2014 Oregon Science Standards (NGSS)

SCIMATH Performance Tasks & SCI/ELA Formative Assessment Development (Aligned to CCSS)

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Oregon Department of Education

NEXT GENERATION SCIENCE STANDARDS

OFFICE OF LEARNING
INSTRUCTION · STANDARDS · ASSESSMENT & ACCOUNTABILITY UNIT
STUDENT ASSESSMENT

COMMON CORE STATE STANDARDS OREGON

NEXT GENERATION SCIENCE STANDARDS
For States, By States

AGENDA

- Oregon Science Standards Update (2009, 2014)
- Framework for K-12 Science Education
- Next Generation Science Standards Vision and Dimensions (2014ORSS)
- Next Generation Science Standards Conceptual Shifts
- Key Shifts from 2009 ORSS→ 2014 ORSS
- NGSS/CCSS-Math & CCSS-ELA Connections
- SCIMATH TASKS (Achieve)
- SCI/ELA TASKS (SIMILAR TO SMARTER BALANCED ELA PERFORMANCE TASKS)
- QUESTIONS

2009 Oregon Science Standards Framework*

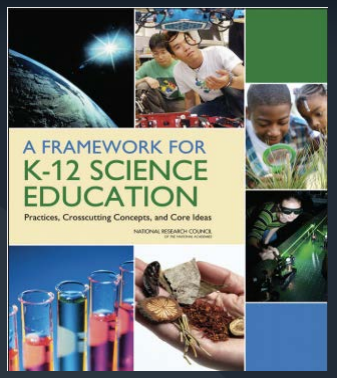
	Science Content Knowledge: Structure and Function	Science Content Knowledge: Interaction and Change	Science Process Skills*: Scientific Inquiry	Science Process Skills*: Engineering Design
Physical	*Properties of Matter* *Forms of Energy*	*Changes in Matter* *Energy Transfer and Conservation* *Forces and Motion*	*Abilities to do Scientific Inquiry Nature, History, and Interaction of Science and Technology*	*Abilities to do Engineering Design Nature, History, and Interaction of Technology and Science*
Life	*Organization of Living Systems*	*Matter and Energy Transformations in Living Systems* *Interdependence* *Evolution and Diversity*		
Earth and Space	*Properties of Earth Materials* *Objects in the Universe*	*Matter and Energy Transformations in Earth Systems* *History of Earth*		

*Continue to assess the 2009 Oregon Science Standards until 2018-2019 via OAKS Science

* *The Science Process Skills align with the Oregon Essential Skills*

OREGON EDUCATION

K-12 Science Education Goal for ALL Students



- appreciation of the beauty and wonder of science;
- possess sufficient knowledge of science and engineering to engage in public discussions on related issues;
- careful consumers of scientific and technological information related to their everyday lives;
- able to continue to learn about science outside school;
- have the skills to enter careers of their choice

A Framework for K-12 Science Education p. ES 2

Released in July 2011; free PDF online

www7.nationalacademies.org/bose/Standards_Framework_Homepage.html

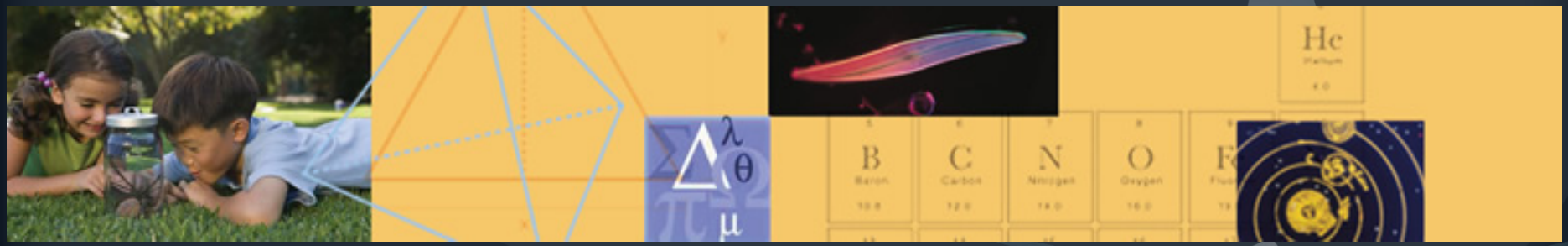
2014 ORSS (NGSS) Vision

- Learning as a **developmental progression**
- **Engaging students** in scientific investigations and argumentation to achieve deeper understanding of core science ideas
- **Integrating the knowledge of scientific explanations and the practices** needed to engage in scientific inquiry and engineering design

KNOWLEDGE AND PRACTICE MUST BE INTERTWINED IN LEARNING EXPERIENCES

Interconnected Dimensions

- Scientific and Engineering Practices
- Crosscutting Concepts
- Disciplinary Core Ideas in Science



Disciplinary Core Ideas

Life Science	Physical Science
LS1: From Molecules to Organisms: Structures and Processes LS2: Ecosystems: Interactions, Energy, and Dynamics LS3: Heredity: Inheritance and Variation of Traits LS4: Biological Evolution: Unity and Diversity	PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy PS4: Waves and Their Applications in Technologies for Information Transfer
Earth & Space Science	**Engineering & Technology**
ESS1: Earth's Place in the Universe ESS2: Earth's Systems ESS3: Earth and Human Activity	ETS1: Engineering Design ETS2: Links Among Engineering, Technology, Science, and Society

