Illinois State Board of Education

ROE|ISC IARSS

School Year 2022/23
Capacity Builders Series

May 2023

Equity ● Quality ● Collaboration ● Community

Welcome & Housekeeping

Agenda

- Welcome & Housekeeping
- NGSS 101
- NGSS: Continue Learning
- District Spotlight

Housekeeping

- Please take a few minutes to register for this event by using this link: https://forms.office.com/r/ZkY21EFy72

- Please pull up the slides, we will be working in them during the session: https://docs.google.com/presentation/d/1PGvBGQjGMPZVob2GKunwp8eQ-8wdYNRtxRDWehHEOdE/edit#slide=id.gf9b561472c_0_0

- All resources are archived on ROE 35 google site and ISBE's Standards and Courses webpage

Objectives

During this interactive presentation, participants will be engaged in a high-level overview of the three dimensions of the Illinois Learning Standards for Science.

1. By the end of this presentation, participants will be able to: identify and describe the 3 dimensions of the Illinois learning standards for science.

What is your level of familiarity with the Next Generation Science Standards?

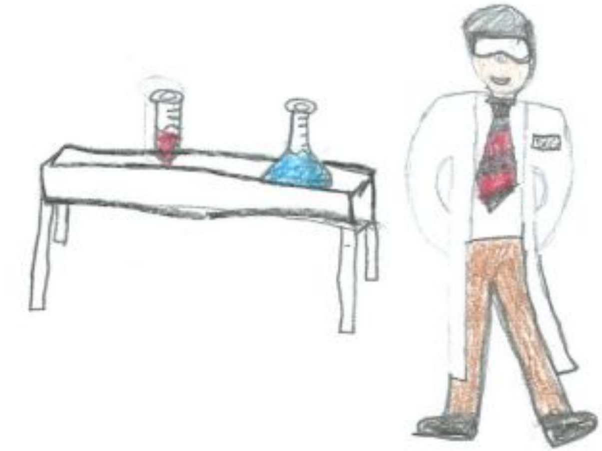
- NGS What??
- I have heard them mentioned, but don't know many details because science is not my content area.
- Science is not my jam, but I have attended one or more presentations about it and/or read about it in detail.
- Science is my jam, and I feel very knowledge about the shifts that are need to implement these standards.
- Caitlyn, stop talking. I eat, breath, and sleep NGSS and I can do this presentation for you.

Reflect: 3-Minute Pause

Jamboard

Take a few minutes to pause and reflect on your own K-12 science education experience. Jot down on a sticky note what comes to mind when you think back.

- Positive or negative experiences you encountered, your ability to connect to the content/science/scientists, the science instruction modality, teacher role vs. student role, cultural funds of knowledge your teachers accessed.



Students don’t relate to science or scientists.

Students don’t build the skills needed for real science.

Students don’t understand where science comes from.

History of Illinois Science Learning Standards

Developed in 1985, officially adopted in 1997

Science Goals 11-13 geared at science

Goal 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems.

Goal 12: Understand the fundamental concepts, principals, and interconnections of the life, physical and earth/space sciences.

Goal 13: Understand the relationships among science, technology, and society in historical and contemporary contexts.

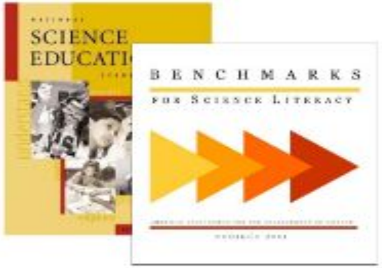
SCIENCE

STATE GOAL 11: Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.

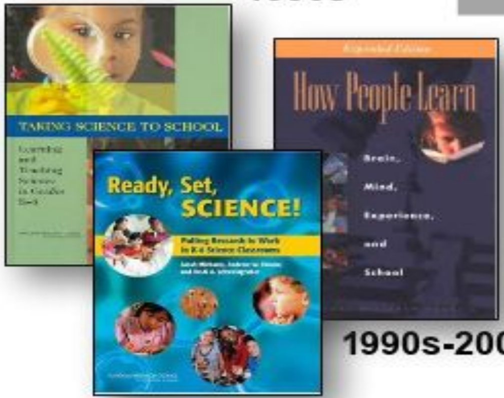
WHY THIS GOAL IS IMPORTANT: The inquiry process prepares learners to engage in science and apply methods of technological design. This understanding will enable students to pose questions, use models to enhance understanding, make predictions, gather and work with data, use appropriate measurement methods, analyze results, draw conclusions based on evidence, communicate their methods and results, and think about the implications of scientific research and technological problem solving.

As a result of their schooling students will be able to:

LEARNING STANDARD	EARLY ELEMENTARY	LATE ELEMENTARY	MIDDLE/JUNIOR HIGH SCHOOL	EARLY HIGH SCHOOL	LATE HIGH SCHOOL
A. Know and apply the concepts, principles and processes of scientific inquiry.	**11.A.1a** Describe an observed event. **11.A.1b** Develop questions on scientific topics. **11.A.1c** Collect data for investigations using measuring instruments and technologies. **11.A.1d** Record and store data using available technologies. **11.A.1e** Arrange data into logical patterns and describe the patterns. **11.A.1f** Compare observations of individual and group results.	**11.A.2a** Formulate questions on a specific science topic and choose the steps needed to answer the questions. **11.A.2b** Collect data for investigations using scientific process skills including observing, estimating and measuring. **11.A.2c** Construct charts and visualizations to display data. **11.A.2d** Use data to produce reasonable explanations. **11.A.2e** Report and display the results of individual and group investigations.	**11.A.3a** Formulate hypotheses that can be tested by collecting data. **11.A.3b** Conduct scientific experiments that control all but one variable. **11.A.3c** Collect and record data accurately using consistent measuring and recording techniques and media. **11.A.3d** Explain the existence of unexpected results in a data set. **11.A.3e** Use data manipulation tools and quantitative (e.g., mean, mode, simple equations) and representational methods (e.g., simulations, image processing) to analyze measurements. **11.A.3f** Interpret and represent results of analysis to produce findings. **11.A.3g** Report and display the process and results of a scientific investigation.	**11.A.4a** Formulate hypotheses referencing prior research and knowledge. **11.A.4b** Conduct controlled experiments or simulations to test hypotheses. **11.A.4c** Collect, organize and analyze data accurately and precisely. **11.A.4d** Apply statistical methods to the data to reach and support conclusions. **11.A.4e** Formulate alternative hypotheses to explain unexpected results. **11.A.4f** Using available technology, report, display and defend to an audience conclusions drawn from investigations.	**11.A.5a** Formulate hypotheses referencing prior research and knowledge. **11.A.5b** Design procedures to test the selected hypotheses. **11.A.5c** Conduct systematic controlled experiments to test the selected hypotheses. **11.A.5d** Apply statistical methods to make predictions and to test the accuracy of results. **11.A.5e** Report, display and defend the results of investigations to audiences that may include professionals and technical experts.
B. Know and apply the concepts, principles and processes of technological design.	**11.B.1a** Given a simple design problem, formulate possible solutions. **11.B.1b** Design a device that will be useful in solving the problem. **11.B.1c** Build the device using the materials and tools provided. **11.B.1d** Test the device and record results using given instruments, techniques and measurement methods. **11.B.1e** Report the design of the device, the test process and the results in solving a given problem.	**11.B.2a** Identify a design problem and propose possible solutions. **11.B.2b** Develop a plan, design and procedure to address the problem identifying constraints (e.g., time, materials, technology). **11.B.2c** Build a prototype of the design using available tools and materials. **11.B.2d** Test the prototype using suitable instruments, techniques and quantitative measurements to record data. **11.B.2e** Assess test results and the effectiveness of the design using given criteria and noting possible sources of error. **11.B.2f** Report test design, test process and test results.	**11.B.3a** Identify an actual design problem and establish criteria for determining the success of a solution. **11.B.3b** Sketch, propose and compare design solutions to the problem considering available materials, tools, cost effectiveness and safety. **11.B.3c** Select the most appropriate design and build a prototype or simulation. **11.B.3d** Test the prototype using available materials, instruments and technology and record the data. **11.B.3e** Evaluate the test results based on established criteria, note sources of error and recommend improvements. **11.B.3f** Using available technology, report the relative success of the design based on the test results and criteria.	**11.B.4a** Identify a technological design problem inherent in a commonly used product. **11.B.4b** Propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time. **11.B.4c** Develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations). **11.B.4d** Determine the criteria upon which the designs will be judged, identify advantages and disadvantages of the designs and select the most promising design. **11.B.4e** Develop and test a prototype or simulation of the solution design using available materials, instruments and technology. **11.B.4f** Evaluate the test results based on established criteria, note sources of error and recommend improvements. **11.B.4g** Using available technology, report to an audience the relative success of the design based on the test results and criteria.	**11.B.5a** Identify a design problem that has practical applications and propose possible solutions, considering such constraints as available tools, materials, time and costs. **11.B.5b** Select criteria for a successful design solution to the identified problem. **11.B.5c** Build and test different models or simulations of the design solution using suitable materials, tools and technology. **11.B.5d** Choose a model and refine its design based on the test results. **11.B.5e** Apply established criteria to evaluate the suitability, acceptability, benefits, drawbacks and consequences for the tested design solution and recommend modifications and refinements. **11.B.5f** Using available technology, prepare and present findings of the tested design solution to an audience that may include professional and technical experts.



