



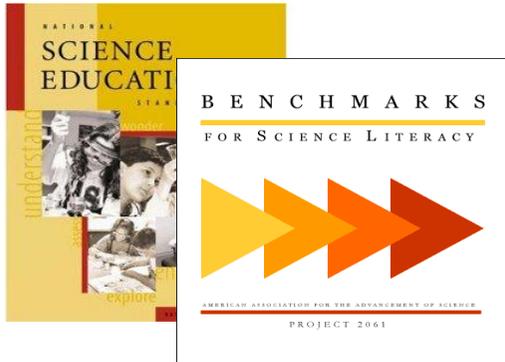
**NEXT GENERATION**

**SCIENCE**

**STANDARDS**

**For States, By States**

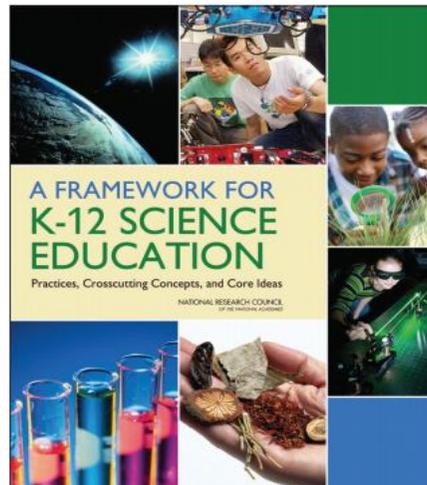
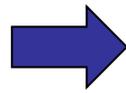
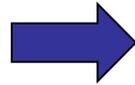
# Building on the Past; Preparing for the Future