Core and Component Ideas

Life Science	Earth & Space Science	Physical Science	Engineering & Technology
LS1: From Molecules to Organisms: Structures and Processes	**ESS1: Earth's Place in the Universe**	**PS1: Matter and Its Interactions**	**ETS1: Engineering Design**
LS1.A: Structure and Function	ESS1.A: The Universe and Its Stars	PS1.A: Structure and Properties of Matter	ETS1.A: Defining and Delimiting an Engineering Problem
LS1.B: Growth and Development of Organisms	ESS1.B: Earth and the Solar System	PS1.B: Chemical Reactions	ETS1.B: Developing Possible Solutions
LS1.C: Organization for Matter and Energy Flow in Organisms	ESS1.C: The History of Planet Earth	PS1.C: Nuclear Processes	ETS1.C: Optimizing the Design Solution
LS1.D: Information Processing	**ESS2: Earth's Systems**	**PS2: Motion and Stability: Forces and Interactions**	**ETS2: Links Among Engineering, Technology, Science, and Society**
LS2: Ecosystems: Interactions, Energy, and Dynamics	ESS2.A: Earth Materials and Systems	PS2.A: Forces and Motion	ETS2.A: Interdependence of Science, Engineering, and Technology
LS2.A: Interdependent Relationships in Ecosystems	ESS2.B: Plate Tectonics and Large-Scale System Interactions	PS2.B: Types of Interactions	ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	ESS2.C: The Roles of Water in Earth's Surface Processes	PS2.C: Stability and Instability in Physical Systems	
LS2.C: Ecosystem Dynamics, Functioning, and Resilience	ESS2.D: Weather and Climate	**PS3: Energy**	
LS2.D: Social Interactions and Group Behavior	ESS2.E: Biogeology	PS3.A: Definitions of Energy	
LS3: Heredity: Inheritance and Variation of Traits	**ESS3: Earth and Human Activity**	PS3.B: Conservation of Energy and Energy Transfer	
LS3.A: Inheritance of Traits	ESS3.A: Natural Resources	PS3.C: Relationship Between Energy and Forces	
LS3.B: Variation of Traits	ESS3.B: Natural Hazards	PS3.D: Energy in Chemical Processes and Everyday Life	
LS4: Biological Evolution: Unity and Diversity	ESS3.C: Human Impacts on Earth Systems	**PS4: Waves and Their Applications in Technologies for Information Transfer**	
LS4.A: Evidence of Common Ancestry and Diversity	ESS3.D: Global Climate Change	PS4.A: Wave Properties	
LS4.B: Natural Selection		PS4.B: Electromagnetic Radiation	
LS4.C: Adaptation		PS4.C: Information Technologies and Instrumentation	
LS4.D: Biodiversity and Humans			

***Note**: In NGSS, the core ideas for Engineering, Technology, and the Application of Science are integrated with the Life Science, Earth & Space Science, and Physical Science core ideas*

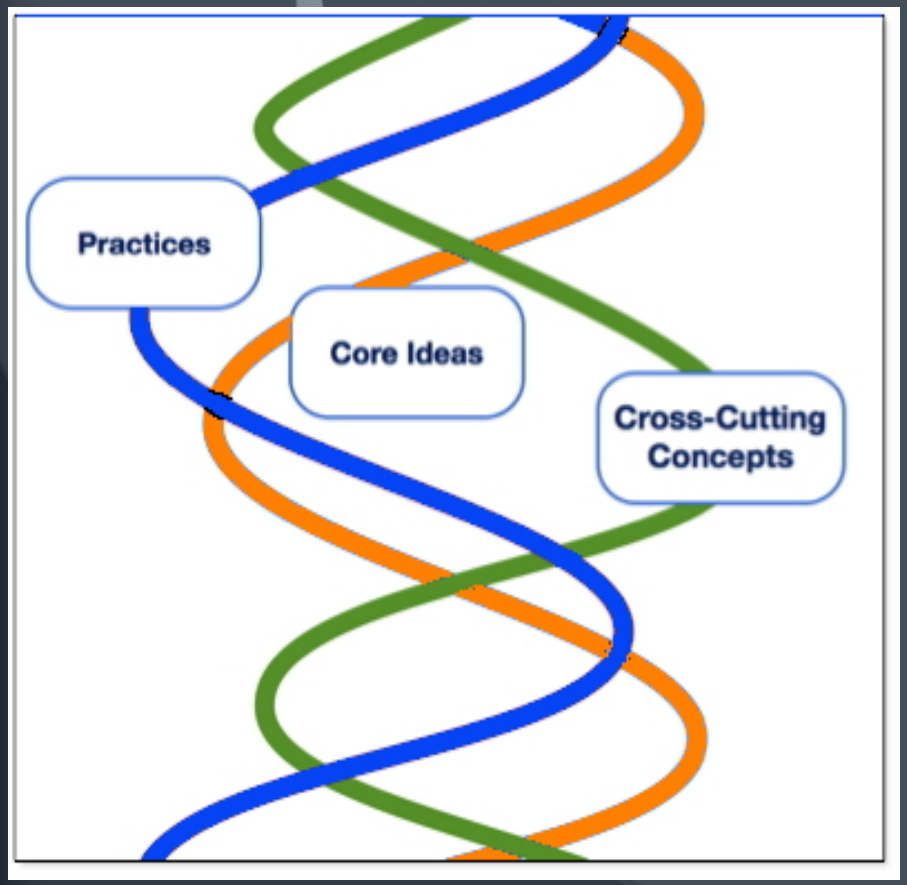
Scientific and Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Developing explanations and designing solutions
- Engaging in argument
- Obtaining, evaluating, and communicating information

Crosscutting Concepts

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Structure and function
- Stability and change

