Successfully Support the NGSS Transition

Engage in the conversation about the transition to the new Oregon science standards (NGSS). Whether communicating with school boards and communities or assisting educators in the pedagogical shifts, this session will provide you with key systems and resources every district or building leader needs for successful implementation of NGSS. Participants will learn about hands-on tools for supporting instructional alignment to the NGSS conceptual shifts and the connections to CCSS. There will be specific examples of classroom and district successes and updates on transitional timelines.

Oregon Summer Assessment Institute – August 6th, 2015

OREGON'S NEW SCIENCE STANDARDS

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Rachel Aazzerah
Oregon Department of Education

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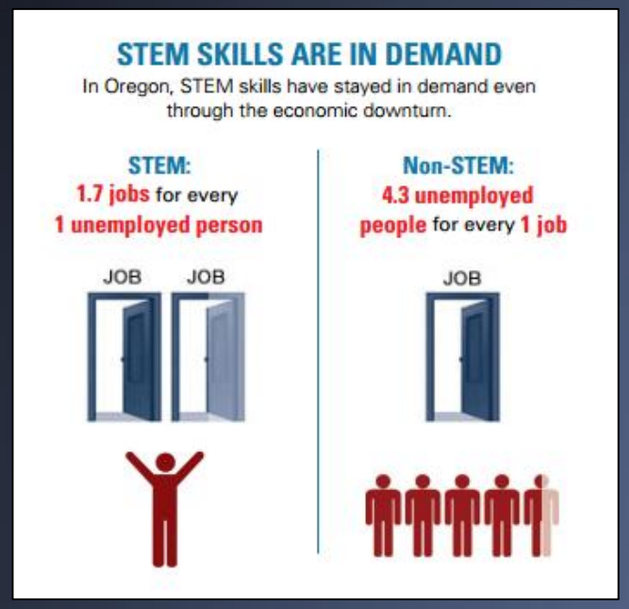
Science Assessment Specialist
Rachel.aazzerah@state.or.us

OREGON DEPARTMENT OF EDUCATION

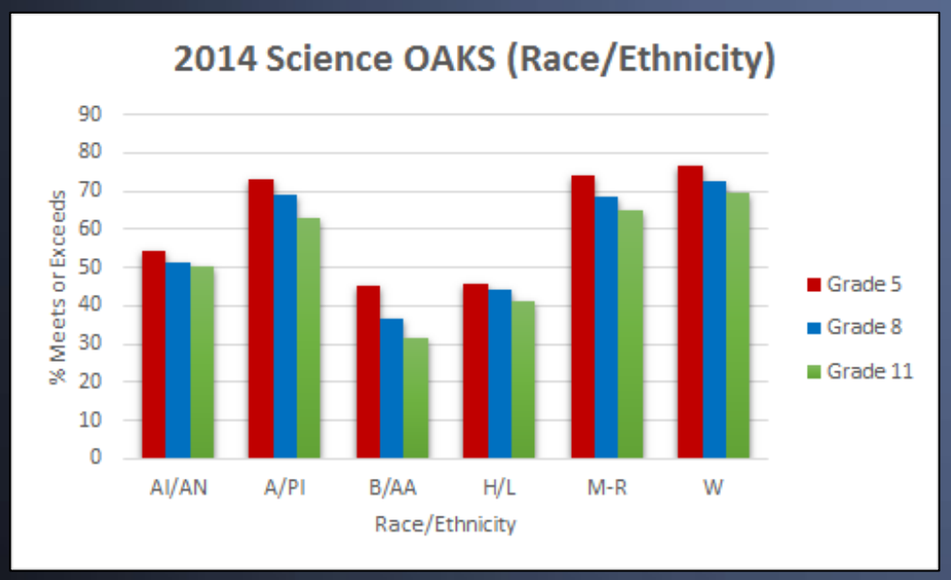
REVIEW GOALS & OBJECTIVES

- Understanding Oregon Science Standards to engage All Students
- Make connections between NGSS and CCSS
- Supports for successful implementation
- Update on assessment strategies and timelines

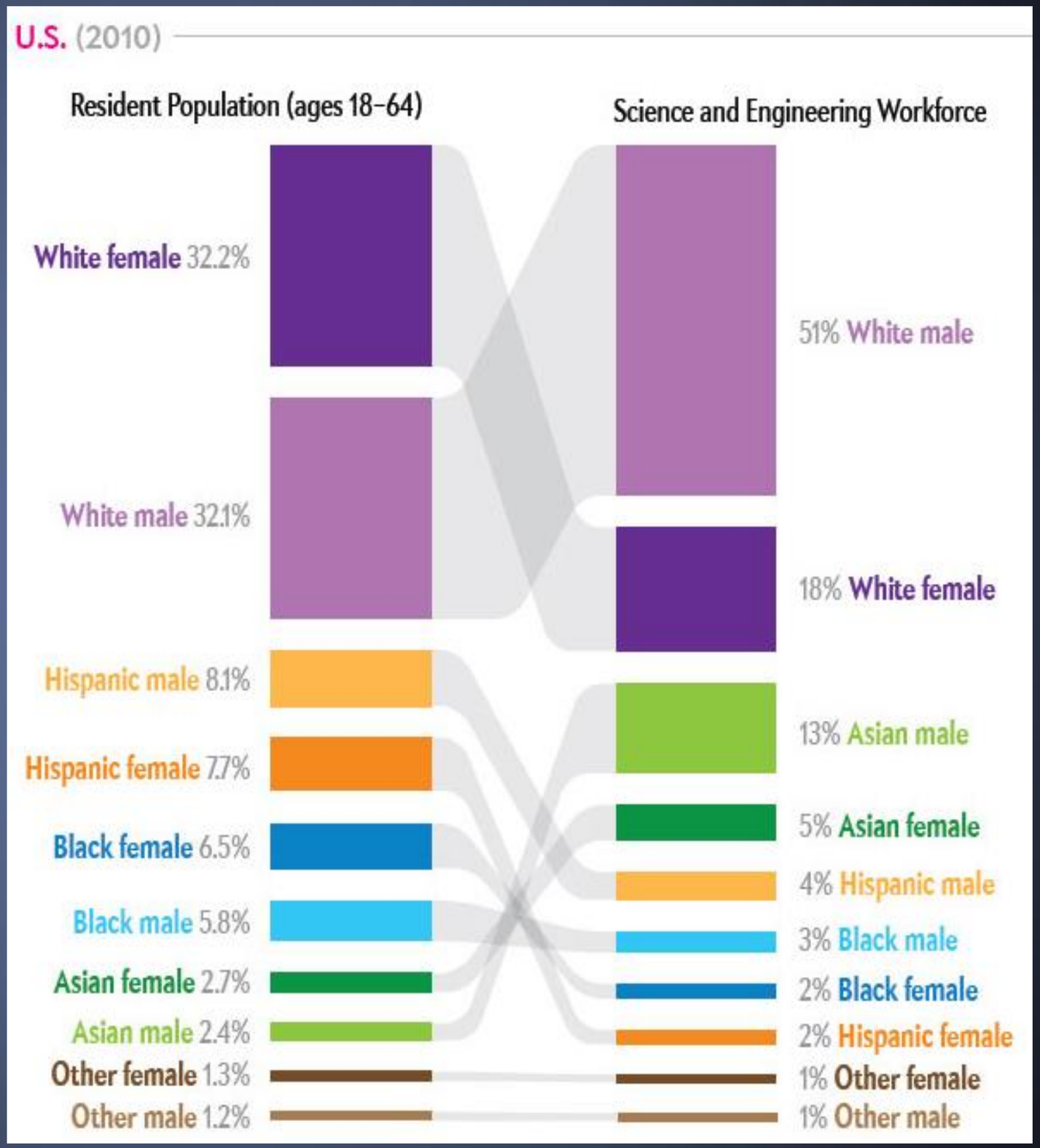
Why Science Now?