1990s

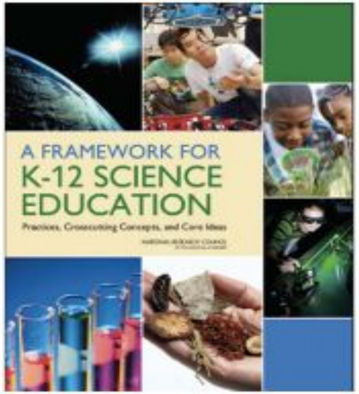


1990s-2009

Previous national science education efforts

The NGSS were created based around extensive evidence-based research.

Step 1



2010-2011
National Research Council (NRC) develops Conceptual Framework

This research laid the foundation for the Framework for K-12 Science Education, which lays out the three-dimensional structure underlying the NGSS

Step 2

NEXT GENERATION SCIENCE STANDARDS

April 2013
Released for states' adoption

This framework was "translated" to form the new standards, released April 2013

Conceptual Shifts in the Next Generation Science Standards

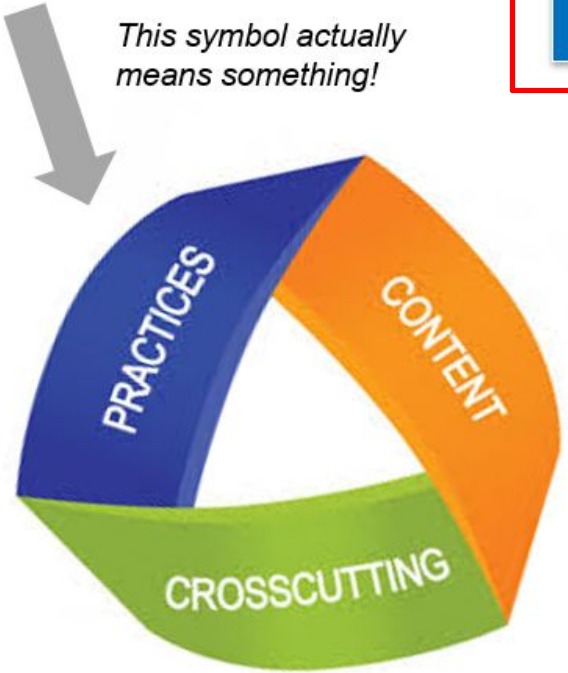
Appendix A

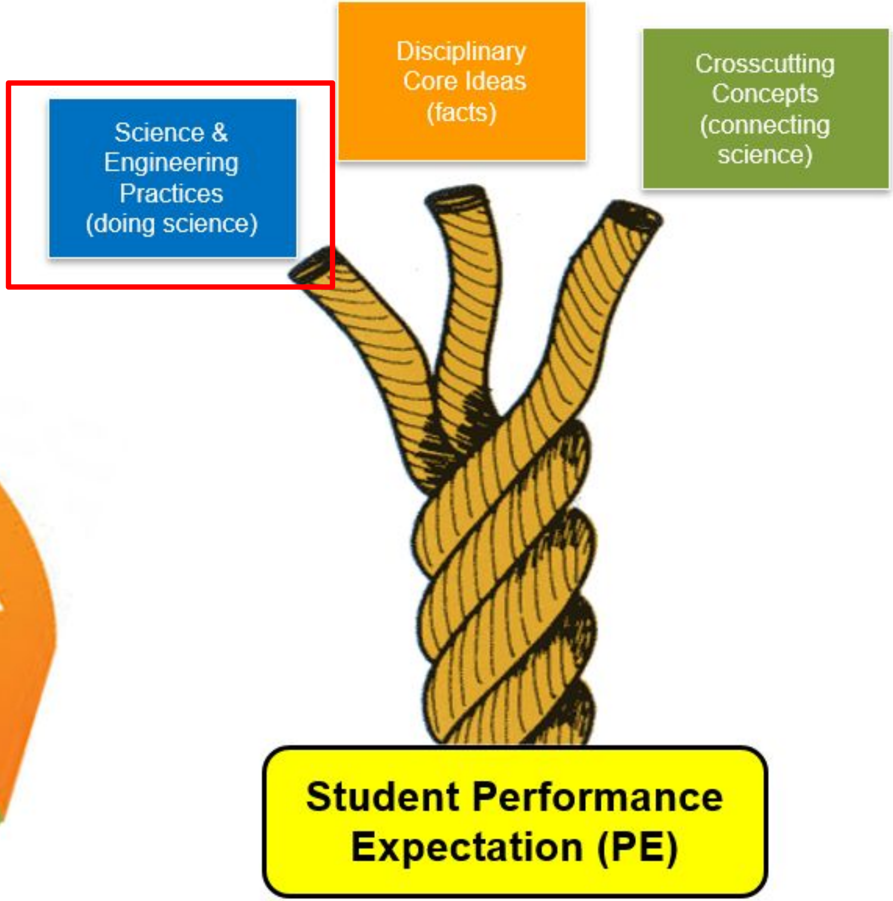
1. K-12 Science Education should reflect the interconnected nature of science **as it is practiced and experienced in the real world.** (I.E the 3 dimensions experienced together- not as separate entities)
2. The Next Generation Science Standards are **student** performance expectations- NOT curriculum.
3. The science concepts in the **NGSS build coherently** from K-12.
4. The NGSS focus on deeper understanding of content **as well as application of content**.
5. **Science and engineering are integrated in the NGSS from K-12**.
6. The NGSS are designed to prepare students for college, career, and citizenship.
7. The NGSS and Common Core State Standards (ELA and Mathematics) are aligned.

Based off these 7 shift, in the chat, I want you to write how this may change what a science classroom looks like.

NEXT GENERATION SCIENCE STANDARDS *

This symbol actually means something!





Performance Expectations

Foundation Boxes

Connection Boxes

MS.PS-SPM Structure and Properties of Matter

MS.PS-SPM Structure and Properties of Matter

Students who demonstrate understanding can:

a. Construct and use models to explain that atoms combine to form new substances of varying complexity in terms of the number of atoms and repeating subunits. [Clarification Statement: Examples of atoms combining can include Hydrogen (H_2) and Oxygen (O_2) combining to form hydrogen peroxide (H_2O_2) or water (H_2O).] [Assessment Boundary: Valence electrons and bonding energy are not addressed.]

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to explain, explore, and predict more abstract phenomena and design systems. • Use and/or construct models to predict, explain, and/or collect data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs. (a)	**PS1.A: Structure and Properties of Matter** • All substances are made from some 100 different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (a) • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (a)	**Patterns** Macroscopic patterns are related to the nature of microscopic and atomic-level structure. Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. Patterns can be used to identify cause and effect relationships. Graphs and charts can be used to identify patterns in data. (a)

Connections to other DCIs in this grade-level: **MS.ESS-ESP, MS.ESS-SS, MS.LS-MEOE**

Articulation of DCIs across grade-levels: **3.IF, 5.SPM, HS.PS.SPM, HS.PS-NP, HS.PS-E**

Common Core State Standards Connections: [Note: these connections will be made more explicit and complete in future draft releases]

ELA–

W.5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.6.1 Write arguments to support claims with clear reasons and relevant evidence.