NGSS Architecture



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

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

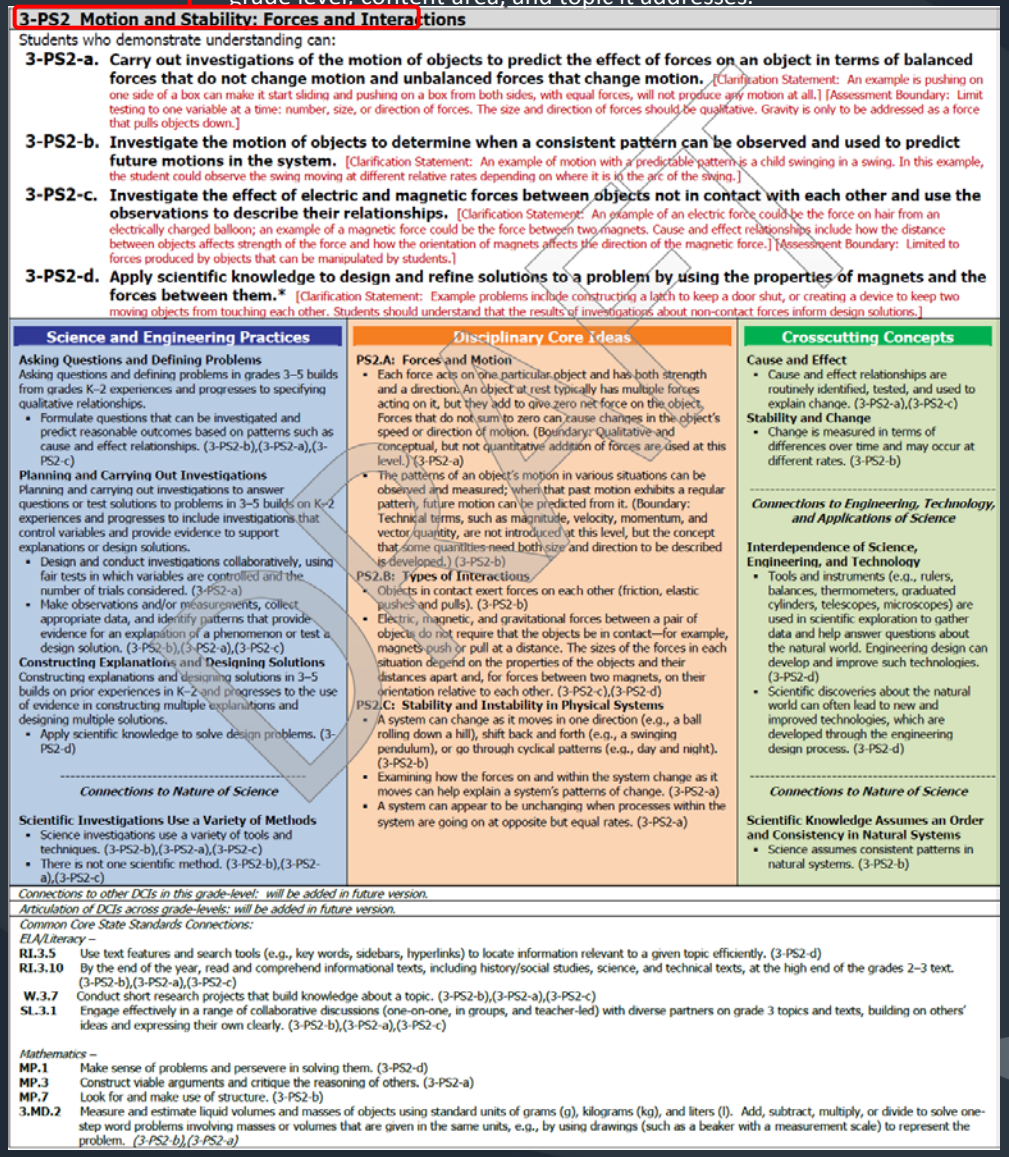
A collection of several performance expectations describing what students should be able to do to master this standard

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



3-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-a. **Carry out investigations of the motion of objects to predict the effect of forces on an object in terms of balanced forces that do not change motion and unbalanced forces that change motion.** [Clarification Statement: An example is pushing on one side of a box can make it start sliding and pushing on a box from both sides, with equal forces, will not produce any motion at all.] [Assessment Boundary: Limit testing to one variable at a time: number, size, or direction of forces. The size and direction of forces should be qualitative. Gravity is only to be addressed as a force that pulls objects down.]

3-PS2-b. **Investigate the motion of objects to determine when a consistent pattern can be observed and used to predict future motions in the system.** [Clarification Statement: An example of motion with a predictable pattern is a child swinging in a swing. In this example, the student could observe the swing moving at different relative rates depending on where it is in the arc of the swing.]

3-PS2-c. **Investigate the effect of electric and magnetic forces between objects not in contact with each other and use the observations to describe their relationships.** [Clarification Statement: An example of an electric force could be the force on hair from an electrically charged balloon; an example of a magnetic force could be the force between two magnets. Cause and effect relationships include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Limited to forces produced by objects that can be manipulated by students.]

3-PS2-d. **Apply scientific knowledge to design and refine solutions to a problem by using the properties of magnets and the forces between them.*** [Clarification Statement: Example problems include constructing a latch to keep a door shut, or creating a device to keep two moving objects from touching each other. Students should understand that the results of investigations about non-contact forces inform design solutions.]