Source: Change the Equation (2012)



Source: Oregon Department of Education (2014)



Source: National Science Board . National Science Foundation. (2014)

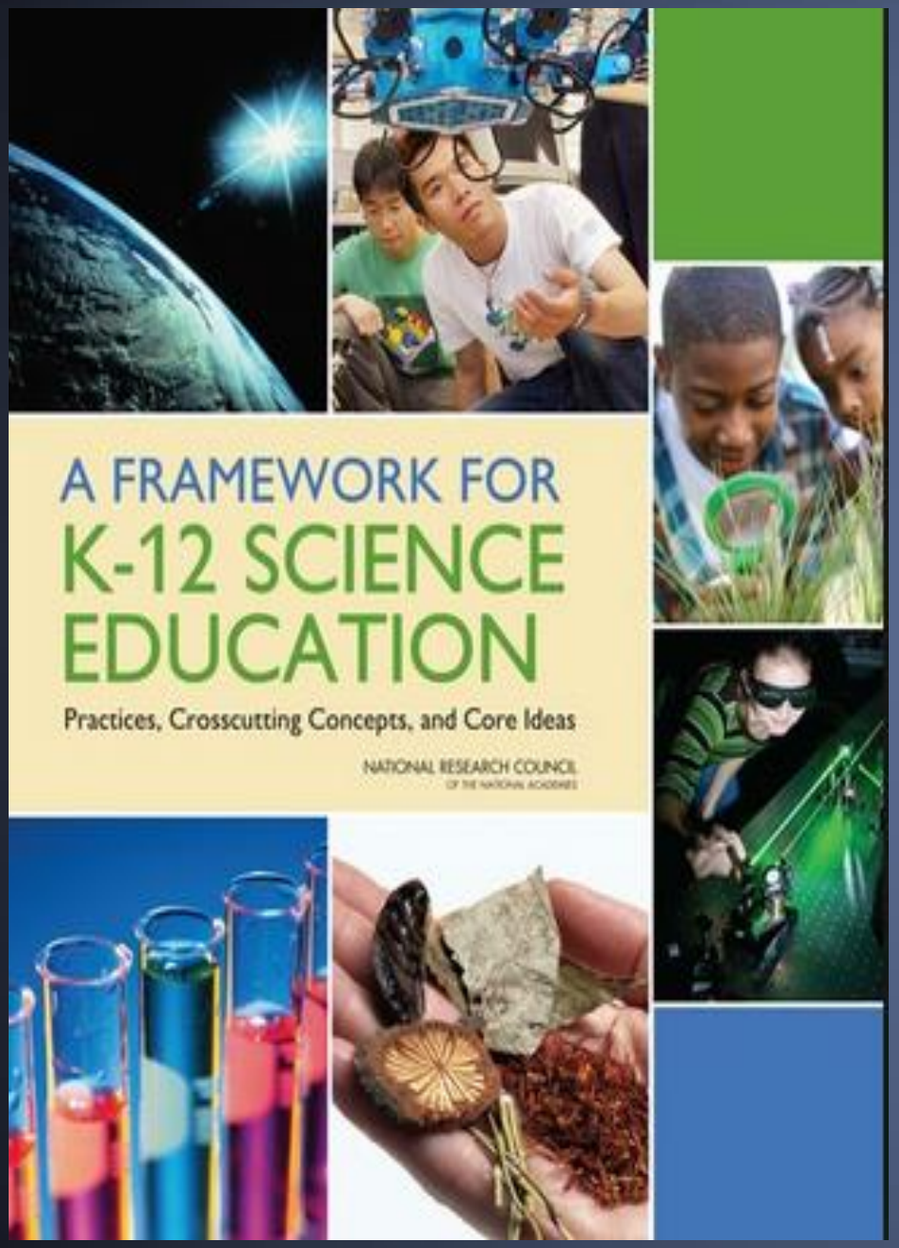
What Are the NGSS?

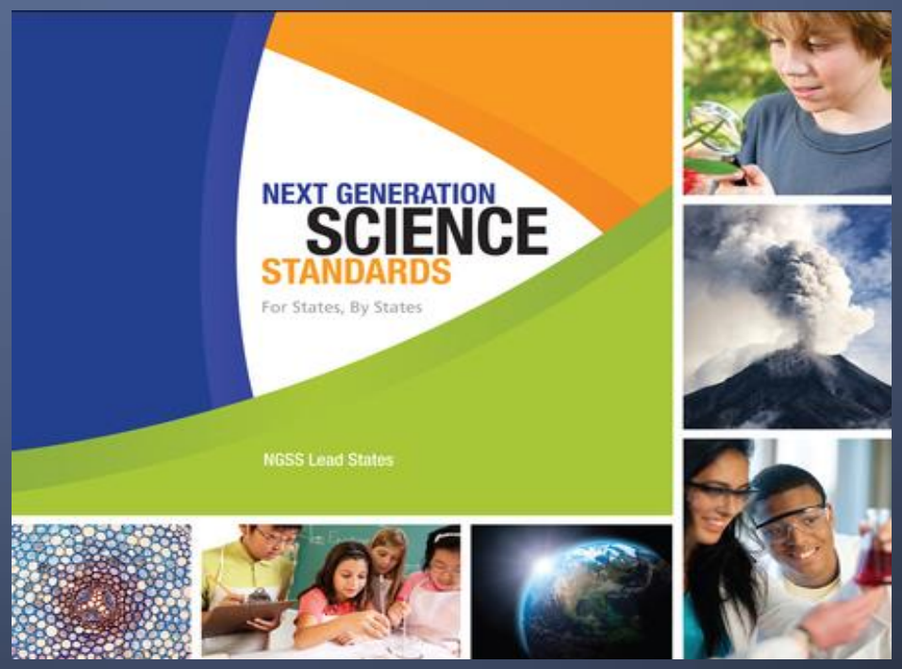
- Nationally-developed science standards
- Internationally benchmarked
- Written by scientists, engineers, and educators
- Oregon contribution: writing and review
- Adopted by Oregon in March 2014

NEXT GENERATION SCIENCE STANDARDS
For States, By States

Curiosity & Rigor

VISION & MISSION





KEY PEDAGOGICAL PRACTICES (SHIFTS)

- Focus: The standards are focused on deeper understanding and application of science content reflecting real-world phenomena.

- Coherence: Science & engineering (practices) build coherently across K–12.

- Rigor: Science & engineering practices and crosscutting concepts are Integrated with disciplinary core ideas across the K–12 system.