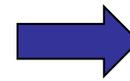
1990s

Phase I

Phase II

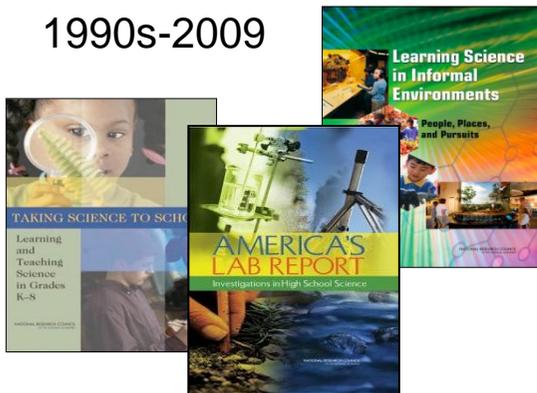


1/2010 - 7/2011



7/2011 – April 2013

1990s-2009



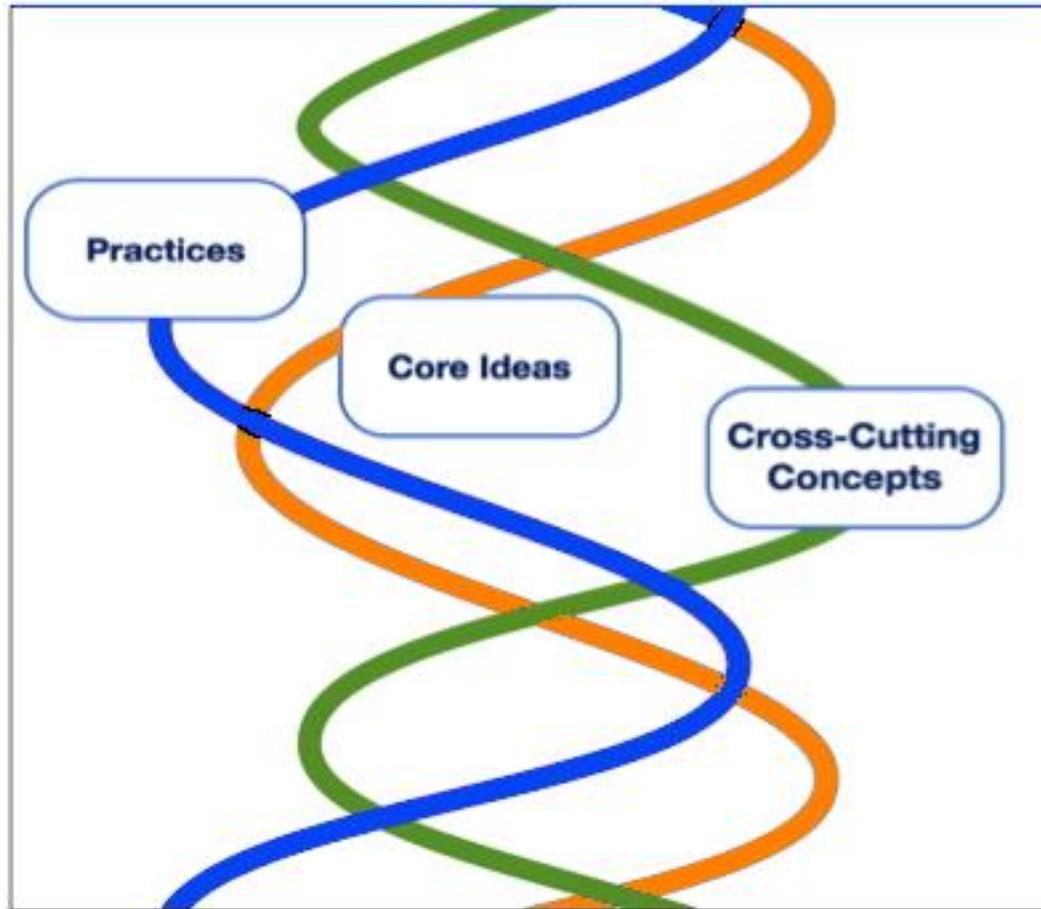


# Conceptual Shifts in the Next Generation Science Standards



**Interconnected Nature of  
Science as it is Practiced and  
Experienced in the Real World**

# Three Dimensions Intertwined



- The NGSS are written as Performance Expectations
- NGSS will require contextual application of the three dimensions by students.
- Focus is on how and why as well as what