Science and Engineering Practices

Asking Questions and Defining Problems
Asking questions and defining problems in grades 3–5 builds from grades K–2 experiences and progresses to specifying qualitative relationships.
- Formulate questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (3-PS2-b),(3-PS2-a),(3-PS2-c)

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Design and conduct investigations collaboratively, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-a)
- Make observations and/or measurements, collect appropriate data, and identify patterns that provide evidence for an explanation of a phenomenon or test a design solution. (3-PS2-b),(3-PS2-a),(3-PS2-c)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions.
- Apply scientific knowledge to solve design problems. (3-PS2-d)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods
- Science investigations use a variety of tools and techniques. (3-PS2-b),(3-PS2-a),(3-PS2-c)
- There is not one scientific method. (3-PS2-b),(3-PS2-a),(3-PS2-c)

Disciplinary Core Ideas

PS2.A: Forces and Motion
- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-a)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-b)

PS2.B: Types of Interactions
- Objects in contact exert forces on each other (friction, elastic pushes and pulls). (3-PS2-b)
- Electric, magnetic, and gravitational forces between a pair of objects do not require that the objects be in contact—for example, magnets push or pull at a distance. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-c),(3-PS2-d)

PS2.C: Stability and Instability in Physical Systems
- A system can change as it moves in one direction (e.g., a ball rolling down a hill), shift back and forth (e.g., a swinging pendulum), or go through cyclical patterns (e.g., day and night). (3-PS2-b)
- Examining how the forces on and within the system change as it moves can help explain a system's patterns of change. (3-PS2-a)
- A system can appear to be unchanging when processes within the system are going on at opposite but equal rates. (3-PS2-a)

Crosscutting Concepts

Cause and Effect
- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-a),(3-PS2-c)

Stability and Change
- Change is measured in terms of differences over time and may occur at different rates. (3-PS2-b)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology
- Tools and instruments (e.g., rulers, balances, thermometers, graduated cylinders, telescopes, microscopes) are used in scientific exploration to gather data and help answer questions about the natural world. Engineering design can develop and improve such technologies. (3-PS2-d)
- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-d)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science assumes consistent patterns in natural systems. (3-PS2-b)

Connections to other DCIs in this grade-level: will be added in future version.

Articulation of DCIs across grade-levels: will be added in future version.

Common Core State Standards Connections:

ELA/Literacy –

RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently. (3-PS2-d)

RI.3.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2–3 text. (3-PS2-b),(3-PS2-a),(3-PS2-c)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-PS2-b),(3-PS2-a),(3-PS2-c)

SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. (3-PS2-b),(3-PS2-a),(3-PS2-c)

Mathematics –

MP.1 Make sense of problems and persevere in solving them. (3-PS2-d)

MP.3 Construct viable arguments and critique the reasoning of others. (3-PS2-a)

MP.7 Look for and make use of structure. (3-PS2-b)

3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. *(3-PS2-b),(3-PS2-a)*

2014 ORSS(NGSS) ADOPTED GRADE LEVEL MIDDLE SCHOOL SCIENCE STANDARDS SEQUENCE

GRADE 8	CROSS CUTTING THEMES	EARTH AND SPACE SCIENCES			LIFE SCIENCES		PHYSICAL SCIENCES			ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE
	Stability and Change Scale, Proportion, and Quantity	Space Systems	History of Earth	Human Impacts	Natural Selection and Adaptations	Growth Development, and Reproduction of Organisms	Forces and Interactions	Waves and Electromagnetic Radiation	Energy	
		MS-ESS1-1	MS-ESS1-4	MS-ESS3-4	MS-LS4-1	MS-LS3-1	MS-PS2-1	MS-PS4-1	MS-PS3-1	MS-ETS1-1
		MS-ESS1-2			MS-LS4-2	MS-LS4-5	MS-PS2-2	MS-PS4-2	MS-PS3-2	MS-ETS1-2
		MS-ESS1-3			MS-LS4-3		MS-PS2-3	MS-PS4-3		MS-ETS1-3
					MS-LS4-4		MS-PS2-4			MS-ETS1-4
					MS-LS4-6		MS-PS2-5			

GRADE 7	CROSS CUTTING THEMES	EARTH AND SPACE SCIENCES			LIFE SCIENCES		PHYSICAL SCIENCES			ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE
	Energy and Matter: Flows, Cycles, and Conservation Cause and Effect	Earth's Systems	History of Earth	Human Impacts	Interdependent Relationships in Ecosystems	Matter and Energy in Organisms and Ecosystems	Chemical Reactions	Structure and Property of Matter		
		MS-ESS2-1	MS-ESS2-2	MS-ESS3-2	MS-LS2-2	MS-LS1-6	MS-PS1-2	MS-PS1-1		MS-ETS1-1
		MS-ESS3-1	MS-ESS2-3		MS-LS2-5	MS-LS1-7	MS-PS1--5	MS-PS1-3		MS-ETS1-2
						MS-LS2-1	MS-PS1--6	MS-PS1-4		MS-ETS1-3
						MS-LS2-3				MS-ETS1-4
						MS-LS2-4				

GRADE 6	CROSS CUTTING THEMES	EARTH AND SPACE SCIENCES			LIFE SCIENCES		PHYSICAL SCIENCES			ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE
	Systems and System Models Patterns Structure and Function	Earth's Systems	Weather and Climate	Human Impacts	Structure, Function and Information Processing	Growth Development, and Reproduction of Organisms			Energy	
		MS-ESS2-4	MS-ESS2-5	MS-ESS3-3	MS-LS1-1	MS-LS1-4			MS-PS3-3	MS-ETS1-1
			MS-ESS2-6		MS-LS1-2	MS-LS1-5			MS-PS3-4	MS-ETS1-2
			MS-ESS3-5		MS-LS1-3	MS-LS3-2			MS-PS3-5	MS-ETS1-3
					MS-LS1-8					MS-ETS1-4

NGSS Conceptual Shifts

1. Interconnected Nature of Science as it is Practiced and Experienced in the Real World
2. Student Performance Expectations – NOT Curriculum.
3. Science Concepts Build Coherently from K–12
4. Focus on Deeper Understanding of Content as well as Application of Content
5. Science and Engineering are Integrated in the NGSS
6. Prepare students for College, Career, and Citizenship
7. The NGSS and CCSS are Aligned