Three- Dimensions of the Framework for K-12 Science

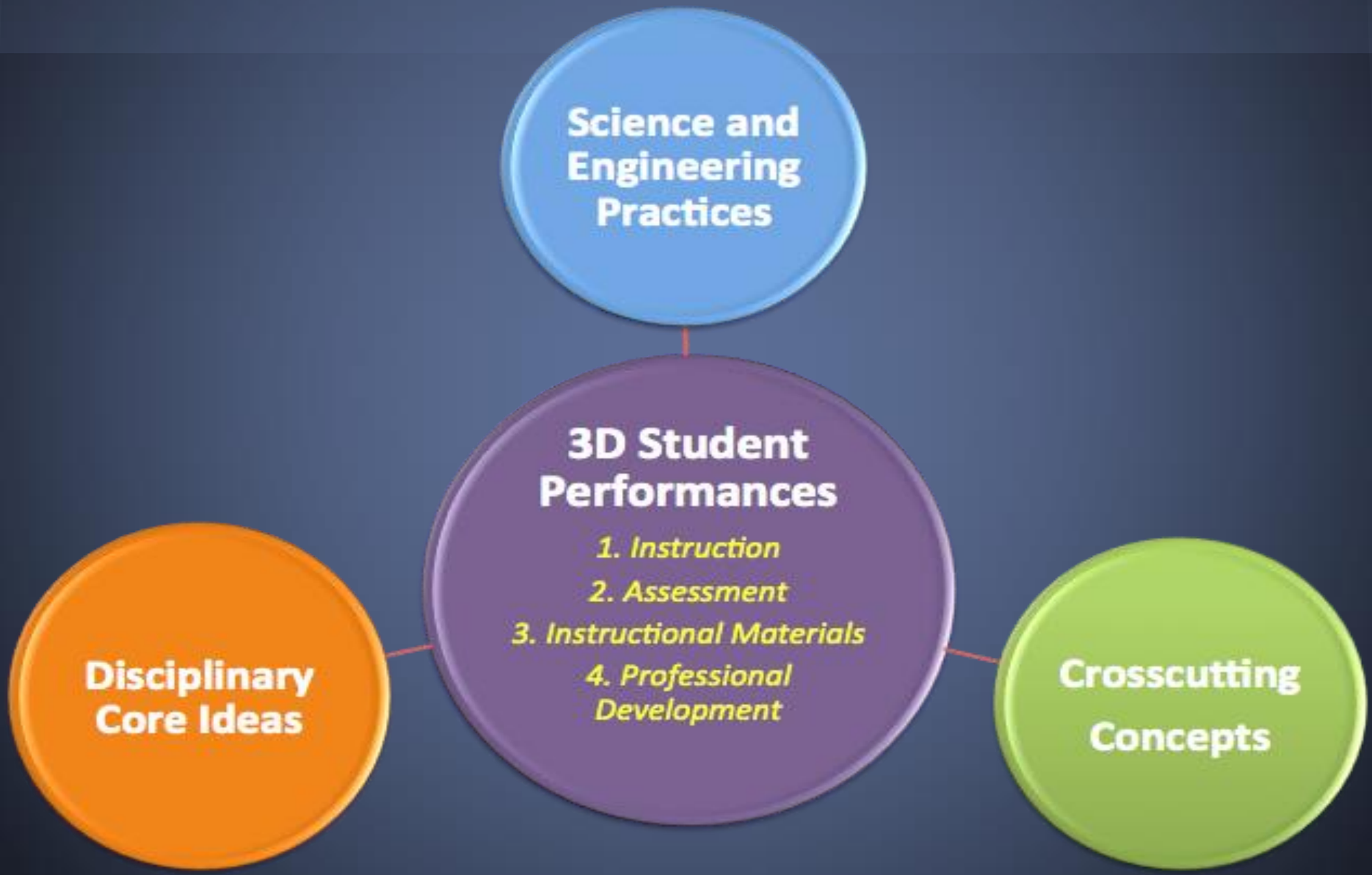


Diagram model by Brett Moulding

Three-Dimensional Learning

Kitchen Tools & Techniques (Practices)

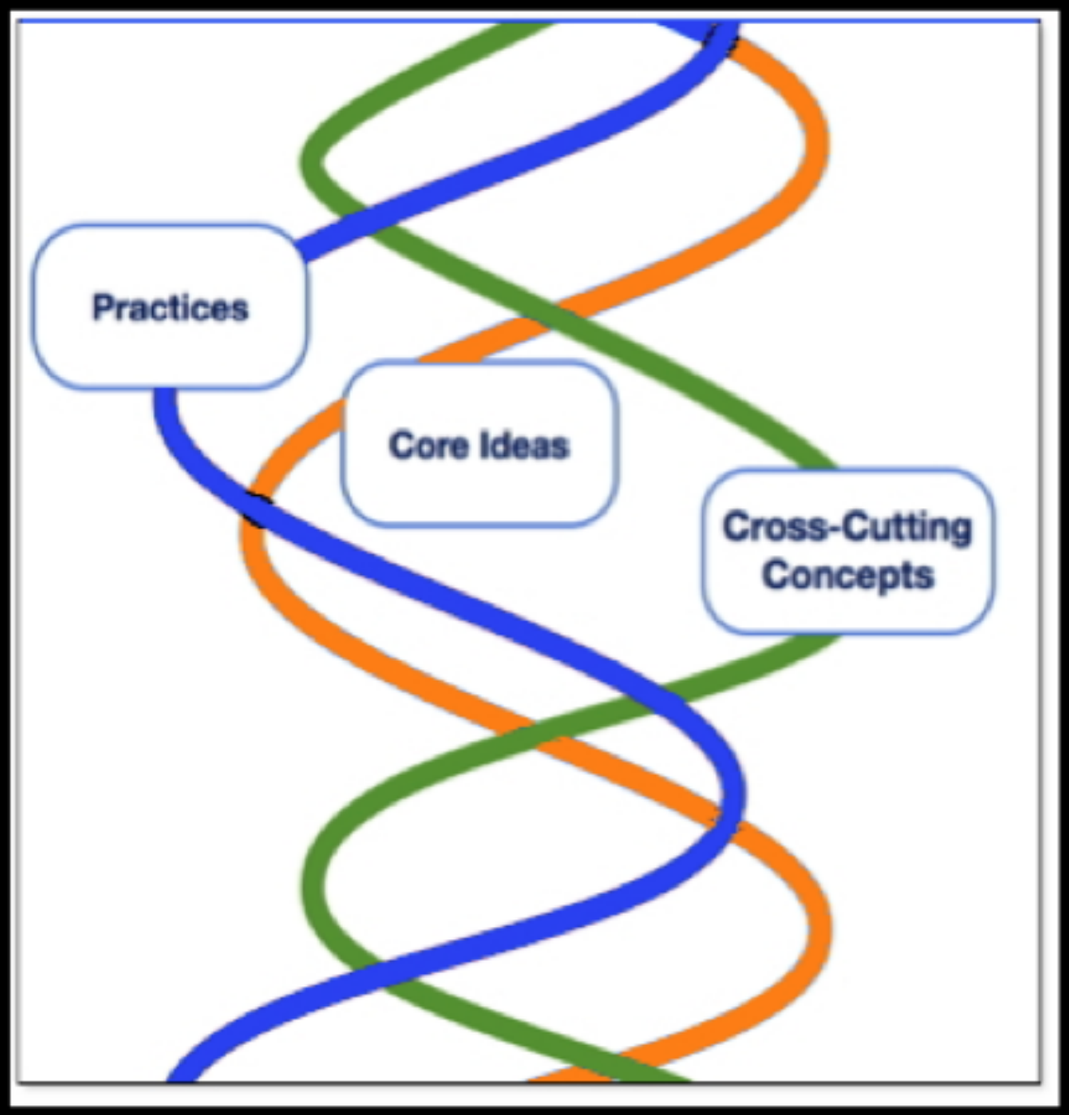
Basic Ingredients (Core Ideas)

Herbs, Spices, & Seasonings (Crosscutting Concepts)

Preparing a Meal

(Three dimensional Learning)

Modified from Joseph Kraicik



- The Standards are written as Performance Expectations

- The Standards will require Contextual Application of the the three dimensions by students