W.7.1 Write arguments to support claims with clear reasons and relevant evidence.

SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

WHST.6-8.1 Write arguments focused on discipline-specific content.

RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Mathematics–

MP.4 Model with mathematics.

MP.8 Look for and express regularity in repeated reasoning.

6.SP Develop understanding of statistical variability

Summarize and describe distributions

Science and Engineering Practices
>>What do Scientists and Engineers do?<<

Group One	
Planning- research ahead of time Problem solving Reading and writing Research, investigation, analyze, seeking to understand Placed-based learning Take risks Present findings Collaboration, team work Solve math problems	Research/Investigate
	Communication (written, verbal, collaboration)
	Problem solving/Analysis

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Science and Engineering Practices
What do Scientists and Engineers do?

Group Two	
solve problems health advances research perform tests form hypotheses compare and contrast experiment are curious, ask questions	Data Interpretation

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Science and Engineering Practices
What do Scientists and Engineers do?

ROE|ISC IARSS

Group Three	
● Collaborate ● Problem solve ● Math ● Modeling ● Computer modeling ● Research ● Test former research ● Evaluate research or experiments ● Determine root cause ● Ask questions ● Define problems ● Communicate findings ● Work with data ● Hypothesize ● Organize data ● Writing to communicate ● Structure inquiry and/or research	Communication Data Usage and Interpretation Investigate Model Organize the Process Inquire

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Science and Engineering Practices
What do Scientists and Engineers do?

Group Four	
Problem Solve Collaborate Test hypothesis Collect data Learn new things about the work around us Engineers use new knowledge to build things Observe Research Experiment Present knowledge to wider community	Collaborate and Critique
	Communicate & Construct
	Experiment
	Solve problems
	Create
	Contextualize (the why, what, and how)

Reflection Questions

Science and Engineering Practices (SEP) Reflection Questions
Group One

1. Are there words that show up a lot? What are they?

   Collaboration
   Communication
   Problem Solving

2. Were there words on other posters that you didn't think of? Anything surprising?

   Very similar

   "Observing"
   "Planning"

3. Was it easy or hard to fill up these charts?

   The integration of multiple content areas can make it easy
   "Fun" teaching and learning

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Science and Engineering Practices (SEP) Reflection Questions
Group Two

1. Are there words that show up a lot? What are they?

Experiment, problem solve, collaborate, communicate

2. Were there words on other posters that you didn't think of? Anything surprising?

Risk taking, presenting knowledge to a wider community

3. Was it easy or hard to fill up these charts?

First column was ok; second was a bit more difficult

Science and Engineering Practices (SEP) Reflection Questions
Group Three

1. Are there words that show up a lot? What are they?

    Problem solving
    Collaboration
    Investigation
    Communication

2. Were there words on other posters that you didn't think of? Anything surprising?

    Take risks
    Creativity
    Engineering Design Process

3. Was it easy or hard to fill up these charts?

    The first one was easier, especially the left hand side.

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Science and Engineering Practices (SEP) Reflection Questions
Group Four

1. Are there words that show up a lot? What are they?

Collaboration
Analysis
Communication
Organizing

2. Were there words on other posters that you didn't think of? Anything surprising?

Nice to see Group 1 including place-based learning/focus.
Model & Design (Empathy, Iteration)
Curiosity

3. Was it easy or hard to fill up these charts?

Yes

Science and Engineering Practices (SEP)

[Appendix F]

Asking Questions and Defining Problems

Developing and Using Models

Planning and Carrying Out Investigations

Analyzing and Interpreting Data

Using Mathematics and Computational Thinking

Constructing Explanations and Designing Solutions

Engaging in Argument from Evidence

Obtaining, Evaluating, and Communicating Information

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., measurements, observations, patterns) to construct an explanation.

NGSS is a Piece of Cake

Performance Expectation

Baking Tools & Techniques

Science & Engineering Practices

Cake

Disciplinary Core Ideas

Frosting

Crosscutting Concepts

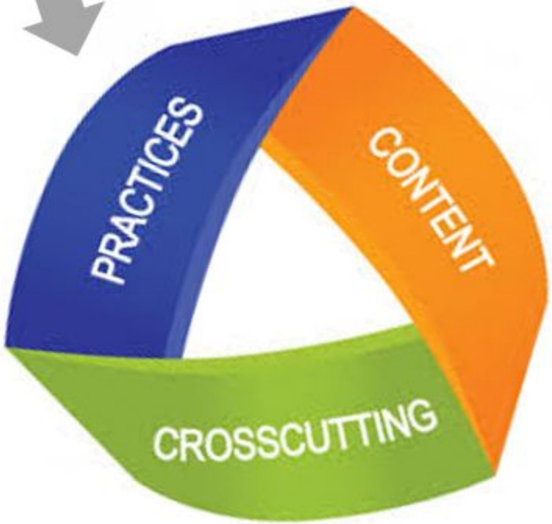
Adapted from NSTA

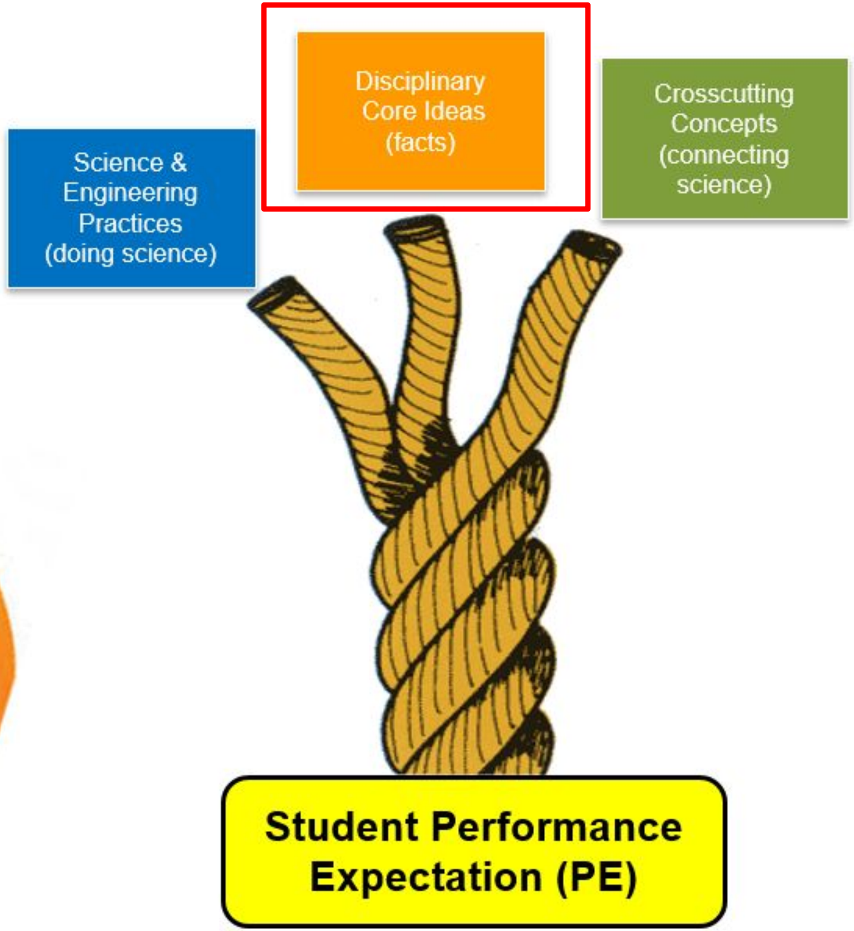
Science and Engineering Practices Additional Resources

- Appendix F- Science and Engineering Practices
- Practices should not stand along: How to sequence practices in a cascade to support student investigations
- Engaging English Learners in the Science and Engineering Practices
- Why should students learn to plan and carry out investigations in science and engineering?
- Why focus on science and engineering practices and not “inquiry?” Why is “the scientific method” mistaken?
- How can assessments be designed to engage students in a range of science and engineering practices?
- Getting their hands dirty: Engaging learners in authentic science practices outside the classroom
- Science and Engineering Posters

NEXT GENERATION SCIENCE STANDARDS *

This symbol actually means something!