# Weaving Practices with Content – Not Just the NGSS

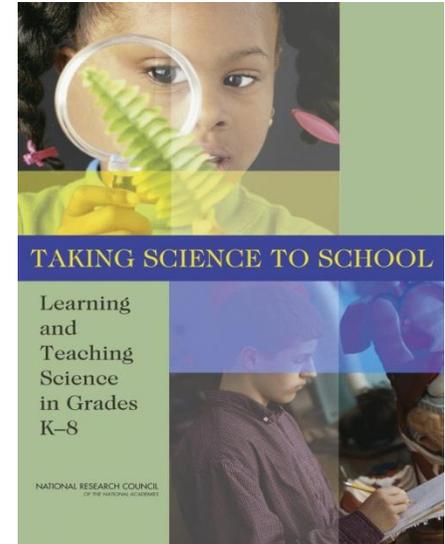
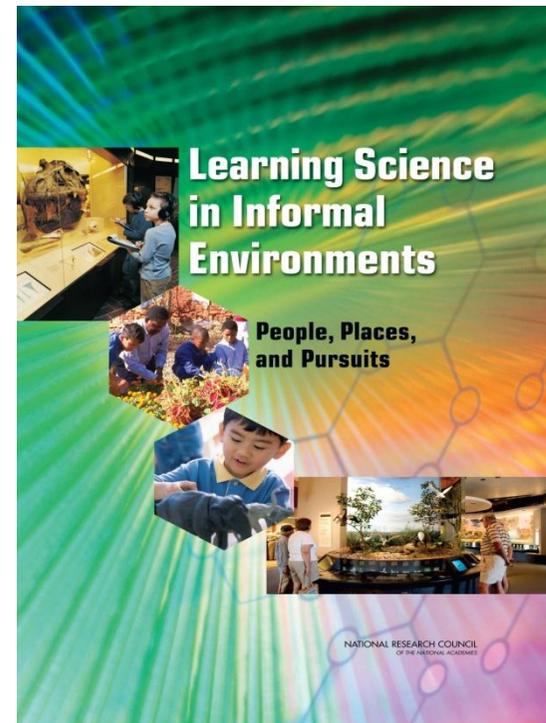
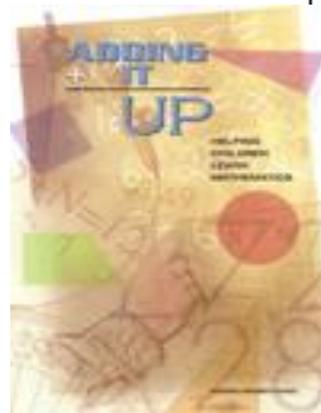
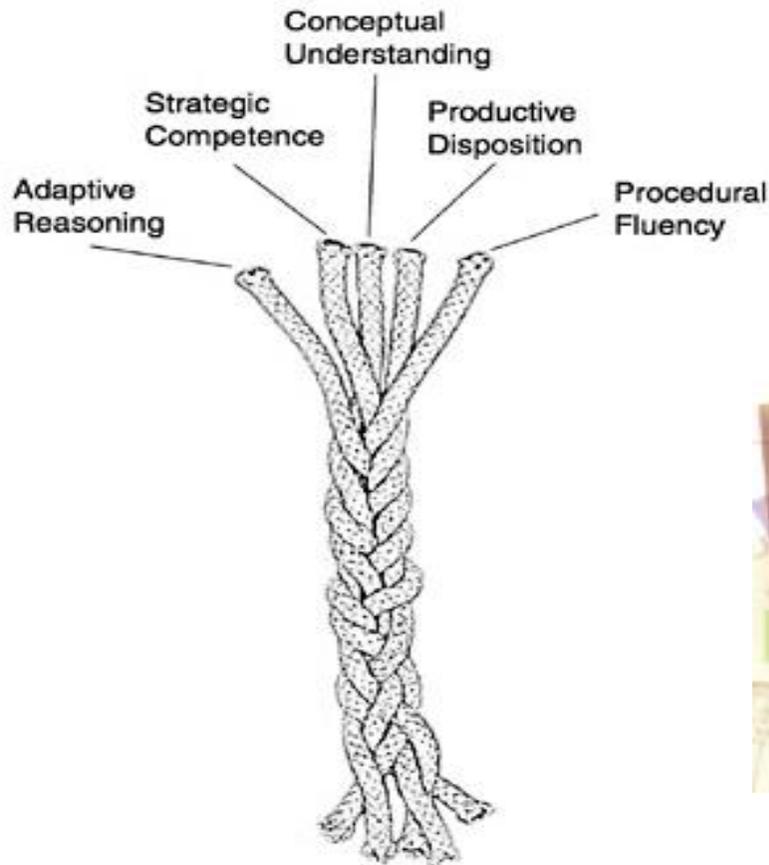


- K-12 Science Education Framework
- New Advanced Placement Coursework and Assessment
- PISA 2015
- Vision and Change in Undergraduate Biology
- A New Biology for the 21<sup>st</sup> Century
- Scientific Foundations for Future Physicians

# How do we know this approach works?



## Box 4-1 Intertwined Strands of Proficiency



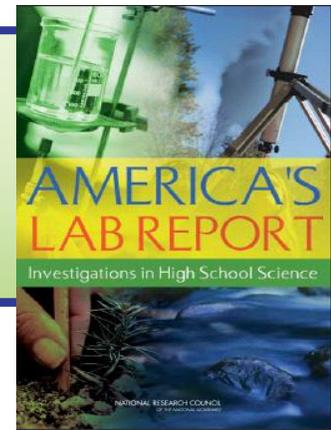
4 strands

Motivation and Engagement

6 strands – incorporates affective domain



# Goals of Laboratory Experiences based on ALR Findings



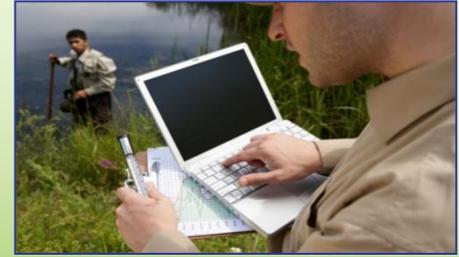
- Mastery of subject matter.
- Developing scientific reasoning.
- Understanding the complexity and ambiguity of empirical work.
- Developing practical skills.
- Interest in science and science learning.