- Focus is on the How and the Why as well as the What

Three Dimensional Learning

Science & Engineering Practice

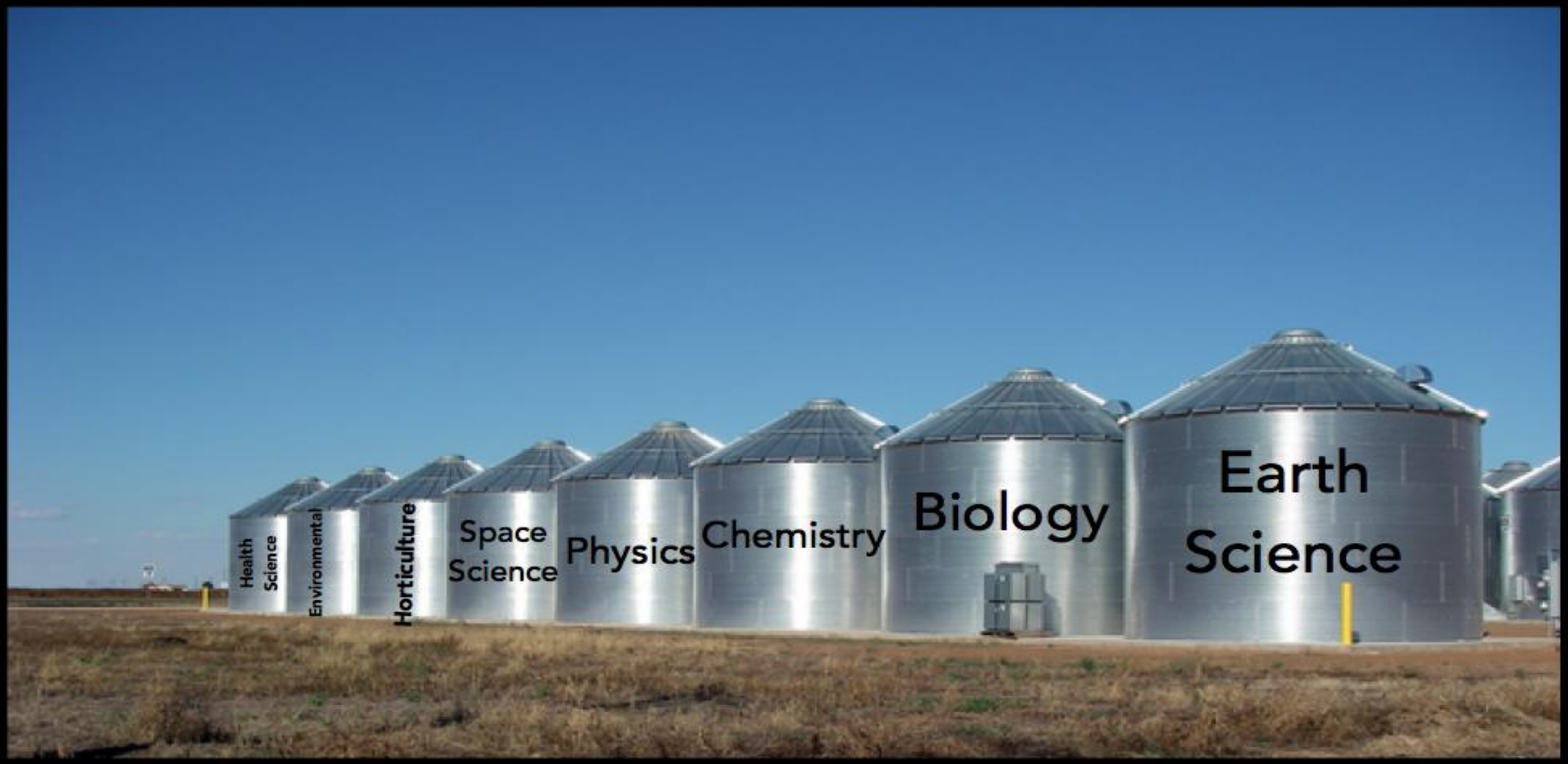
- Ask questions (for science) & define problems (for engineering)
- Develop & use models
- Plan & carry out investigations
- Analyze & interpret data
- Use mathematics & computational thinking
- Construct explanations (for science) & design solutions (for engineering)
- Engage in argument from evidence
- Obtain, evaluate, and communicate information