Disciplinary Core Ideas (DCI)

Appendix F- DCI progressions
Appendix I Engineering Design

No more "mile wide, inch deep"

"…the framework focuses on a ***limited number of core ideas****... Reduction of the sheer sum of details to be mastered is intended to* ***give time*** *for students to engage in scientific investigations and argumentation and to achieve* ***depth of understanding*** *of the core ideas presented."*

"…our effort to identify a small number of core ideas ***may disappoint some scientists and educators*** *who find little or nothing of their favorite science topics included in the framework.*

*…**students will leave school better grounded in scientific knowledge and practices** than when instruction 'covers' multiple disconnected pieces of information that are memorized and soon forgotten once the test is over."*

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. *Appendix E: Progressions within the Next Generation Science Standards*. Washington, DC: The National Academies Press.

Disciplinary core ideas - Learning as a progression

"[The framework] is built on the notion of learning as a developmental progression. It is designed to help children continually build on and revise their knowledge and abilities."

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. *Appendix E: Progressions within the Next Generation Science Standards*. Washington, DC: The National Academies

SCIENCE!

SCIENCE!

Physical Sciences

Life Sciences

Earth and Space Sciences

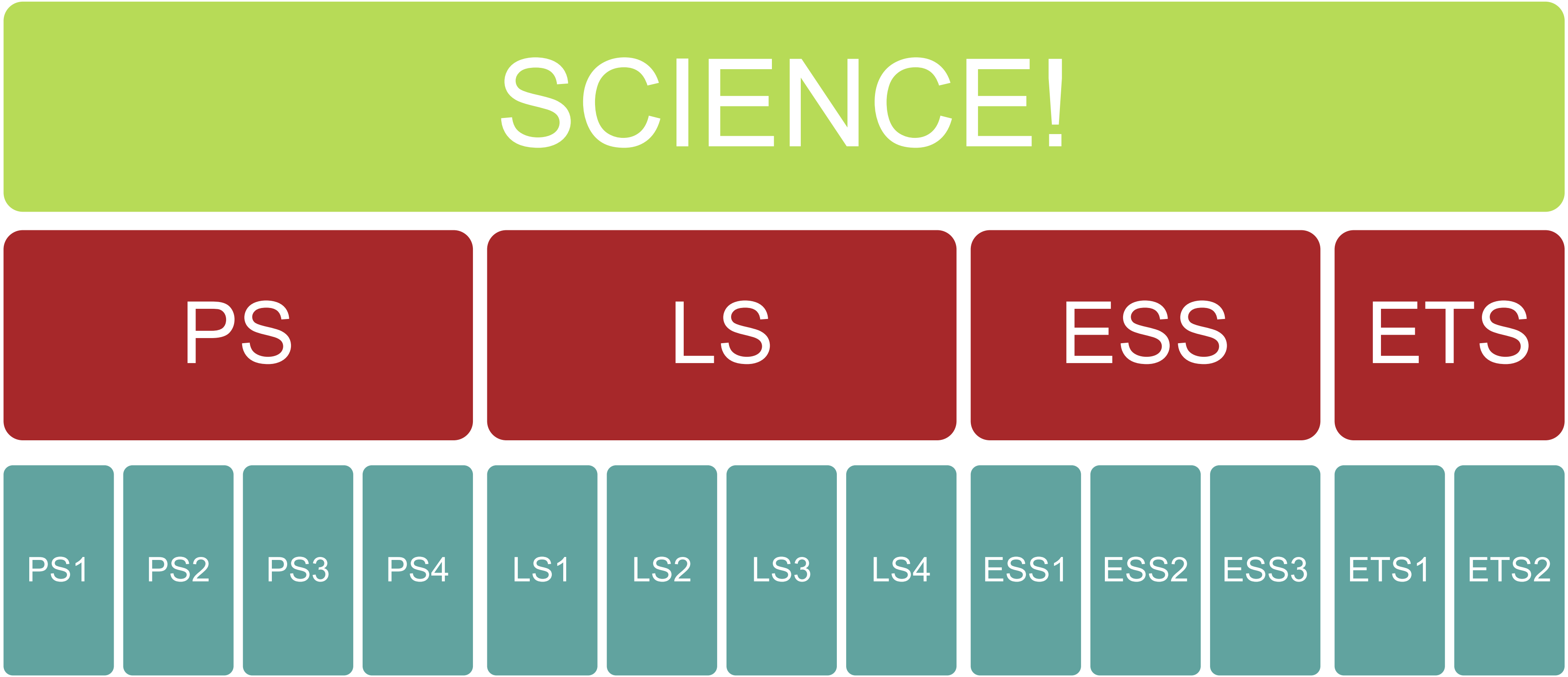
Engineering, Technology, and Applications of science

Disciplines

SCIENCE!

PS	LS	ESS	ETS

Disciplines



Disciplinary Core Ideas

Disciplinary Core Ideas (DCIs)

Core ideas should:

1. Have broad importance across multiple sciences or engineering disciplines or be a key organizing principle of a single discipline.
2. Provide a key tool for understanding or investigating more complex ideas and solving problems.
3. Relate to the interests and life experiences of students or be connected to societal or personal concerns.
4. Be teachable and learnable over multiple grades at increasing levels of depth and sophistication.

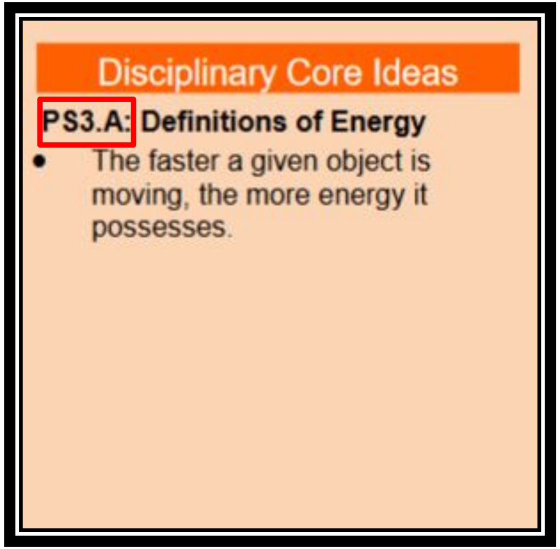
National Research Council (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington DC: The National Academies Press

SCIENCE!

- PS
  - PS1: PS1.A, PS1.B, PS1.C
  - PS2: PS2.A, PS2.B, PS2.C
  - PS3: PS3.A, PS3.B, PS3.C, PS3.D
  - PS4: PS4.A, PS4.B, PS4.C
- LS
  - LS1: LS1.A, LS1.B, LS1.C, LS1.D
  - LS2: LS2.A, LS2.B, LS2.C, LS2.D
  - LS3: LS3.A, LS3.B
  - LS4: LS4.A, LS4.B, LS4.C, LS4.D
- ESS
  - ESS1: ESS1.A, ESS1.B, ESS1.C
  - ESS2: ESS2.A, ESS2.B, ESS2.C, ESS2.D, ESS2.E
  - ESS3: ESS3.A, ESS3.B, ESS3.C, ESS3.D
- ETS
  - ETS1: ETS1.A, ETS1.B, ETS1.C
  - ETS2: ETS2.A, ETS2.B

Disciplinary Core Ideas

Appendix F



SCIENCE!