Currently, research indicates significant numbers of students do not have quality opportunities to engage in science and engineering practices



**Student performance  
expectations – NOT curriculum**

# Describe Achievement, Not Instruction



- Standards articulate a clear vision of the learning goals for students
- Standards articulate the student performance at the conclusion of instruction
- Standards are NOT a description of curriculum.
- Standards do NOT dictate instruction.

# Instruction Builds Toward PEs



## Performance Expectation



**MS-PS1-4** *Develop a model that predicts and describes changes in atomic motion, temperature and state of a pure substance when thermal energy is added or removed.*

**MS-PS3-5.** *Construct, use, and present arguments to support the claim that when the motion energy of an object changes energy is transferred to or from the object.*

### Developing and Using Models

Students revise models.

MS-PS1 - The changes of state that occur with variations in pressure can be described and predicted.

*Apply understanding of internal and external pressure*

### Developing and Using Models

Students decide on one model to explain why the tanker imploded.

MS-PS1 - ...in a gas, they are widely spaced except when they happen to collide.

*Drawings included molecules and force arrows.*

### Obtaining, evaluating, and communicating information

Students evaluate a video that shows a tanker dramatically imploding the day after being washed out with steam and then all the outlet valves were closed.

MS-PS1 - ...in a gas, they are widely spaced except when they happen to collide.

The changes of state that occur with variations in pressure can be described.

*Students discuss spacing of molecules during liquid and gas phase of water.*

Cause and Effect

Matter and Energy

**MS-PS1-4** *Develop a model that predicts and describes changes in atomic motion, temperature and state of a pure substance when thermal energy is added or removed.*

**MS-PS3-5.** *Construct, use, and present arguments to support the claim that when the motion energy of an object changes energy is transferred to or from the object.*

### Engaging in Argument from Evidence

Students engage in argument about their ideas of why blimps have ballonets filled with air.

### Constructing Explanations

Students translate the data into evidence from the investigations to construct an explanation of the tanker implosion.

### Planning and carrying out investigations

Students refined their models by planning and carrying out an investigation using the collapsing can to evaluate different variables.

MS-PS1 - ...in a gas, they are widely spaced except when they happen to collide.

MS-PS1 - The changes of state that occur with variations in temperature or pressure can be described and predicted.

MS-PS3 - Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.

*Students can use their conceptual model to describe changes in temperature and pressure in terms of space between and motion of gaseous molecules .*

MS-PS1 - The changes of state that occur with variations in temperature or pressure can be described and predicted.

MS-PS3 - Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.

*Investigations result in evaluation of relationship between temperature, pressure, spacing of molecules. Students can clearly illustrate the movement of energy within the total system.*

Cause and Effect

Matter and Energy



**Science concepts build  
coherently across K-12**

# Disciplinary Core Ideas Progressing to Understanding



	K-2	3-5	6-8	9-12
PS1.A Structure of matter	<p>Objects can be built up from smaller parts. Matter exists as different substances that have observable different properties. Different properties are suited to different purposes.</p>	<p>Because matter exists as particles that are too small to see, matter is always conserved even if it seems to disappear, Measurements of a variety of observable properties can be used to identify particular substances.</p>	<p>The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.</p>	<p>The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter, including chemical reactions. Repeating patterns of the periodic table reflect patterns of outer electrons. A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.</p>

# Building Understanding in Middle School – Concept Bundling



## Matter and Its Interactions

The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter.

Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

- Within this DCI, 4 of the 8 Practices are highlighted. For instruction, additional practices would be used to build toward these understandings.