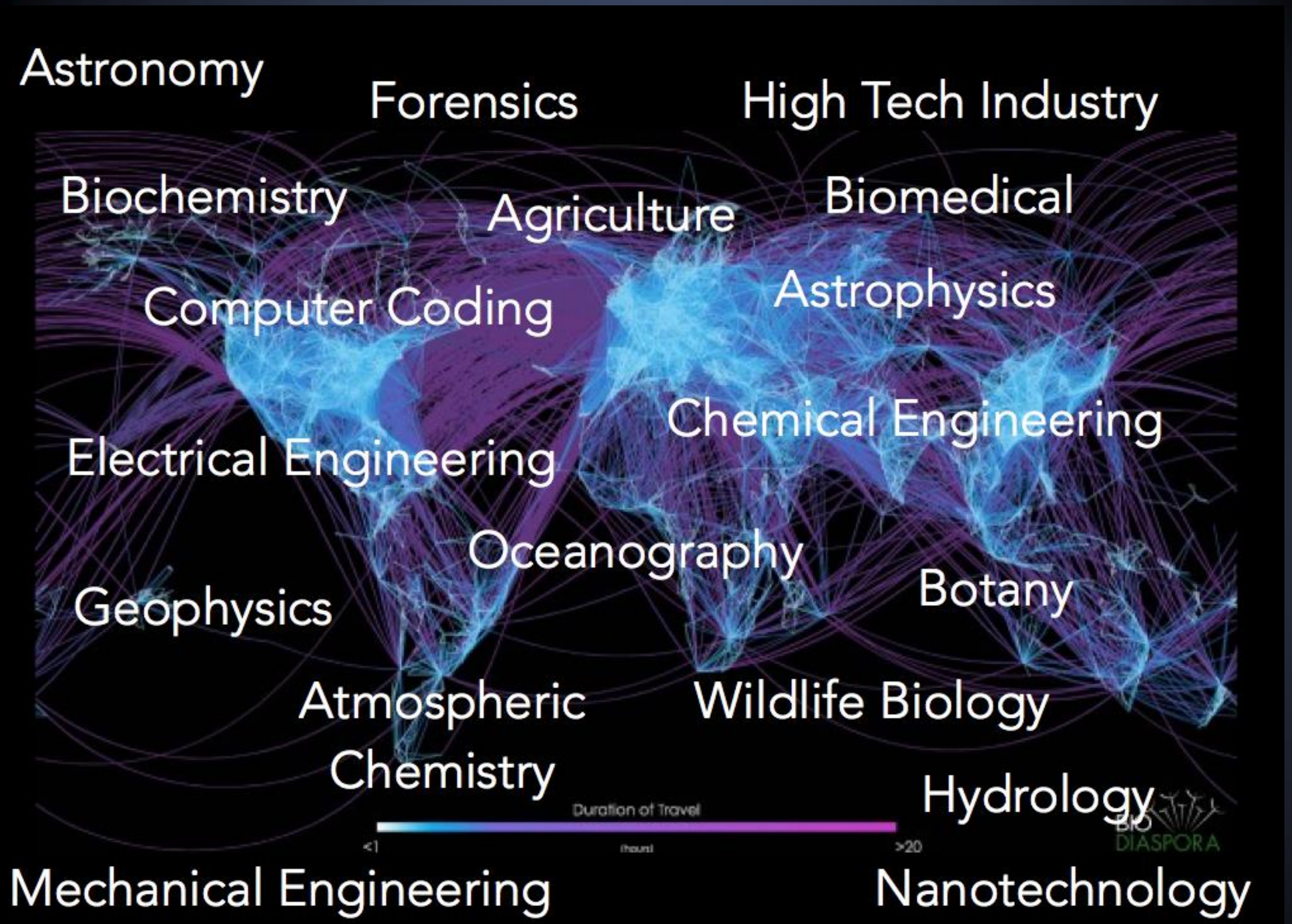
Crosscutting Concepts

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

Disciplinary Core Ideas

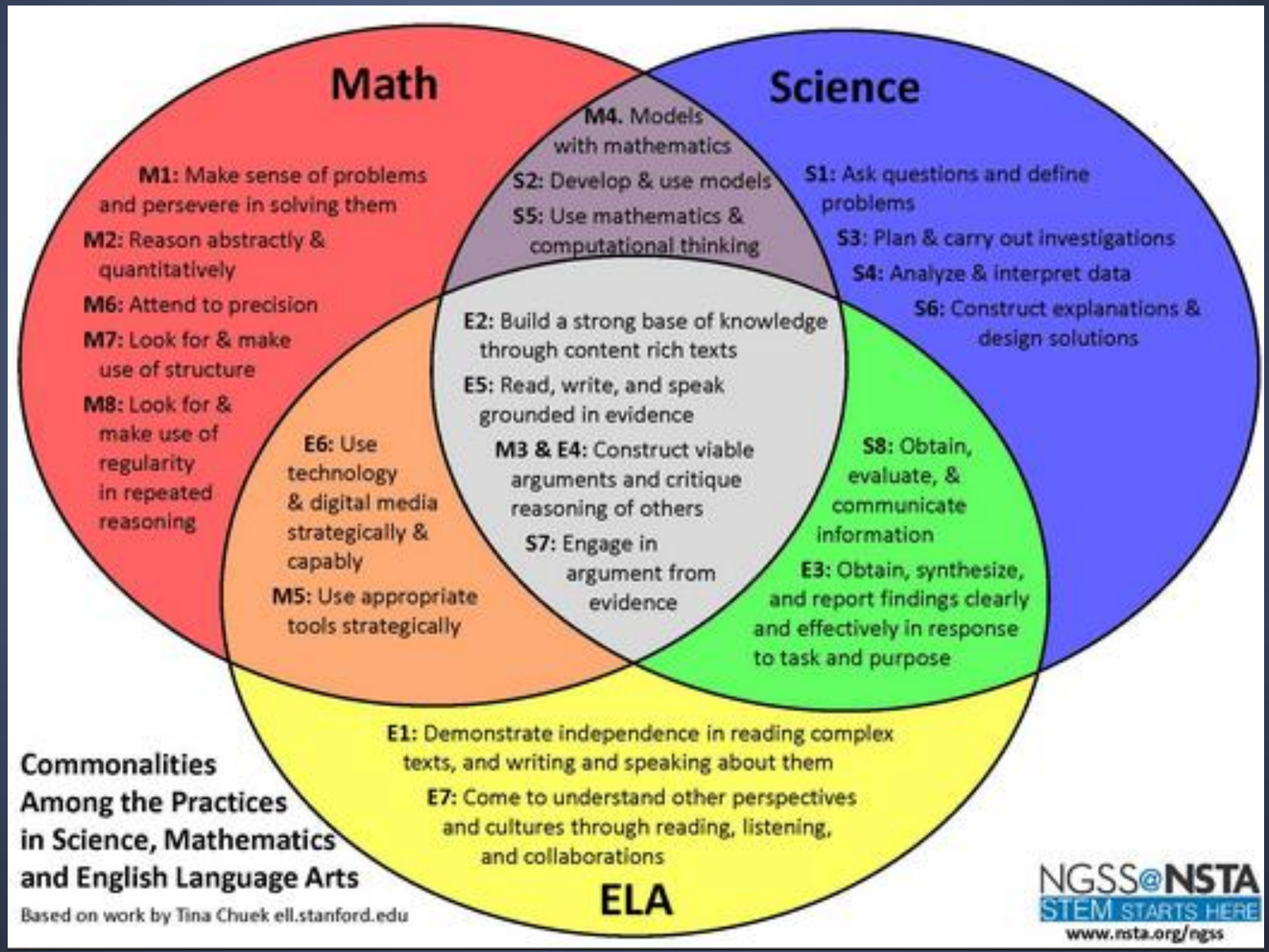
- Physical Science
- Life Science
- Earth & Space Sciences
- Engineering, Technology & Applications of Science


Health Science
Environmental
Horticulture
Space Science
Physics
Chemistry
Biology
Earth Science


Astronomy
Forensics
High Tech Industry
Biochemistry
Agriculture
Biomedical
Computer Coding
Astrophysics
Chemical Engineering
Electrical Engineering
Oceanography
Geophysics
Botany
Atmospheric Chemistry
Wildlife Biology
Hydrology
Duration of Travel
<1
hours
>20
Mechanical Engineering
Nanotechnology


Performing Arts
Foreign Language
Technology
Social Studies
Health & P.E.
Language Arts
Math
Science

Explicit Ties to ELA & Math

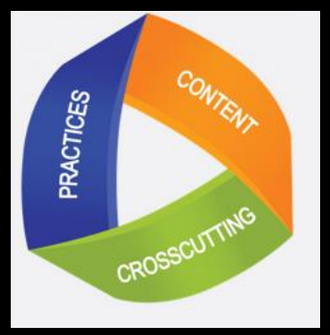


Solving the Mystery of the Megaflood:

4th Graders engage in the Scientific Practices, Core Ideas, and Crosscutting Concepts of the Next Generation Science Standards

"Ideas without precedent are generally looked upon with disfavor and men are shocked if their conceptions of an orderly world are challenged."

J Harlen Bretz, 1928

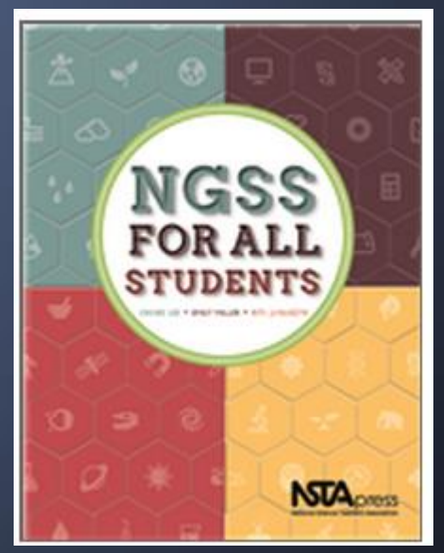


Jennifer Whitten - Beaver Acres Elementary (4th Grade)

Case Studies - SCIENCE FOR ALL STUDENTS

Appendix D Case Studies

- Economically disadvantaged students
- Students from major racial and ethnic groups
- Students with disabilities
- Students with limited English proficiency
- Girls
- Students in alternative education programs
- Gifted and talented students



Resources and Support

- A Framework for K-12 Science Education

- Next Generation Science Standards
  - EQuIP Rubric for Lessons and Unit Alignment
  - Middle and High School Sample Tasks
  - K-12 Evidence Statements
  - NGSS Publishers Criteria (feedback period)

