c) (MS-PS4-d)
WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-d)
SL.8.1 Engage effectively in a range of col… …s (one-on-one, in groups, and teacher-led) with dive… partners on grade 6 topics, texts, and issues, building others' ideas and expressing their own clea… *(MS-PS4-d)*
SL.8.4 Present claims and findings, empha… …in a focused, coherent manner with relevant evidence, sound …lid reasoning, and well-chosen details; use appropriate eye co…tact, adequate volume, and clear pronunciation. *(MS-PS4-c) (MS-PS4-d)*
Mathematics –
MP.4 Model with mathematics. *(MS-PS4-a)*
6.EE Represent and analyze quantitative relationships between depen…

Three-Dimensional Learning

- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

Three-Dimensional Learning Dissected

MS-LS2-1 Analyze and interpret data to provide evidence for

the effects of

resource availability on organisms and populations of organisms in an ecosystem.

NGSS Dissection Activity

Divide into 5 groups

- Each group takes one PE
- Together the group Identifies and circles each
  - PE
  - Practice in the PE
  - DCI in the PE
  - CCC in the PE
  - Clarification statement
  - Assessment Boundary
  - All connections in Foundation Boxes
    - DCI
    - Practices
    - CCC
  - All connections to other DCIs in this grade band
  - All articulations across grade bands
  - All connections to CCSS for M and ELA

Discuss the richness of just one PE   Discuss the power of bundling PEs

Subtle Shifts Activity

Institute for Inquiry - Exploratorium

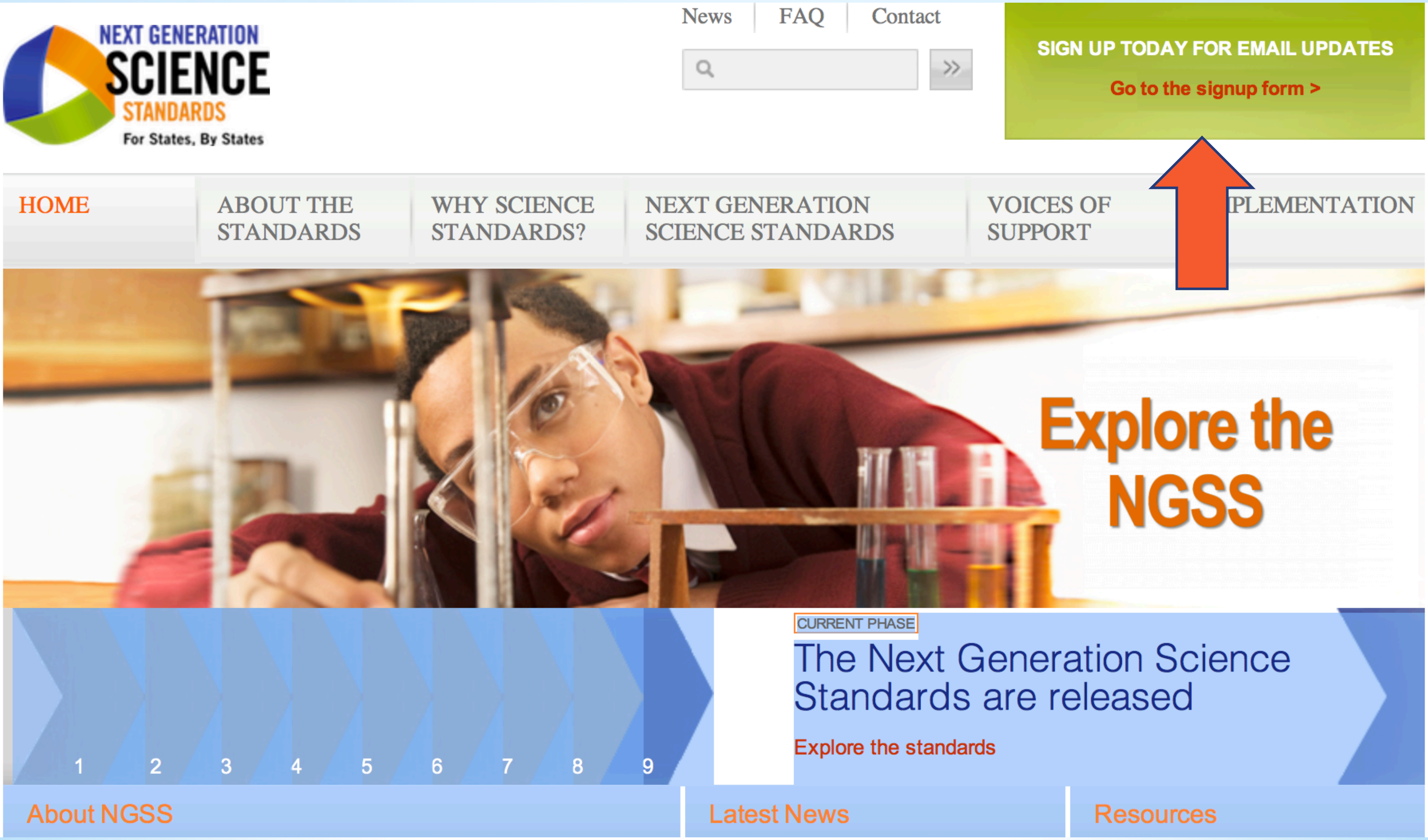
Take Home Messages from Subtle Shifts

- To help learners develop the abilities to do scientific inquiry, teachers need to give students responsibility for using science process skills and the Science and Engineering Practices (SEP).
- Teachers can make small shifts in existing activities to help learners strengthen the skills and practices needed for scientific inquiry.
- Lessons can be modified in specific ways to achieve particular purposes.

- Participate in a Shifted Activity (20 minutes)
- Share Observations (5 minutes)
- Compare Shifted and Unshifted activities to identify shifts and benefits (20 minutes)
- Measuring Shadows: Making your own shifts (15 minutes)
- Share out and debrief (15 minutes)

*Subtle Shifts

http://www.nextgenscience.org



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PLEMENTATION

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CURRENT PHASE

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About NGSS
Latest News
Resources

Transitioning

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Choose one NGSS Performance Expectation that you plan to explicitly incorporate into your curriculum and answer the following questions in writing:

- Which PE did you choose?
- Why did you select that PE?
- Identify the practice and crosscutting concept from the PE.
- Describe specific examples of how you can incorporate the same crosscutting concept and practice into your curriculum in other ways.
- Share your plan with your group.

The intent of the Framework is to change how we teach science so that it is more like how scientists work.

- How does this compare to your current teaching practice?
- What shifts will be necessary in your instruction or curriculum?
- What questions do you have?

Your Thoughts

*Survey