PS				LS				ESS			ETS	
PS1	PS2	PS3	PS4	LS1	LS2	LS3	LS4	ESS1	ESS2	ESS3	ETS1	ETS2
PS1.A PS1.B PS1.C	PS2.A PS2.B PS2.C	PS3.A PS3.B PS3.C PS3.D	PS4.A PS4.B PS4.C	LS1.A LS1.B LS1.C LS1.D	LS2.A LS2.B LS2.C LS2.D	LS3.A LS3.B	LS4.A LS4.B LS4.C LS4.D	ESS1.A ESS1.B ESS1.C	ESS2.A ESS2.B ESS2.C ESS2.D ESS2.E	ESS3.A ESS3.B ESS3.C ESS3.D	ETS1.A ETS1.B ETS1.C	ETS2.A ETS2.B

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NGSS is a Piece of Cake

Performance Expectation

Baking Tools & Techniques

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Frosting

Crosscutting Concepts

Adapted from NSTA

Disciplinary Core Ideas Additional Resources

- Next Generation Science Standards: What's different, and do they matter?
- Overview: How can we promote equity in science education?
- How can science instruction leverage and develop student interests?
- Why you should stop pre-teaching science vocabulary and focus on students developing conceptual meaning first
- Why students should investigate contemporary science topics- and not just 'settled' science?
- How teachers can develop formative assessments that fit a three-dimensional view of science learning
- Evaluating curriculum materials for alignment with the new vision for K-12 science education
- Research Brief: Supporting teacher professional communities to implement school-wide initiatives
- Using Phenomena in BGSS-Designed lessons and units
- How to define meaningful daily learning objectives for science investigations
- Why is it crucial to make cultural diversity visible in STEM education

NEXT GENERATION SCIENCE STANDARDS *

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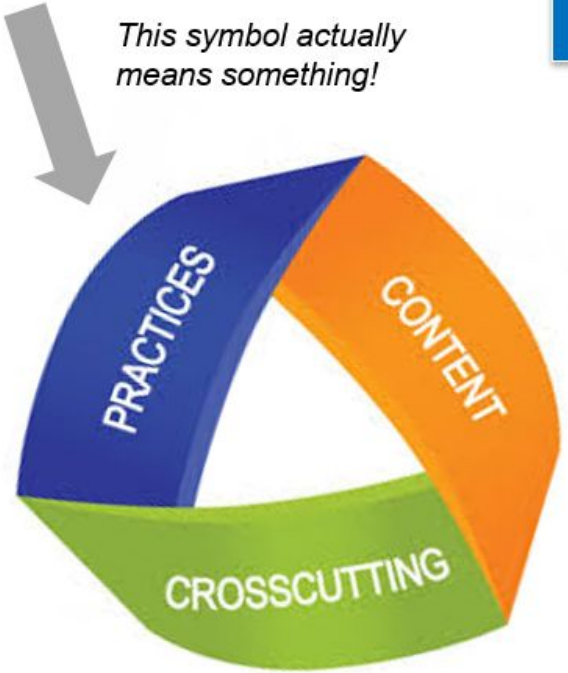

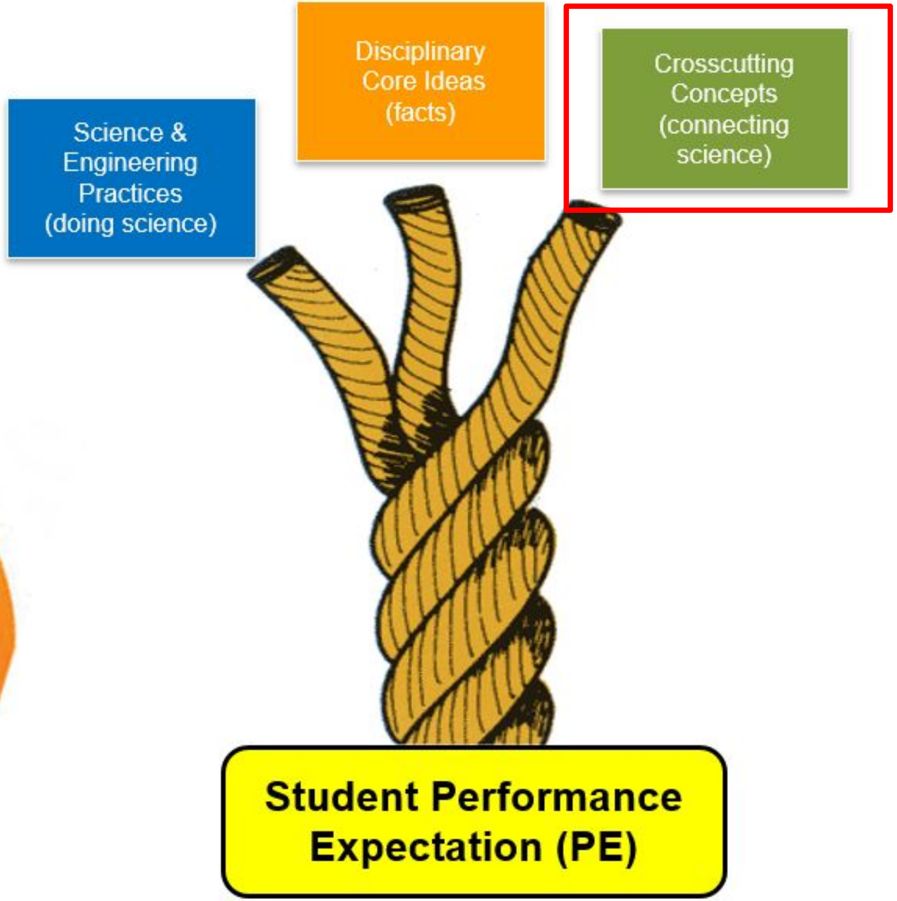

Crosscutting Concepts (CCCs)

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

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Classroom Vignette patterns in garbage

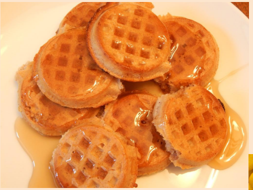
Directions

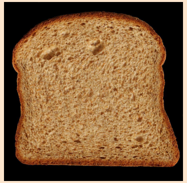
- Sort through your garbage, and make observations of the garbage materials
- Group your garbage into different categories based on similarities or differences you observe
  - Please note: you do not have to use all four squares, but you must used two or more.

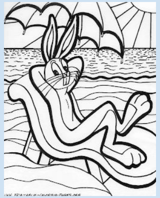
Be prepared to share thoughts on…

- How did you decide what materials go together?
- What is similar about these materials?
- What is different about the materials?
- If you were given a new material, how would you know which category it belongs to?
- As you are sorting, is there anything you are noticing or wondering about?