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.\*

# Scientific and Engineering Practices



Grades K-2	Grades 3-5	Grades 6-8	Grades 9-12
<p>Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"> <li>• Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).</li> </ul>	<p>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> <li>• Develop and/or use models to describe and/or predict phenomena.</li> </ul>	<p>Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.</p> <ul style="list-style-type: none"> <li>• Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.</li> </ul>	<p>Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.</p> <ul style="list-style-type: none"> <li>• Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.</li> </ul>

# Crosscutting Concepts



Grades K-2	Grades 3-5	Grades 6-8	Grades 9-12
<p>Students recognize that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</p>	<p>Students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.</p>	<p>Students recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships, and use graphs and charts to identify patterns in data.</p>	<p>Students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.</p>



**Deeper Understanding of  
Content as well as Application of  
Content**

# The Earth-Sun-Moon System Example

## Current State Standards



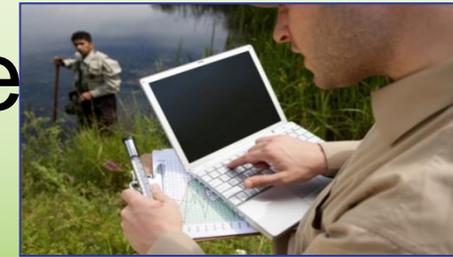
### Existing State Standard – Grade 3

- Students know the way in which the Moon's appearance changes during the four-week lunar cycle.
- Students know that Earth is one of several planets that orbit the Sun and that the Moon orbits Earth.

### Existing State Standard – Grade 5

- Students know the solar system includes the planet Earth, the Moon, the Sun, eight other planets and their satellites, and smaller objects, such as asteroids and comets.

# The Earth-Sun-Moon System Example Next Generation Science Standards



## 1-ESS1 Earth's Place in the Universe

### 1-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

- 1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.** [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]

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

##### 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. (1-ESS1-1)

#### Disciplinary Core Ideas

##### ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)

#### Crosscutting Concepts

##### Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1), (1-ESS1-2)

## 5-ESS1 Earth's Place in the Universe

### 5-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

- 5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

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

##### Analyzing and Interpreting Data

Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.

- Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)

#### Disciplinary Core Ideas

##### ESS1.B: Earth and the Solar System

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)

#### Crosscutting Concepts

##### Patterns

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)

# The Earth-Sun-Moon System Example Next Generation Science Standards (cont)



## MS-ESS1 Earth's Place in the Universe

### MS-ESS1 Earth's Place in the Universe

Students who demonstrate understanding can:

**MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** *[Clarification Statement: Examples of models can be physical, graphical, or conceptual.]*

*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

##### Developing and Using Models

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

- Develop and use a model to describe phenomena. (MS-ESS1-1)

#### Disciplinary Core Ideas

##### ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)

##### ESS1.B: Earth and the Solar System

- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)

#### Crosscutting Concepts

##### Patterns

- Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1)