2009 ORSS→ 2014 ORSS Key Shifts

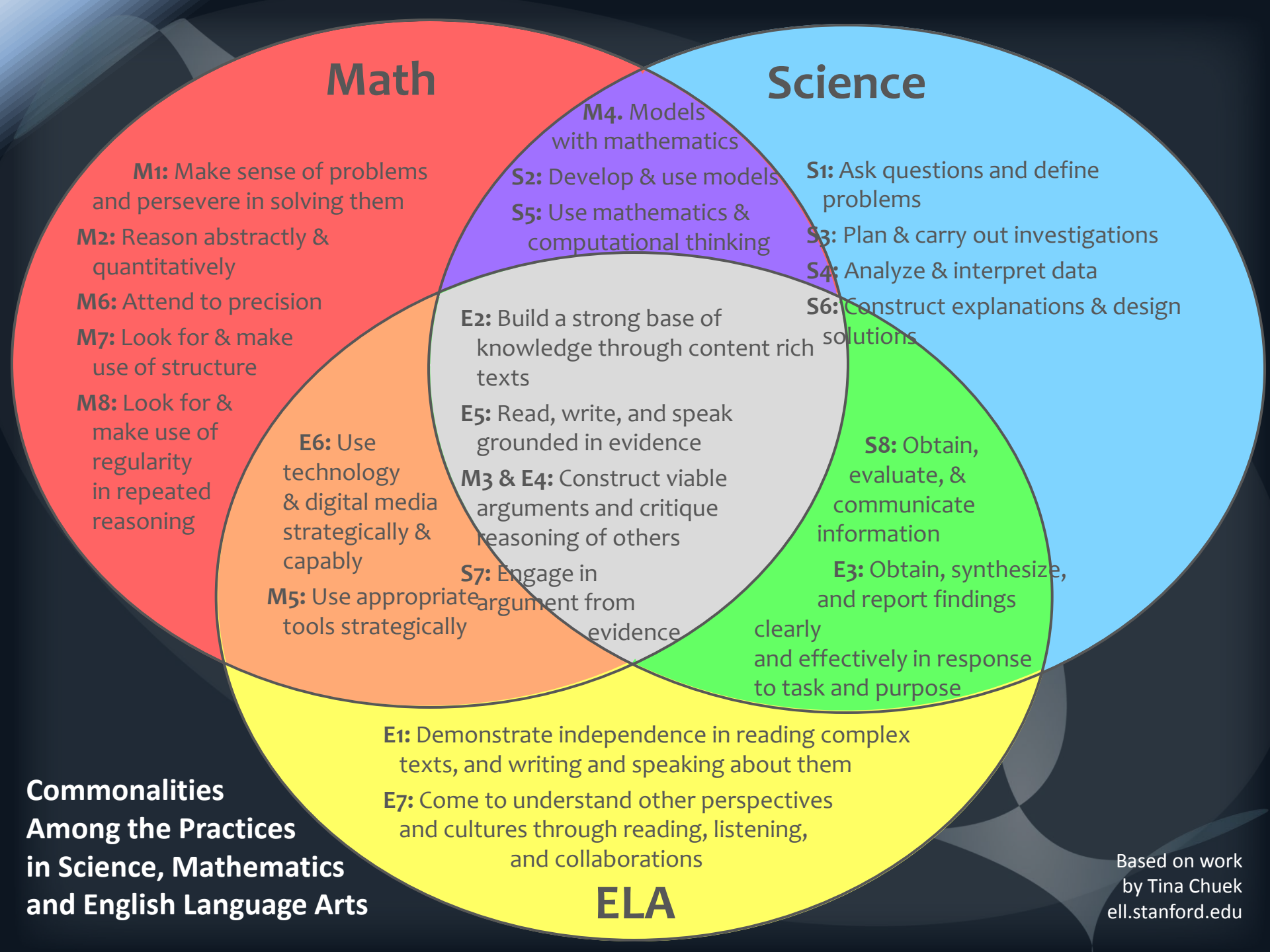
New Content:

- Waves at 1st and 4th grades
- Earth and human activity at 3rd grade
- Equilibrium and closed systems, interaction of magnetic field and electric current; digital transmission and waves, electromagnetic radiation; using statistics and probability in population and diversity studies at High School

- Most standards in the K-5 grades remained intact, the greatest changes are the instructional approaches moving from content based to more performance based.
- Some science content has moved from high school to middle school (ex. fields in forces and stored energy in systems; and cycling of matter, flow of energy, and geoscience processes in systems).

2009 ORSS→ 2014 ORSS Key Shifts

- Some science content is eliminated from middle school (ex. Electricity and magnetism are included, but static and current electricity, and series and parallel electrical circuits are not covered).
- There is good alignment in the practices between the 2009 ORSS and the 2014 ORSS. Developing and Using Models, Computational Thinking and Engaging in Argument from Evidence are newly explicitly referenced.
- 2014 ORSS demands a higher level of rigor to develop critical thinking skills than the 2009 ORSS.
- The Cross Cutting Concepts are now explicitly stated in the standards, while in the 2009 ORSS most were stated in the Core Standards Statements and implied in the grade level standards.



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

Based on work by Tina Chuek
ell.stanford.edu

Practices in Math, Science, and ELA*

Practices in Mathematics, Science, and English Language Arts*		
Math	**Science**	**English Language Arts**
M1. Make sense of problems and persevere in solving them.	**S1.** Asking questions (for science) and defining problems (for engineering).	**E1.** They demonstrate independence.
M2. Reason abstractly and quantitatively.	**S2.** Developing and using models.	**E2.** They build strong content knowledge.
M3. Construct viable arguments and critique the reasoning of others.	**S3.** Planning and carrying out investigations.	**E3.** They respond to the varying demands of audience, task, purpose, and discipline.
M4. Model with mathematics.	**S4.** Analyzing and interpreting data.	**E4.** They comprehend as well as critique.
M5. Use appropriate tools strategically.	**S5.** Using mathematics, information and computer technology, and computational thinking.	**E5.** They value evidence.
M6. Attend to precision.	**S6.** Constructing explanations (for science) and designing solutions (for engineering).	**E6.** They use technology and digital media strategically and capably.
M7. Look for and make use of structure.	**S7.** Engaging in argument from evidence.	**E7.** They come to understanding other perspectives and cultures.
M8. Look for and express regularity in repeated reasoning.	**S8.** Obtaining, evaluating, and communicating information.	