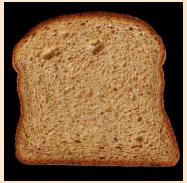
Group One

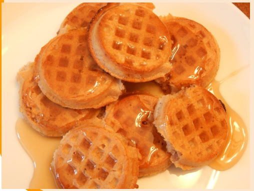


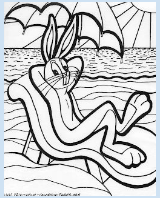




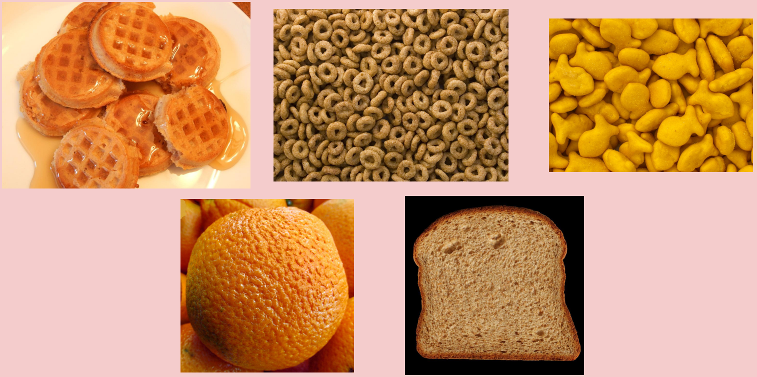
Group Two



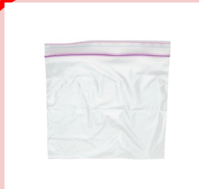


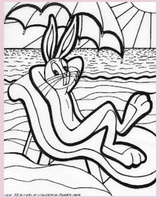


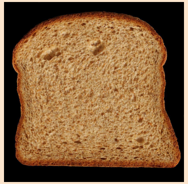
Group Three

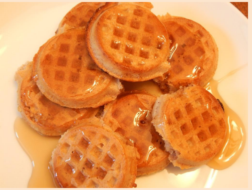


Group Four









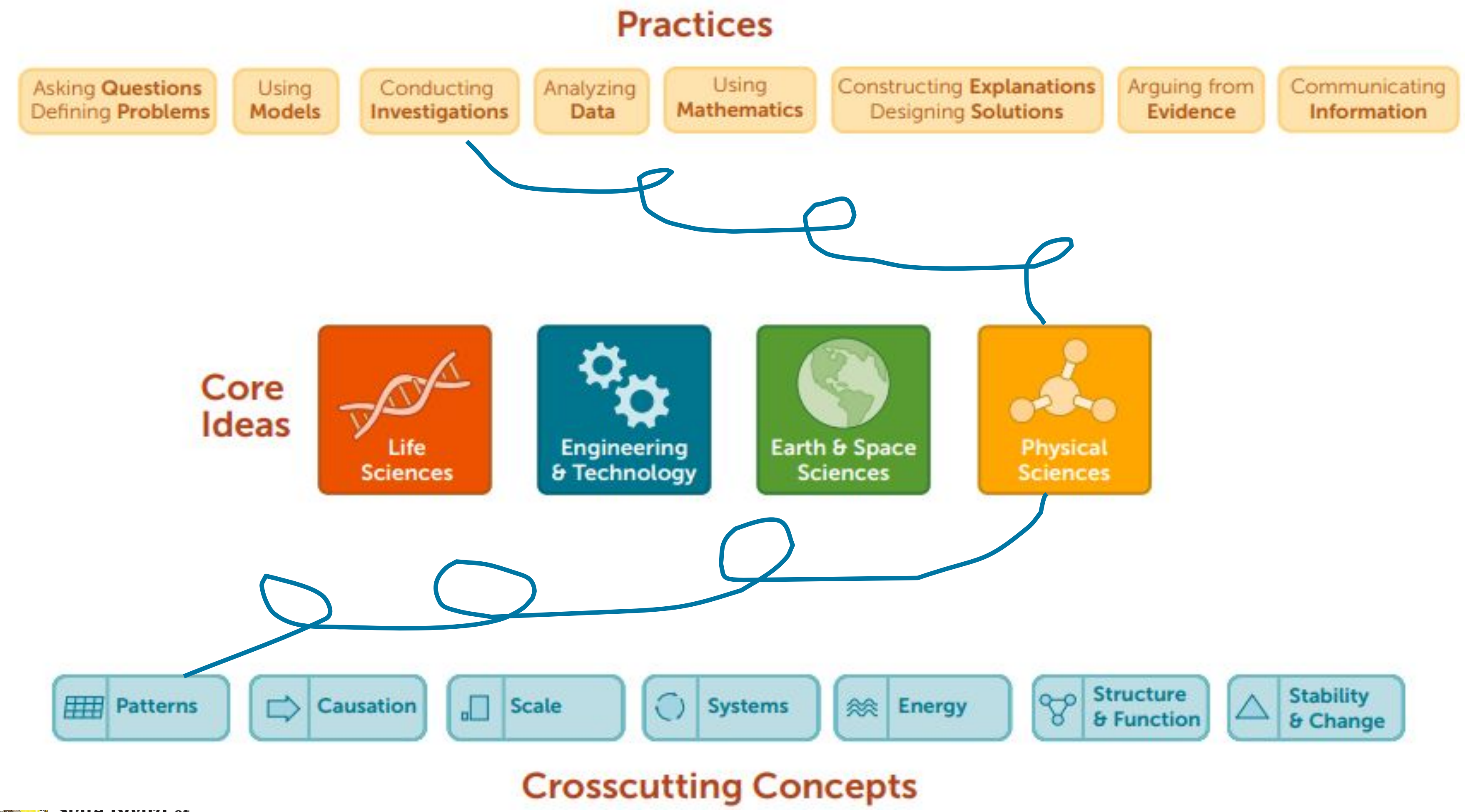
Classroom Vignette

Share out…

- How did you decide what materials go together?
- What is similar about these materials?
- What is different about the materials?
- If you were given a new material, how would you know which category it belongs to?
- As you are sorting, is there anything you are noticing or wondering about?

Teacher Moves

- The teacher made students' use of the CCC, patterns, explicit by describing how scientists look for and find patterns of similarity and differences in their observations, which can lead scientists to ask new questions or find new ways to organize their data.
- The teacher commends the students for using patterns, as scientists do, to categorize the garbage materials.



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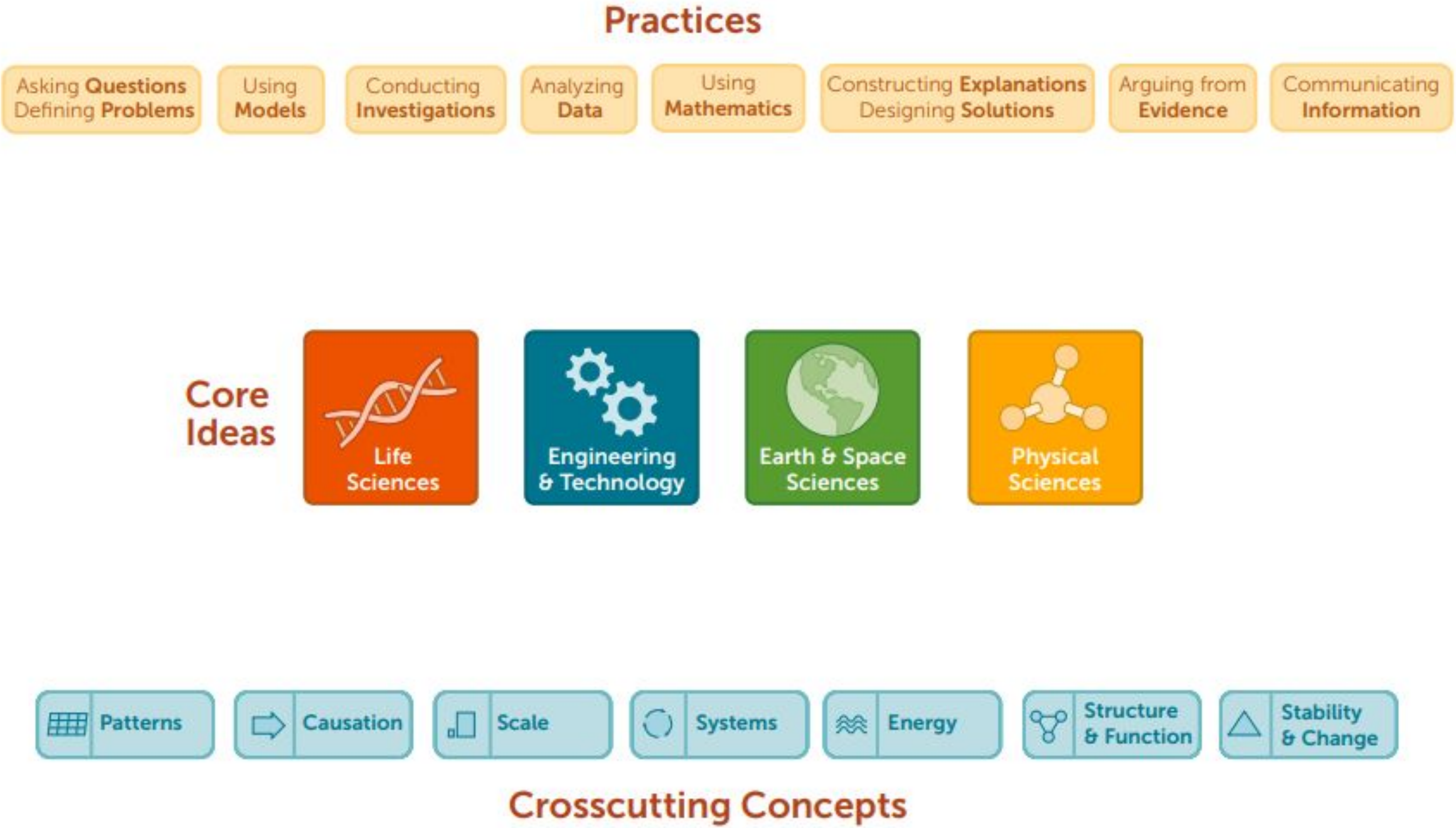
Notice and Wonders

Notice	Wonder
food & things we use to hold food	Which items can or can't be recycled?
Containers (Function)	Can a wax coated milk carton be recycled?
Materials	Which items will compost versus rot?
Is there a rationale for the number of groups (could add additional constraints)	How long will compost take for each items?
Common shapes or colors	

Share out verbally or in the chat…



Classroom Vignette

Then

Traditionally, CCCs have been thought of as common themes across science disciplines that serve "as background knowledge for students in 'gifted,' 'honors,' or 'advanced' programs'" (NGSS Lead States 2013, p. 6).