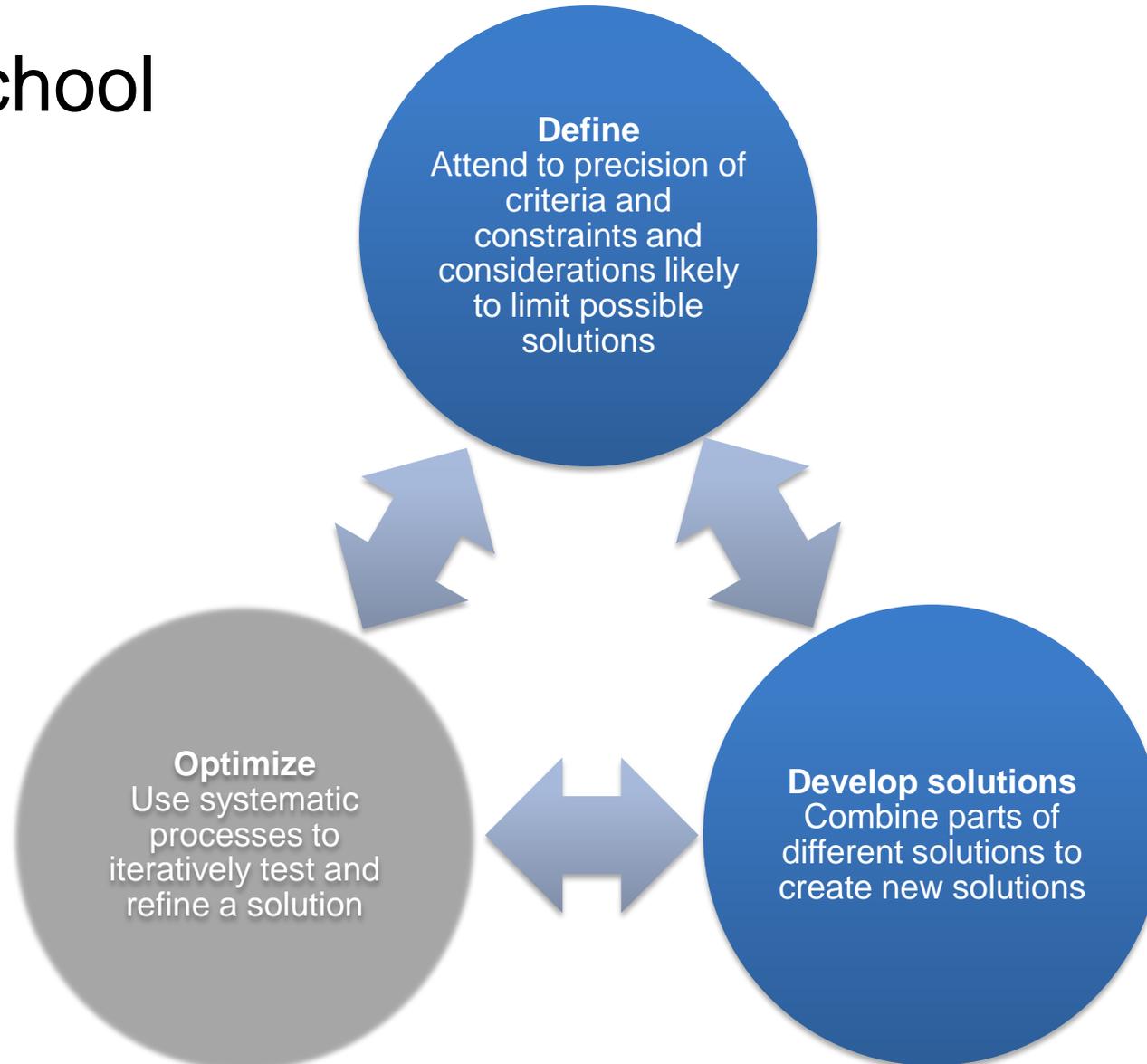


**Science and Engineering are  
Integrated**

# Engineering Design and the NGSS



## Middle School





**Prepare students for college,  
career, and citizenship**

# Preparing ALL Students for ALL Opportunities



- Understanding science is key to comprehending current events, choosing and using technology, or making informed decisions.
- Science is also at the heart of the United States' ability to continue to innovate, lead, and create the jobs of the future.
- All students no matter what their future education and career path must have a solid K–12 science education in order to be prepared for college, careers, and citizenship.
- The NGSS were reviewed by a large number of college and university instructors as well as employers to ensure the content properly prepared students for success in college and careers.



**NGSS and Common Core State  
Standards are Aligned**

# MATH

**M1.** Make sense of problems & persevere in solving them

M6. Attend to precision

M7. Look for & make use of structure

M8. Look for & express regularity in repeated reasoning

**S2.** Develop and use models

**S5.** Use mathematics & computational thinking

**M4.** Model with mathematics

**E2.** Build strong content knowledge

**E4.** Comprehend as well as critique

**E5.** Value evidence

**M2.** Reason abstractly & quantitatively

**M3.** Construct viable argument & critique reasoning of others

**S7.** Engage in argument from evidence

**S6.** Construct explanations & design solutions

**S8.** Obtain, evaluate & communicate information

**E6.** Use technology & digital media strategically & capably

**M5.** Use appropriate tools strategically

**E1.** Demonstrate independence

**E3.** Respond to the varying demands of audience, talk, purpose, & discipline

**E7.** Come to understand other perspectives & cultures

**S1.** Ask questions & define problems

**S3.** Plan & carry out investigations

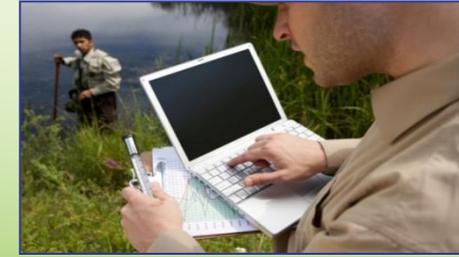
**S4.** Analyze & interpret data

# SCIENCE

# ELA

Source: Working Draft v2, 12-06-11 by Tina Cheuk, [ell.stanford.edu](http://ell.stanford.edu)