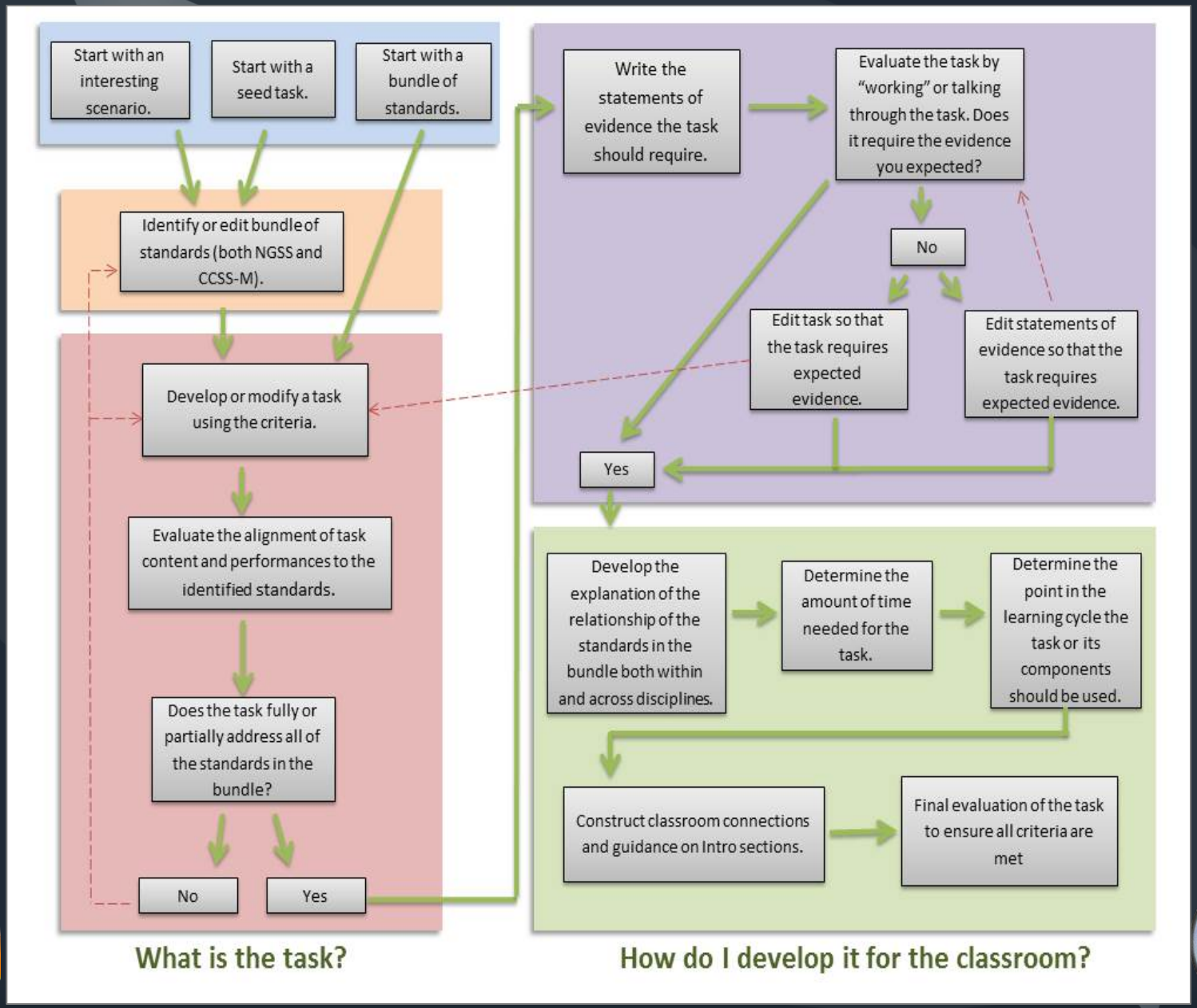
* The Common Core English Language Arts uses the term “student capacities” rather than the term “practices” used in Common Core Mathematics and the Next Generation Science Standards.

NEXT GENERATION SCIENCE STANDARDS

For States, By States

SCIMATH TASKS

THE SCIMATH TASK DEVELOPMENT PROCESS



NGSS/CCSS-Math Task Template

Introduction

This section includes a short "abstract" describing the task background information and the unifying theme/question for the task. This section also includes reference to the materials from which the assessment task was developed.

Standards Bundle

This section lists the Next Generation Science Standards (performance expectations), CCSS-M practices and grade level standards, and CCSS-ELA/Literacy standards that are partially or fully assessed by the task components. Standards completely highlighted in bold are fully assessed by the task, including an integration of the dimensions from the foundation boxes associated with each NGSS performance expectation as reflected in the evidence statements and as outlined in the standards alignment and connections section below.

Information for Classroom Use

Connections to Instruction: This section provides recommendations for how this assessment task might be used in the classroom, including type of class and where within the instructional unit it might be used, whether it could be used as a formative or summative assessment, and suggestions for how it might be subdivided.

Approximate Duration for the Assessment Task: This section will provide information on the amount of time needed to complete the assessment task and how it might be broken up to fit within limited-time class periods at different points in time over the course of an instructional unit. Note that this section does not include instructional time leading up to each task component(s).

Assumptions: A description of the foundational knowledge and abilities required of the teacher and/or students in order to use this assessment task.

Materials Needed: A description of the resources needed to complete the task components.

NGSS/CCSS-Math Task Template

Assessment Task

This section represents the portion of the task that would be given to students.