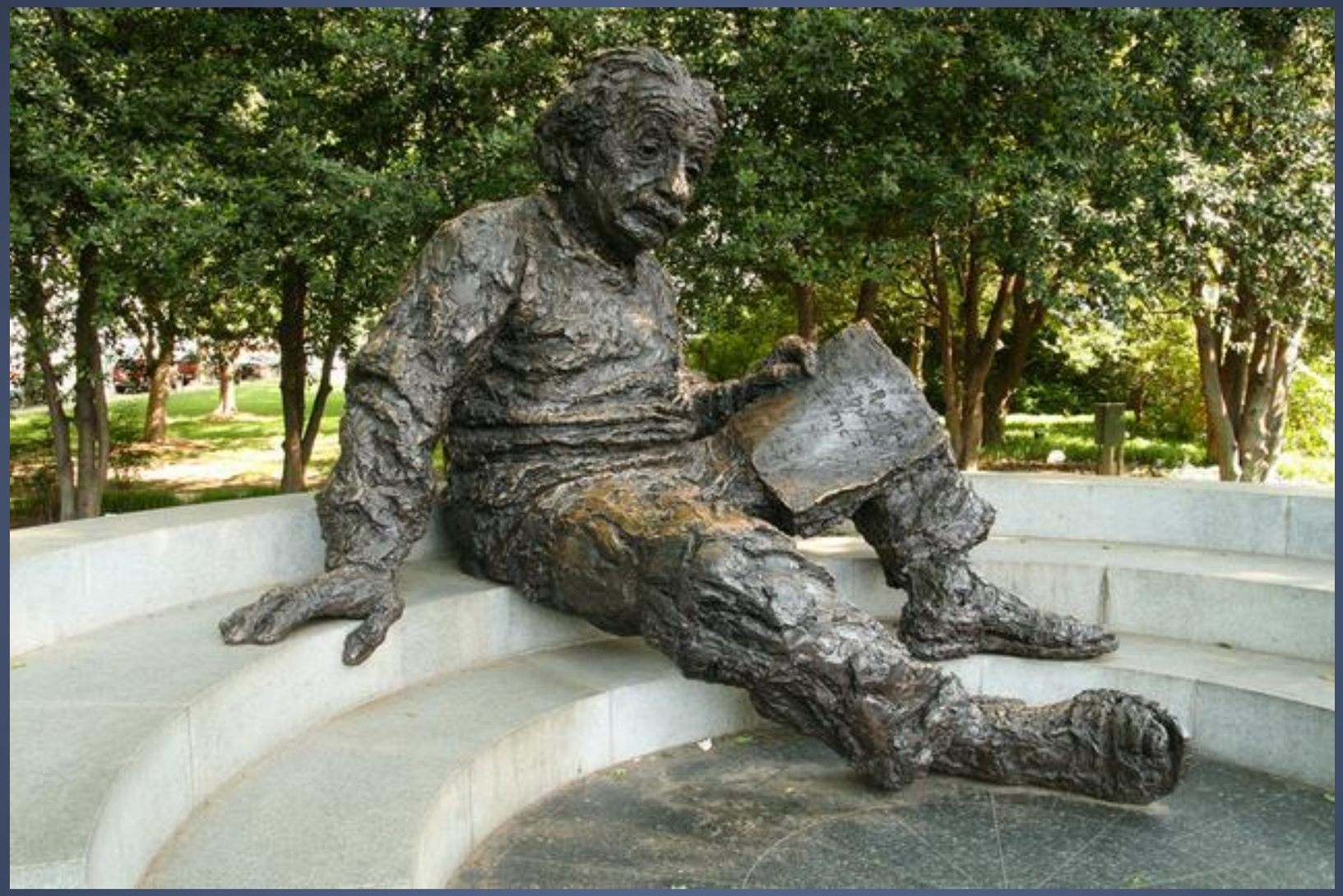
- Oregon Department of Education
  - Science/STEM Education Updates
  - Network for Quality Teaching & Learning (PLT Conferences)
  - Instructional Materials Criteria (expected Summer 2016 for formal review)
  - Science/Mathematics and Science/ELA Performance Tasks
  - 3-D Assessment Resources

Science Assessment:
What Does 3-dimensional Science Assessment Look Like?

Oregon Department of Education

Spring 2015-Spring 2018

GIVE PERMISSION TO MAKE MISTAKES!



"A person who never made a mistake never tried anything new."
—Albert Einstein

MS.Natural Selection and Adaptations

MS.Natural Selection and Adaptations

Students who demonstrate understanding can:

MS-LS4-1. **Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2. **Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.** [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3. **Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.** [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

MS-LS4-4. **Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.** [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-6. **Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.** [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

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 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)
- Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)

Using Mathematics and Computational Thinking
Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)

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 ideas, principles, and theories.

- Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2)
- Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)

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-LS4-1)

Disciplinary Core Ideas

LS4.A: Evidence of Common Ancestry and Diversity

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)

LS4.C: Adaptation

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

Crosscutting Concepts

Patterns

- Patterns can be used to identify cause and effect relationships. (MS-LS4-2)
- Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4-3)

Cause and Effect

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-6)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)

Adapted from Furtak, E.M., Glasser, H., & Wolfe, Z.M. (in press). *The Feedback Loop: A Science Teacher's Guide to Improving Teaching and Enhancing Student Learning.* Arlington, VA: NSTA Press.

Name:_____ Period:_____

Adaptation

There is a population of foxes living together in foothills of Denver Colorado where there is a large variety of habitats from trees and open grass fields. The fox populations consist of these three types of color variations. Imagine that there is a major fire in the area where these foxes lived. Now there are fewer trees in the area

Fox 1

Fox 2

Fox 3

1. Predict which of these fox populations would be more successful in surviving in order to reproduce under these new conditions.

2. Explain your reasoning?

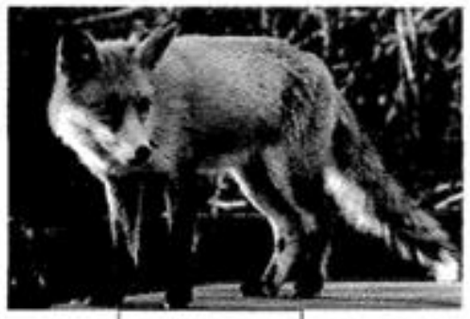
3. What could we do to find out if your prediction is correct?

Adapted from Furtak, E.M., Glasser, H., & Wolfe, Z.M. (in press). *The Feedback Loop: A Science Teacher's Guide to Improving Teaching and Enhancing Student Learning*. Arlington, VA: NSTA Press.

Adaptation [redacted]

There is a population of foxes living together in foothills of Denver Colorado [redacted] a large variety of habitats from trees and open grass fields. The fox populations consist of these three types of color variations. Imagine that there is a major fire in the area where these foxes lived. Now there are fewer trees in the area

Fox 1



Fox 2

Fox 3

1. Predict which of these fox populations would be more successful in surviving in order to reproduce under these new conditions.

Fox 1

2. Explain your reasoning?

Fox 1 would survive long under the conditions because she is going to be smoke on ash. The fox is black so it would be consisted in the ash. It could hide and hunt without being seen so it could survive. That's why the fox 1 would survive longer

3. What could we do to find out if your prediction is correct?

We could put them in a indoor facility and make the woods like come to life and see what happen

Adapted from Furtak, E.M., Glasser, H., & Wolfe, Z.M. (in press). *The Feedback Loop: A Science Teacher's Guide to Improving Teaching and Enhancing Student Learning*. Arlington, VA: NSTA Press.

Adapted from Furtak, E.M., Glasser, H., & Wolfe, Z.M. (in press). *The Feedback Loop: A Science Teacher's Guide to Improving Teaching and Enhancing Student Learning.* Arlington, VA: NSTA Press.

Tracking Inferences About Student Learning

Things the students understand that I can use as a resource for my instruction	What the students need to work on

Adapted from Furtak, E.M., Glasser, H., & Wolfe, Z.M. (in press). *The Feedback Loop: A Science Teacher's Guide to Improving Teaching and Enhancing Student Learning.* Arlington, VA: NSTA Press.