# Appendix L: Connections to Common Core Mathematics



## MS-PS3 Energy

As part of this work, teachers should give students opportunities to **work with ratios and proportional relationships and basic statistics**:

Ratios and Proportional Relationships (6–7.RP) and Functions (8.F). Science examples: (1) Analyze an idealized set of bivariate measurement data for kinetic energy vs. mass (holding speed constant). Decide whether the two quantities are in a proportional relationship, e.g., by testing for equivalent ratios or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. (2) Do the same for an idealized set of data for kinetic energy vs. speed (holding mass constant). (For Grade 8: Recognize from the data that the relationship is not proportional; that kinetic energy is a nonlinear function of speed. Draw conclusions such as that doubling the speed more than doubles the kinetic energy. What are some possible implications for driving safety? (see figure))

A graphic with a black background. In the center is a child's face split vertically down the middle. The left side is a grey skull, and the right side is a living child's face. To the left of the face, the text reads: "Hit at 40mph there's a 70% chance I'll die." To the right, it reads: "Hit at 30mph there's an 80% chance I'll live." Below the skull side, it says "Approximate figures". At the bottom right, there is a "SPEED LIMIT 30" sign and a "DON'T DRINK AND DRIVE" logo.

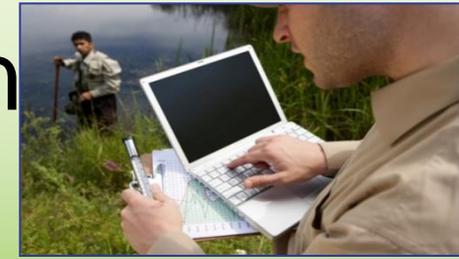
Hit at 40mph  
there's a 70%  
chance I'll die.

Hit at 30mph  
there's an 80%  
chance I'll live.

That's why it's  

Approximate figures

# Appendix M: Connections to Common Core English Language Arts



## Science and Engineering Practice 7: Engaging in Argument from Evidence

The study of science and engineering should produce a sense of the process of argument necessary for advancing and defending a new idea or an explanation of a phenomenon and the norms for conducting such arguments. In that spirit, students should argue for the explanations they construct, defend their interpretations of the associated data, and advocate for the designs they propose. (NRC Framework, 2012, p. 73)

### Supporting CCSS Literacy Anchor Standards and Relevant Portions of the Corresponding Standards for Science and Technical Subjects

### Connection to Science and Engineering Practice

**CCR Reading Anchor #8:** Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

- **RST.6-8.8:** "Distinguish among facts, reasoned judgment based on research findings, and speculation..."
- **RST.9-10.8:** "Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem."
- **RST.11-12.8:** "Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information."

Formulating the best explanation or solution to a problem or phenomenon stems from advancing an argument whose premises are rational and supported with evidence. Reading standard 8 emphasizes evaluating the validity of arguments and whether the evidence offered backs up the claim logically.



**Putting it all together**

# More Bundling



## Instructional/Assessment Task: Ecosystem Balance

LS2: Ecosystems  
ESS3: Earth and Human Activity  
ETS1: Engineering Design

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

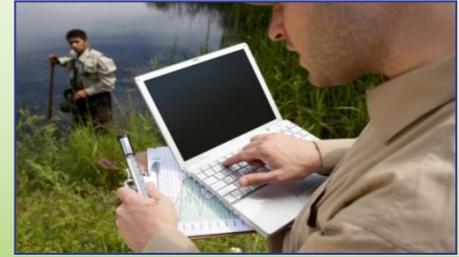
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.\*

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.\*

HS-ETS1-3. Evaluate a solution to a complex real-world problem-based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

# Lake Algae



On June 1, a fictitious fast growing species of algae is accidentally introduced into a lake in a city park. It starts to grow and cover the surface of the lake in such a way that the area covered by the algae doubles every day. If it continues to grow unabated, the lake will be totally covered and the fish in the lake will suffocate. At the rate it is growing, this will happen on June 30.