Now

In contrast, the NGSS expect all students to use CCCs in combination with science and engineering practices (SEPs) and disciplinary core ideas (DCIs) to explain phenomena

*"It is important that teachers view CCCs as **resources** that students use in their everyday lives **to make sense of the world** and bring to the science classroom to help make sense of phenomena. When **CCCs are** viewed as **resources that students come to school with** and not just as outcomes of instruction, teachers can capitalize and build on students' everyday experiences. By capitalizing on students' **"funds of knowledge"** (González, Moll, and Amanti 2005) from their homes and communities, CCCs can **serve as entry points to science learning**. When CCCs are thought of as resources that students already have experience with and use regularly to make sense of the world, **teachers demonstrate value for students' cultural and linguistic resources.** As a result, science is made real, relevant, and accessible to all students."*

NGSS is a Piece of Cake

Performance Expectation

Baking Tools & Techniques

Science & Engineering Practices

Cake

Disciplinary Core Ideas

Frosting

Crosscutting Concepts

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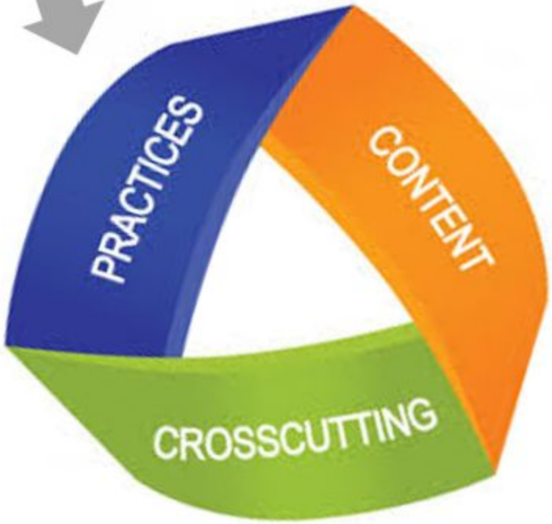
Adapted from NSTA

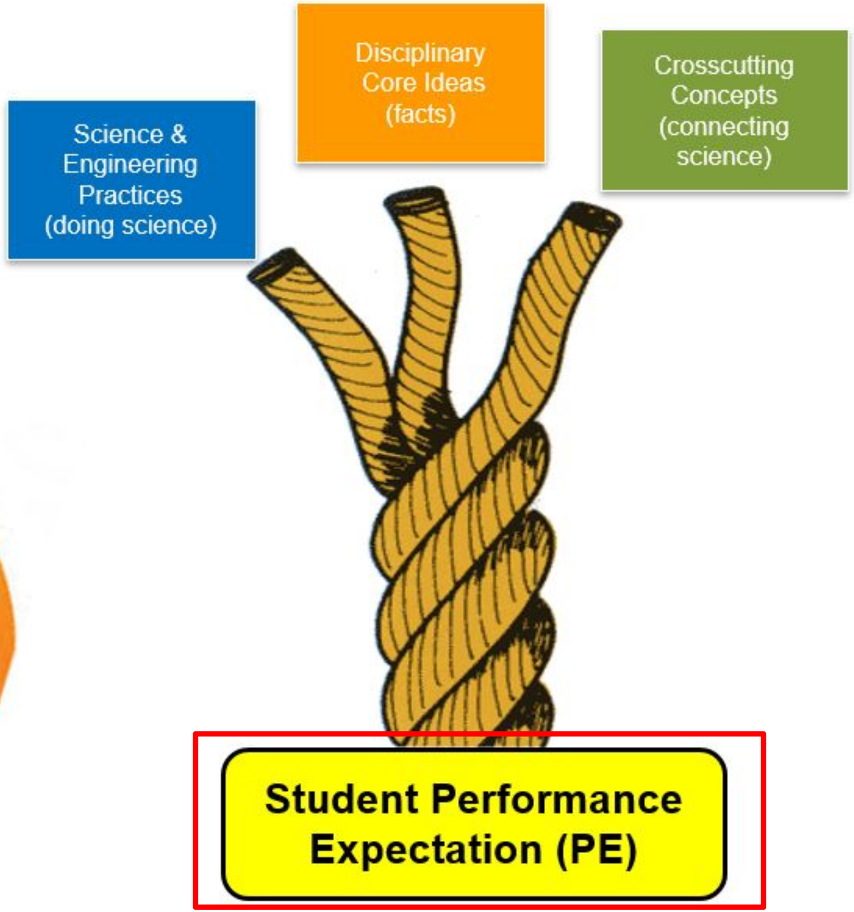
Crosscutting Concepts Additional Resources

- Why and how should I use crosscutting concepts to enhance my science instruction?
- Prompts for Integrating Crosscutting Concepts into assessment and instruction
- Using crosscutting concepts to reflect on and refine your teaching
- Practices should not stand alone: How to sequence practices in a cascade to support student investigations
- Beyond ‘misconceptions’: How to recognize and build on Facets of student thinking

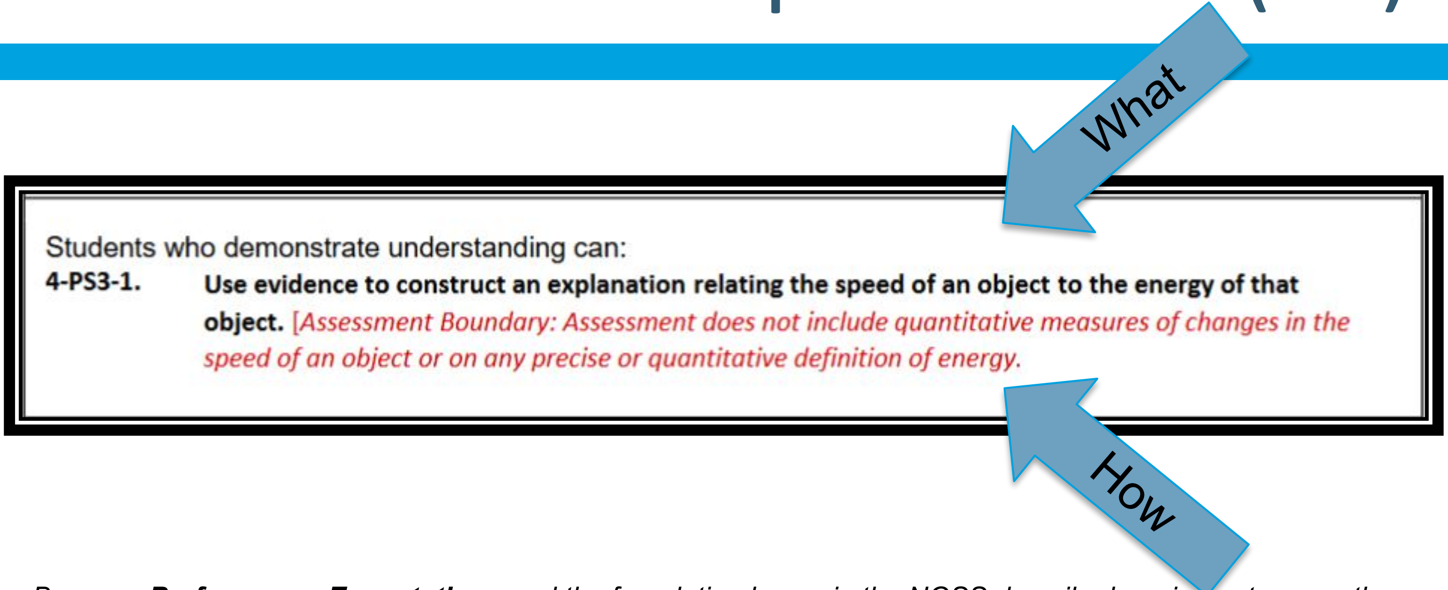
NEXT GENERATION *
SCIENCE
STANDARDS

This symbol actually means something!