From a Performance Expectation to Learning Performances

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.

- LP C-01: Students should be able to analyze and interpret data to claim that substances are the same or different.

- LP C-02: Students should be able to construct an explanation about how they determine that substances are the same based upon characteristic properties.

- LP C-05: Students should be able to analyze and interpret data to determine whether a reaction has occurred using properties of substances before and after the substances interact.

- LP C-06: Students should be able to construct an explanation about how they determine that a chemical reaction has occurred based on properties of substances before and after substances interact.

Explanation Assessment Task

Maria found four different bottles filled with unknown pure liquids. She measured the properties of each liquid. The measurements are displayed in the data table below. Maria wonders if any of the liquids are the same substance.

Liquid	Density	Color	Volume	Boiling Point
1	1.0 g/cm^3	Clear	6.1 cm^3	100 C°
2	0.89 g/cm^3	Clear	6.1 cm^3	211 C°
3	0.92 g/cm^3	Clear	10.2 cm^3	298 C°
4	0.89 g/cm^3	Clear	10.2 cm^3	211 C°

Use the data in the table to:

1) Write a claim stating whether any of the liquids are the same substance.
2) Provide at least two pieces of evidence to support your claim.
3) Provide reason(s) that justify why the evidence supports your claim.

Task Features

- Focus on density and boiling point
- Tasks provide data about characteristic properties of substances
- Tasks provide a motivating context
- Can provide various levels of support

0 x 7.50 in

Look for Claim, Evidence Reasoning

Student 1:

I think that Sample 2 and Sample 4 are the same substance. I think this because they have the same density, 0.89g/cm^3. They also have the same boiling point, of 211º C. Having the same density and boiling point provides evidence that Sample 2 and Sample 4 are the same substance because these two pieces of evidence are properties. Properties are unique characteristics that help to identify and distinguish substances, and they do not change based on amount. The same substances have the same properties, so since Sample 2 and Sample 4 have the same properties, it is very likely that they are the same substance. Volume is not a property, because it changes based on amount (it is amount) and so although they have different volumes, it does not matter in terms of being the same substance.

Student 2

None of the samples in the table could be the same substance. Density, volume, and boiling point are all properties of a substance. Properties are unique characteristics of a substance. For two samples to be the same, they have to have the same properties. None of the samples shown in the table have the same properties.

Modeling assessment task

Watch the video clip. Construct a model to explain why the M&M behaved differently in cold, room temperature, and hot water. Your model should include both pictures and words to explain the behavior of M&M particles in the water at different temperatures.

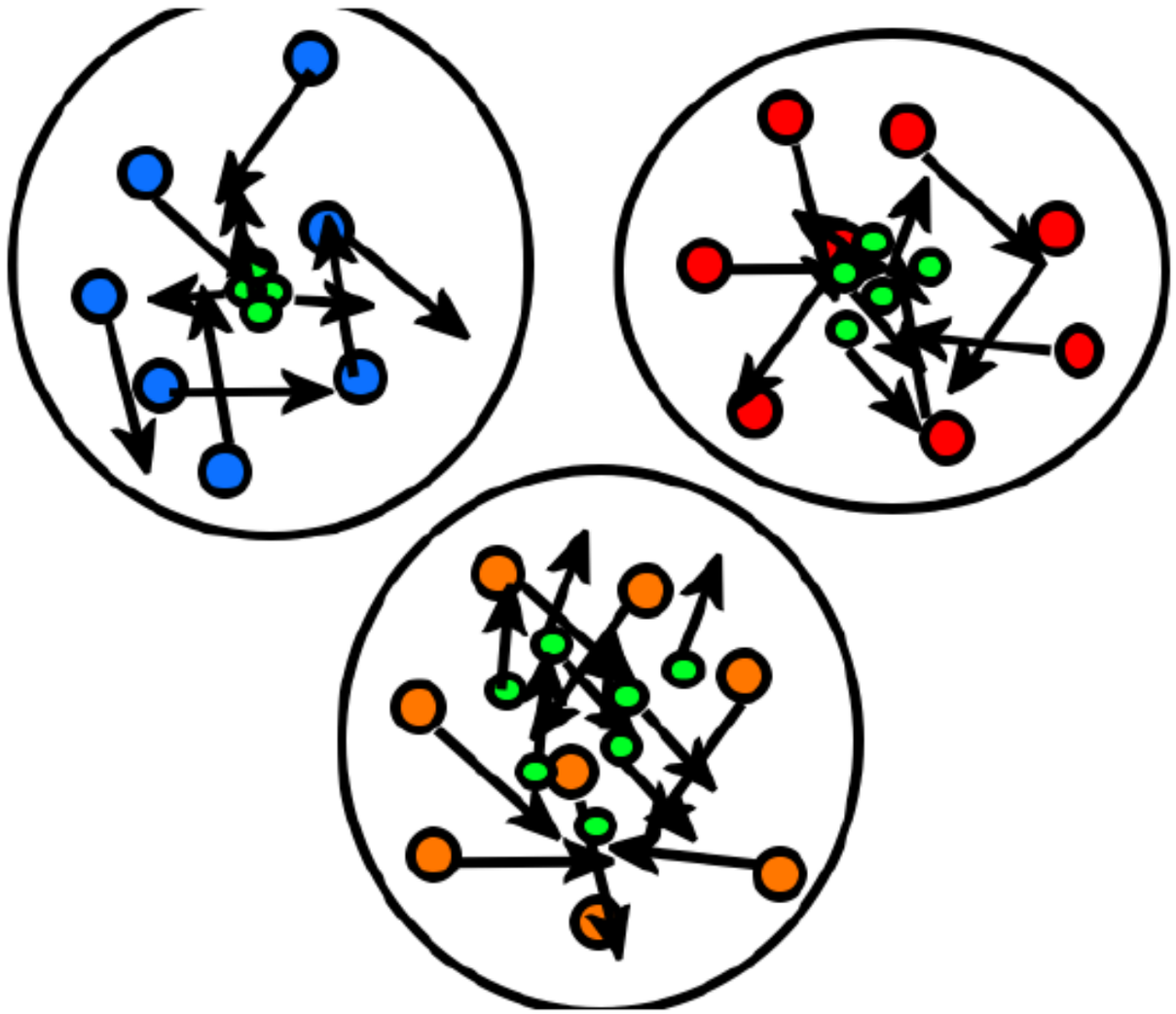
Cold Water (5° C)	Room Temperature Water (20 °C)	Hot Water (80 °C)

http://authoring.concord.org/activities/731/pages/4238/3a3512b2-f193-4fdf-8289-4f19ad8200ea

Task Features

- Task includes evidence that particles are in motion.
- Task includes evidence for speed of particle motion.
- Task presents addition or removal of thermal energy.
- Tasks provide motivating context.