- a. When will the lake be covered half-way?
- b. On June 26, a pedestrian who walks by the lake every day warns that the lake will be completely covered soon. Her friend just laughs. Why might her friend be skeptical of the warning?

# Lake Algae



- c. On June 29, a clean-up crew arrives at the lake and removes almost all of the algae. When they are done, only 1% of the surface is covered with algae. How well does this solve the problem of the algae in the lake? Include a description of the criteria and trade-offs that account for reliability and environmental impacts.
- d. Write an equation that represents the percentage of the surface area of the lake that is covered in algae as a function of time (in days) that passes since the algae was introduced into the lake. Fully explain the equation and your justifications for the relationships expressed in the equation.

# Lake Algae



- e. Using the available data, construct an argument that supports or refutes the problem's claim that the fish will suffocate if the algae species is allowed to grow unabated. Your argument should use evidence regarding carry capacity, resource availability and other environmental factors specifically including competition for resources and the effect on the stability of the ecosystem.
- f. Given the disturbance created by the algae, design a solution to ensure the stability of the lake ecosystem. Be sure to include claims with supporting evidence as to the time needed to return the lake to a stable state and an analysis to reduce the impact of human intervention on the ecosystem. The design should be fully supported in a written report or oral presentation.

# HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

## HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

- HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.** [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and, extreme changes, such as volcanic eruption or sea level rise.]

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

#### Engaging in Argument from Evidence

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)

*In this case,*

- Students will use the mathematical model to coherently support the claim regarding the algae coverage*
- The argument should include criteria and trade-offs that account for reliability and environmental impacts*
- The argument must be reliable and thoroughly explained*

### Disciplinary Core Ideas

#### LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-6)

#### LS4.D: Biodiversity and Humans

- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (*secondary to HS-LS2-7*) (*Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.*)

*In this case,*

- Students should examine the competitive relationship between the fish and algae.*
- Students should explain the interaction of the new species of algae and the ecosystem. In particular, how the increase in algae population affects the oxygen levels in the water and the ecosystem itself.*
- Students should include the functioning of the ecosystem in their arguments.*
- The argument should explain the hypothesis and supporting evidence regarding the recovery of the ecosystem and the effect of leaving 1% of the algae in the lake.*

### Crosscutting Concepts

#### Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6)

*In this case,*

*Students are able to develop arguments that discuss the stability of the ecosystem. The argument and content should address the feedback mechanisms of the ecosystem as well as the rates of change.*

# Examples of Mathematics Evidence



## Standards for Mathematical Content

A-CED.1 Create equations and inequalities in one variable and use them to solve problems. [Create an exponential equation, which includes determining  $p_0$ ]

F-BF.1 Write a[n exponential] function that describes the relationship between two quantities:[algae and time]

F-LE.2 Construct an exponential functions, given a description of a relationship (include reading these from a table).

## Standards for Mathematical Practice

**Make sense of problems and persevere in solving them:** students look for entry points into the solution; they analyze givens, constraints, relationships, and goals; they solve the exponential equation.

**Reason abstractly and quantitatively:** ...represent the algae growth symbolically and manipulate the representing symbols...—and pause as needed during the manipulation process in order to probe into the referents for the symbols involved.

**Modeling with mathematics:** use an exponential function to describe how algae growth depends on time

# Examples of ELA Evidence



## Standards for ELA Content

RI.9-10-8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient identify false statements and fallacious reasoning.

W.9-10.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

## Evidence of ELA Proficiency

Students can effectively identify false statements by presenting mathematical and scientific evidence.

Students can effectively support claims using valid scientific and mathematical evidence.

Students can effectively explain quantitative relationships and the outcomes they predict.

# Contact Information



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