Context: An introduction to the task that defines the setting of the task or that gives the task components a unifying theme or question.

Task Components: All of the activities and questions that make up the assessment task, divided into specific components.

Alignment and Connections of Task Components to the Standards Bundle

This section describes how each task component specifically would assess proficiency of part of the standards bundle, including all-related standards and parts of standards (since most individual task components don't assess a full standard) and how they integrate math, science, and engineering aspects of the task. This section also includes a statement describing which task component(s) together fully assess an NGSS performance expectation, including an integration of the associated dimensions.

Evidence Statements

This section includes a list of statements that will specifically and clearly state the evidence for student proficiency on a task component as it meets the requirements of all dimensions of the associated standards included in the standards bundle and the intent for assessment.

Rubrics (coming soon)

In future versions of these classroom sample assessment tasks, this section will provide example scoring guidelines for the task components that reflect levels of student performance as below basic, basic, proficient, and advanced.

SAMPLE DRAFT SCIMATH TASKS

- MIDDLE SCHOOL:

-Natural Selection and the Development of Antibiotic Resistance

- HIGH SCHOOL:

- -Giant African Land Snail

--Analyzing Floods: Understanding Past Flood Events and Considering Future Flood Events in a Changing Climate

-Solar Cookers

*More to be released by Achieve by late FALL 2014

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Giant African Land Snail

SCIMATH TASK

Bundling Math and Science

Modeling; Reasoning Abstractly and Quantitatively

Cause and Effect

Systems and System Models

Construct and compare linear, quadratic, and exponential models and solve problems.

Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

For exponential models, express as a logarithm the solution to $ab^{ct}=d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

NGSS LS2: Ecosystems

1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*

NGSS LS4: Biological Evolution

2. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*

Giant African Land Snail

In 1966, a Miami boy smuggled three Giant African Land Snails into the country. His grandmother eventually released them into the garden, and in seven years there were approximately 18,000 of them. The snails are very destructive and had to be eradicated. They consume over 500 different types of plants, lay over 1200 eggs per year, and have been shown to cause indigenous snails' populations to decrease over time. According to the USDA, it took 10 years and cost $1 million to eradicate them. Now, Dade County, Florida faces the same infestation.

Giant African Land Snail

a. Assuming the snail population grows exponentially, write an expression for the population, P, in terms of the number, t, of years since their release in 1996.

b. How long does it take for the population to double?

c. Assuming the cost of eradicating the snails is proportional to the population, how much would it have cost to eradicate them if

   i. The Florida Department of Agriculture (FDA) had started the eradication program a year earlier?

   ii. The FDA had let the population grow unchecked for another year?

Giant African Land Snail

d. Using information from online sources develop a model of a possible food web for current day Dade County. The web should include at least one indigenous snail, the wolf snail and at least three indigenous plants. Be sure to include mathematical or computational representations about the current carrying capacity of the ecosystem as well as the energy dissipation as energy is transferred from organism to organism.

e. Given the population growth and the nature of the Land Snails, insert the Land snails into the previously constructed food web. Using your previous representation, construct an argument based on the competitive relationships and the mathematical comparisons between a normally functioning ecosystem versus one with the Land Snails. The argument should also include the Land Snails effect on other organisms within the food web.

Giant African Land Snail

f. Given the attached data on current day Dade County before the introduction of the Land Snails and after, construct an explanation of the effect of Land Snails on the ecosystem. The explanation should include a mathematical representation of the Land Snails effect on biodiversity and populations of the wolf snail.

g. Apply concepts of statistics and probability to develop evidence that Land Snail has an advantageous heritable trait and tent to increase in proportion to wolf snails.

Giant African Land Snail

h. In Hawaii, a new species of snail was introduced to combat the Land Snails. While it showed some progress, there was an extinction of some indigenous snails as a result of the new species. Construct a possible alternative to eradicating the Land Snails and the new species. The plan should include clear discussions regarding the criteria, trade-offs, and the plan for the mitigation of human intervention.

Evidence Statements

Student' model of food webs accurately reflect the flow of matter and energy in Miami Dade County by showing evidence of the following:

- Arrows accurately describing the movement of matter and energy from organism to organism.
- Arrows accurately describe the relationships between different levels of organisms.
- The model properly represents the disruption to the natural web with the insertion of the Land Snail.

Evidence Statements

- The argument of the model includes mathematical representations of dissipation of energy from organism to organism.
- The argument for the model includes evidence of understanding that energy has a source and it is not created or destroyed, but transferred from organism to organism.

SAMPLE DRAFT SCI/ELA TASKS

- ES/MS: Coming Soon!*

-HIGH SCHOOL*: Bioethics (Life Science)

*Steroid and Performance Enhancing Drug Abuse in Athletics

*Ethical Issues in Genetic Testing

*Establishing State Vaccination Policies

*Organ Transplantation

*Human Clinical Trials

*Use of Animals in Biomedical Research

*Aligned with NIH Exploring Bioethics Curriculum Supplement

*More to be released by ODE by FALL 2014/Winter 2015

SCI/ELA TASK

Bioethics Concepts and Skills: Steroid and Performance Enhancing Drug Abuse In Athletics

Modeled after Smarter Balanced ELA Performance Tasks

Classroom Activity

Introductory Classroom Activity (25 minutes)

- Present on a projector (or distribute a handout of) images of athletes that have personally admitted to using steroids to enhance their athletic ability.
- After giving students a moment to look at the images, ask, "Have you heard in the news about athletes that have admitted to using steroids to enhance their athletic performance?" "If a particular athlete set a record while under the influence of steroids, do you think that they should be stripped of that record or for if they are an Olympic athlete, their medal(s)?"
- Three video clips:
- http://www.youtube.com/watch?v=58K_JzRQpRU
- http://www.youtube.com/watch?v=25JqCbCOi3c
- http://www.youtube.com/watch?v=DkQpTdVK1cc

Classroom Activity

Following the three videos, engage students in a brief classroom discussion using some of the following as discussion questions:

-Why do you think the media has biased the illegal use of steroids to mainly baseball players?
-What are the risks of using anabolic steroids or performance enhancing drugs?
-Do you think that it should be legal for professional athletes to be able to take steroids or performance enhancing drugs while they are competing?
-If an athlete is found to be under the influence of steroids and or performance enhancing drugs and they set a world record, are awarded an Olympic medal, etc., do you think they should be stripped of their honor(s)?