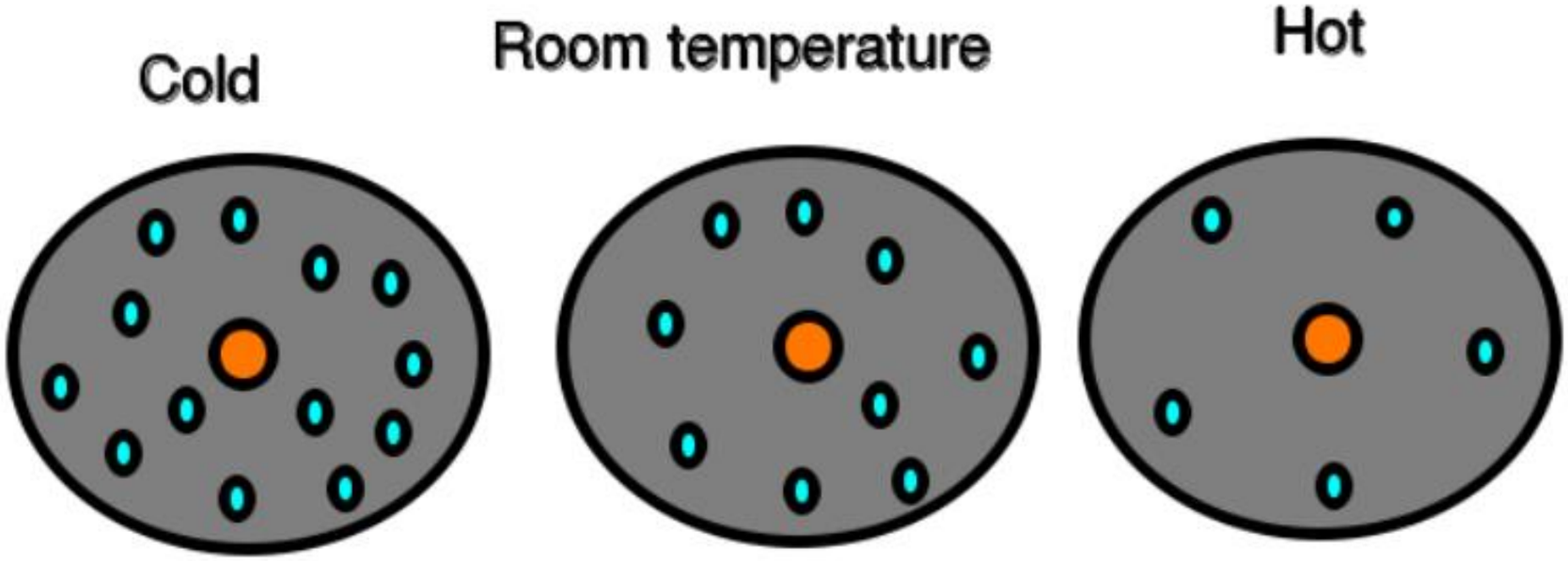
Student response 3 (M&M item)



Key:
green particles:m & m particles
orange particles: hot water particles
Red particles:room temperature particles
Blue particles:cold water particles
Arrows:movement

The m&m particles get more energy in the hot water so they move faster, hit each other harder, and spread farther apart. In the colder water the m&m particles move slower and don't spread apart very far.

Student response 2 (M&M item)



M&Ms are put in water and the particles are spreading out more when they are in hot water, and less when they are in colder water.

Formative Assessment Insights

Free, online course for K-12 Teachers, Instructional Coaches, and PD Staff

Visit our *e-brochure* at http://fa-insights.wested.org.

Through 2 hours/week of professional learning in teams over the course of six months (September through March) participants will:

- ✓ gain deeper knowledge of college- and career-ready standards across content areas,
- ✓ develop knowledge and skills in implementing formative assessment practices effectively in support of deeper learning.

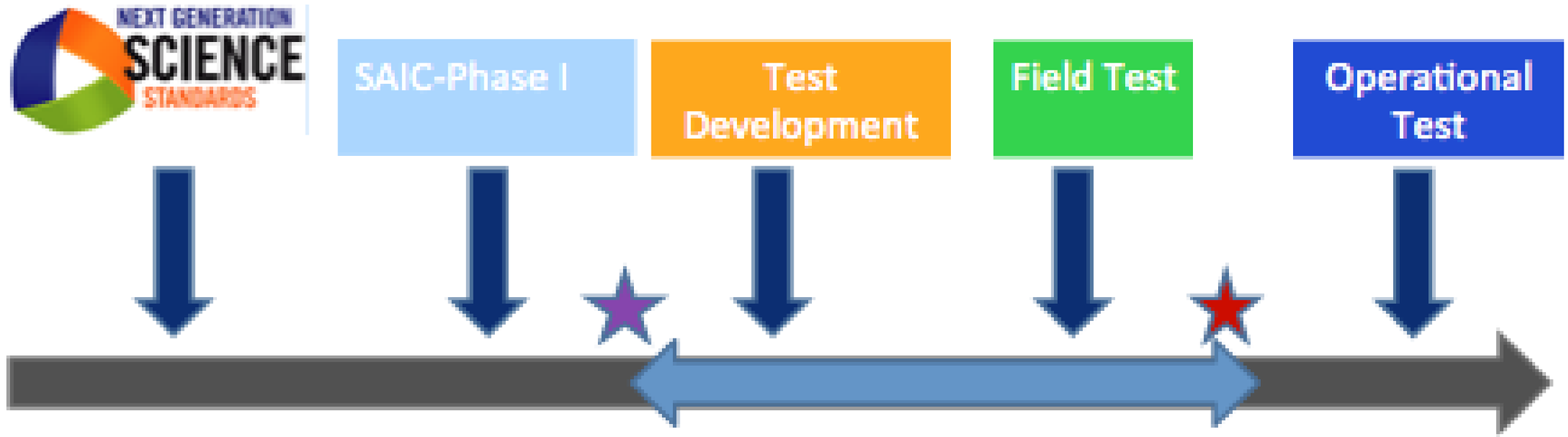
Optional: three graduate credits available through COSA/PSU; additional requirements and costs ($250) apply.

*Deadline to register is **August 21st***.*

- **Schools and districts** registering in **teams**: http://fa-insights.wested.org/or-group-registration/
- **Individual** registration: http://fa-insights.wested.org/or-registration/

*Contact Renee LeDoux at renee.ledoux@state.or.us or 503-947-2545 if you have any questions about the course of have concerns about meeting this registration deadline.

Science Assessment Transition (DRAFT)



New Scoring Guide Development Fall 2015-Winter 2016

Scoring Guide Field Test Spring 2016

Operational Scoring Guide 2017-2018

NGSS Evidence Statements Released

Adopted NGSS Aligned Instructional Materials in Classrooms (Proposed)

CCSSO Science Assessment Item Collaborative (SAIC)

- 13 states (AR, CA, CT, HI, IL, KY, MA, MD, MI, NV, OR, WA, WV & Virgin Islands

- CCSSO (Project Management), WestEd (Consultant) and Achieve (Research Partner)

- Phase I (January-June 30,2015):
  - **Assessment Framework**
  - **Item Content Specifications**
  - **Prototype Item Clusters (5th grade & High School)**

*Collaborative & Prototype Development Planning Meeting (May 14-15, 2015)

** Prototype Development Follow Up Meeting (June 2015)

Science Assessment

Questions

1) Do you support the suggested Science Assessment Transition timeline? Concerns?
2) Do you support the high school science test being offered at a different grade level? If so, which one for accountability purposes (currently 11th grade)?
3) Do you support students only having one opportunity on the new NGSS aligned assessment? Concerns?
4) Do you support the development of new scoring guides that are aligned to the 2014 Science Standards (NGSS) Science and Engineering Practices? (Grade level vs. Grade band?)

NEXT GENERATION SCIENCE STANDARDS

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

Resources and Support

- A Framework for K-12 Science Education

- Next Generation Science Standards
  - EQuIP Rubric for Lessons and Unit Alignment
  - Middle and High School Sample Tasks
  - K-12 Evidence Statements
  - NGSS Publishers Criteria (feedback period)

- Oregon Department of Education
  - Science/STEM Education Updates
  - Instructional Materials Criteria (expected Summer 2016 for formal review)
  - Science/Mathematics and Science/ELA Performance Tasks
  - 3-D Assessment Resources

Thank you

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rachel.aazzerah@state.or.us