Performance Expectations (PE)



Students who demonstrate understanding can:

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

*Because **Performance Expectations** and the foundation boxes in the NGSS describe learning outcomes, they are the basis for using backward design for the development or adaptation of curriculum and instruction. Simply stated, the performance expectation can and should be the starting point of backward design.*

Performance Expectations

MS.PS-SPM Structure and Properties of Matter

MS.PS-SPM Structure and Properties of Matter
Students who demonstrate understanding can: **a. Construct and use models to explain that atoms combine to form new substances of varying complexity in terms of the number of atoms and repeating subunits.** [Clarification Statement: Examples of atoms combining can include Hydrogen (H_2) and Oxygen (O_2) combining to form hydrogen peroxide (H_2O_2) or water (H_2O).] [Assessment Boundary: Valence electrons and bonding energy are not addressed.]

MS.PS-SPM Structure and Properties of Matter

Performance Expectations

MS.PS-SPM Structure and Properties of Matter

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

Foundation Boxes

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to explain, explore, and predict more abstract phenomena and design systems. • Use and/or construct models to predict, explain, and/or collect data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs. (a)	**PS1.A: Structure and Properties of Matter** • All substances are made from some 100 different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (a) • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (a)	**Patterns** Macroscopic patterns are related to the nature of microscopic and atomic-level structure. Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. Patterns can be used to identify cause and effect relationships. Graphs and charts can be used to identify patterns in data. (a)

Language was based on Framework and expanded into Matrices

NRC Framework language from Grade Band Endpoints

Language was based on Framework and expanded into Matrices

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Example

Students who demonstrate an understanding can:

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

Answer: Use observations to describe patterns of what plants and animals (including humans) need to survive.

Use and share observations of local weather conditions to describe patterns over time.

Answer: Use and share observations of local weather conditions to describe patterns over time.

Your Turn!

In your breakout room, work to color code the two performance expectations with your group. When you and your group are done, come back to the main room.

Group One

Students who demonstrate an understanding can:

Plan and conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Group Two

Students who demonstrate an understanding can:

Plan and conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Group Three

Students who demonstrate an understanding can:

Plan and conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Group Four

Students who demonstrate an understanding can:

Plan and conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Answers

Students who demonstrate an understanding can:

Plan and conduct an investigation to compare the effects of different strengths or directions of pushes and pulls on the motion of an object.

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

Final Breakout Room: The Next Generation Science Standards…

Are:

Are NOT:

Application ROE/ISC/District Spotlight

**Someone doing Science

ROE 17

https://drive.google.com/file/d/1WCrrUxLUwOKRltoDLMWguHmlCR6L5JYf/view

Continue YOUR learning

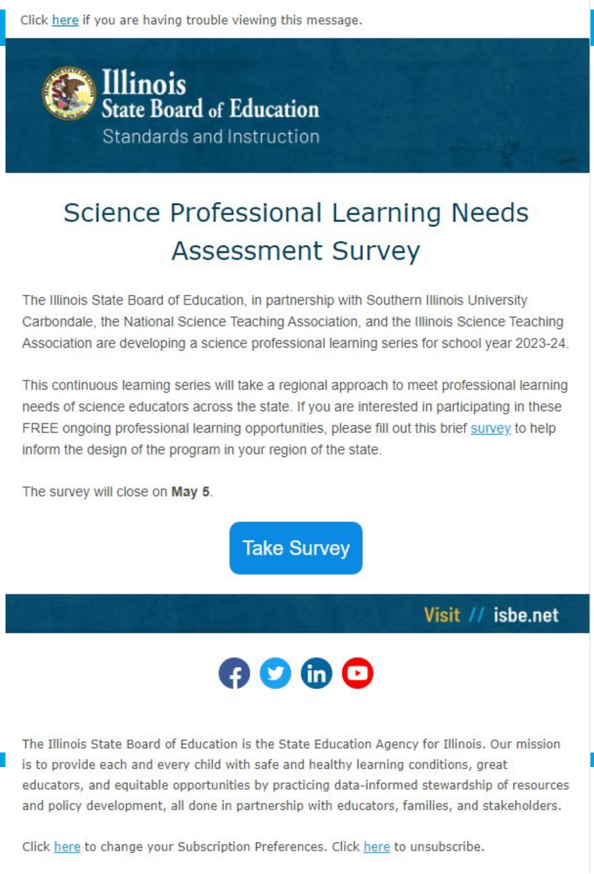
This session was a very basic overview of how to read and identify the standards. But there is

>>So. Much. More. <<

Continue YOUR learning

ISBE, in conjunction with SIU-C, ISTA, and NSTA are partnering to provide professional learning for FY 24.

http://link.isbe.net/m/1/90208844/02-t23069-d41175ce1f2d4832892ebb3f6329a508/1/1/1



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Standards and Instruction

Science Professional Learning Needs Assessment Survey

The Illinois State Board of Education, in partnership with Southern Illinois University Carbondale, the National Science Teaching Association, and the Illinois Science Teaching Association are developing a science professional learning series for school year 2023-24.

This continuous learning series will take a regional approach to meet professional learning needs of science educators across the state. If you are interested in participating in these FREE ongoing professional learning opportunities, please fill out this brief survey to help inform the design of the program in your region of the state.

The survey will close on **May 5**.

Take Survey

Visit // isbe.net

The Illinois State Board of Education is the State Education Agency for Illinois. Our mission is to provide each and every child with safe and healthy learning conditions, great educators, and equitable opportunities by practicing data-informed stewardship of resources and policy development, all done in partnership with educators, families, and stakeholders.

Click here to change your Subscription Preferences. Click here to unsubscribe.

Homework

- Continue to submit reimbursement forms to Krissy Darm at kdarm@roe35.org
- All reimbursement forms must be submitted by June 30, 2023 if they are not in by then, you will not be reimbursed!

Meeting Dates & Times

Upcoming Zoom Meetings

June 5 (office hours reimbursement questions)

10:00 - 11:30 a.m.

Mark your calendars!

Reimbursement

- ROE/ISC/Districts are eligible for reimbursements for implementation expenses related to facilitating new or existing CoP's
  - Wages for ROE/ISC staff participating in/ facilitating communities of practice
    - **Set up a meeting with Krissy to discuss this process
  - Reimbursement for ordinary expenses or tangible materials required when ROE/ISC/Districts facilitate communities of practice
  - Virtual Platforms
  - Technology needed for offering virtual communities of practice (webcams, mics, etc)
  - Substitute pay for teachers participating
  - Books for book studies
  - Stipends for participating educators
  - Costs associated with travel
- Each ROE/ISC Region is eligible to put in for reimbursements ~~up to $11,200~~
- NEW: Starting in February: Each ROE/ISC is eligible for reimbursements on a first come first serve basis.

Illinois State Board of Education

Reimbursement Process

1. Send and collect needs assessment data from local education agencies in your region
2. Complete the PD Plan and submit to Krissy (kdarm@roe35.org) for team review and approval
    a. If you are struggling with the PD plan completion, consider using these guiding questions when answering
3. Begin executing the PD plan by facilitating a new community of practice or support an existing community of practice based around information from the needs assessment data and information shared during Capacity Building Sessions
4. Save and compile any supporting expense documentation (receipts, invoices, copy of check to pay invoice, direct deposit vouchers, copy of timesheet, etc.).
5. Complete the Expense Reporting file and send both the expense reporting file and any supporting documentation to Krissy Darm at kdarm@roe35.org with the subject line: Capacity Builders (ROE number/ ISC Name/ District Name)

Please submit reimbursements as soon as possible so ROE 35 and ISBE can work on the reallocation of funds come spring.

Thank You!

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Amy Smith asmith@peoriaroe.org

Casey Veitch cveitch@roe4.org

Contact Information: Reimbursements & ISBE

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Caitlyn Walker cwalker@isbe.net