“In the performance task that you are going to be participate in this week, you will learn more about steroids and performance enhancing drugs and the debate over their pros and cons of being allowed in athletics. Eventually, you will need to take a position on whether we should allow their use, and you will defend your position in an argumentative essay. It is important to know that, as some of the resources you will be using point out, some people support their use while others are adamantly opposed to allowing them.”

Student Directions

- **Task:**

In your health class, you have been discussing the risks of steroid and performance enhancing drug abuse and about the role they have played in athletics. You have learned about some of the potential side effects that can occur if they are used, as well as how some professional athletes have admitted to their use and have been stripped of their medals, times and athletic honors. As part of your research on this issue, you have found four sources giving additional information about steroid and performance enhancing drug abuse and their role in athletics.

After you have reviewed these sources, you will answer some questions about them. Briefly review these resources and the three questions that follow. Then, go back and read the sources carefully so you will have the information you need to answer the questions and complete your research. You may take notes in the margin as you find information in the sources to capture your thoughts, reactions and any questions you might have, as you read.

- In Part 2, you will write an argumentative essay on a topic related to the sources.

Student Directions

- **Directions for Beginning:**

You will now examine several sources. You can re-examine the sources as often as you like.

- **Initial Questions:**

After examining the research sources, use the rest of the time in Part 1 to answer the questions about them. Your answers to these questions will be part of your score for the reading portion of this assessment. Also, your answers will help you think about the information you have read and viewed, which should help you write your argumentative essay. Both your margin notes and your answers to the questions will be available to you as you work on your essay.

Research Sources

Source #1: Steroid Background Information

*This article, from the **National Institute of Health**, provides background knowledge on what steroids are, as well as the potential risks involved for an abuser of steroids. It also notes that not all medical doctors agree on whether steroids provide that much advantage to an athlete.*

Source #2: Tour in Tatters: Team Ousts the Race Leader

*This article, from the July 26, 2007 edition of **The New York Times**, discusses how a Tour de France cyclist was removed from the race due to his riding under the suspicion of doping, as well as missing and then failing numerous drug tests.*

Research Sources

Source #3: Olympic Champion Acknowledges Use of Steroids

This article, from the October 5, 2007 edition of **The New York Times**, *discusses how Olympic Track and Field athlete, Marion Jones plead guilty to lying to federal agents about her use of performance-enhancing drugs, while competing at the 2000 Olympics in Sydney, Australia.*

Source #4: The Olympics would be better if athletes were allowed to take drugs

*This article from the September 7, 2012 edition of the magazine "**WIRED**" gives the perspective that if athletes were allowed to use steroids or other performance enhancing drugs, then the Olympic athletes would be faster and or better at their events.*

Part 1: Questions Related to Sources

Question #1: As noted in these four articles, the use of steroids and performance enhancing drugs introduces a variety of different moral and ethical issues in regard to athletics. In the boxes below, list at least five major ethical issues that are discussed in the articles and include which article(s) # that the issue was discussed.

Moral/Ethical Issue	Discussed in which article(s) (#)?
1.	
2.	
3.	
4.	
5.	

Part 1: Questions Related to Sources

Question #2: As described in the four short introductions, each of these articles was taken from websites that are designed to appeal to a very specific audience. Choose **one** of the articles and analyze how the author's purpose is reflected in the article's tone and content. Be sure to include specific quotations from the text.

Question #3: None of the four articles directly states a position on whether the use of steroids and performance enhancing drug use in athletics should continue to be banned in the United States. Complete the chart below to reflect the stance you think each of the authors would take if asked if steroids and performance enhancing drug use in athletics should continue to be banned in the United States. Cite specific wording from each article that supports your conclusion.

Part 2: Student Instructions and Assignment

Your Assignment

Based on the articles that you have researched and read, determine whether or not the United States should continue to ban the use of steroids and performance enhancing drug use in professional athletics. Write an argumentative essay that takes a clear position, using material from the articles you have read as support. Be sure that your recommendation acknowledges both sides of the issue so that people know that you have considered this recommendation carefully. You do not need to use all the sources, only the ones that most effectively and credibly support your position and your consideration of the opposing view.

Questions

Resources

Next Generation Science Standards (Achieve):
http://www.nextgenscience.org

Next Generation Science Standards (Achieve) Resources:
http://www.nextgenscience.org/resources

2014 Oregon Science Standards Webpage:
http://www.ode.state.or.us/search/page/?id=4141

Smarter Balanced Assessment Consortium:
http://www.smarterbalanced.org/

Smarter Balanced Practice Tests (Math and ELA Performance Tasks + Rubrics):
http://sbac.portal.airast.org/practice-test/resources/

National Institutes of Health (NIH)- Teaching Exploring Bioethics
(Free Curriculum Supplement):
http://science.education.nih.gov/supplements/nih9/bioethics/guide/teaching.htm

Contacts

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For OAKS Science and local performance assessment related questions, please contact Rachel Aazzerah (rachel.aazzerah@state.or.us).

For Math assessment and work sample related questions, please contact Bryan Toller (bryan.toller@state.or.us)

For ELA assessment and work sample related questions, please contact Ken Hermens (ken.hermens@state.or.us)