Louisiana Student Standards: Science

LOUISIANA SCIENCE TEACHERS ASSOCIATION

JUNE 8, 2017

Louisiana Science Teachers Association

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Breakout with the Ice Breaker

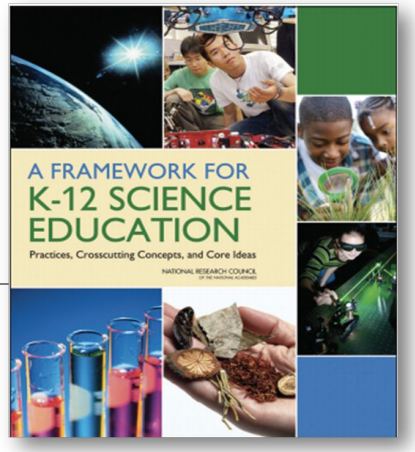
Learning Goals-Introduction to LSSS

- Obtain information about philosophy behind the Louisiana Science Standards and the process that led to the creation of our new state standards.
- Ask questions and define the problems with the current GLEs.
- Use information to construct understanding of the three dimensions of the Louisiana Science Standards.

THE need for new standards

The last time Louisiana adopted new science standards…

Background



When was the last time our science standards were updated?

1. May 1997: Benchmarks
2. 2004: GLE's
3. 2008: Comprehensive Curriculum under Paul Pastorek.
4. 2012: *A Framework for K-12 Science Education*
5. 2013: Next Generation Science Standards (NGSS)
6. March 8, 2017: Louisiana Student Standards for Science (LSSS)

Shake, Rattle, and Roll with Conceptual Shifts

Directions:

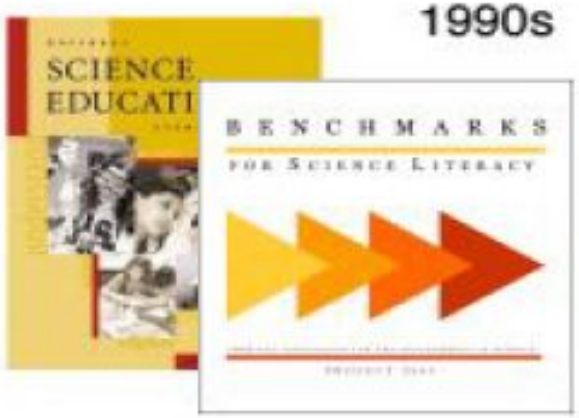
1. In your group, sort the pink cards according to old vs. new science practices.
2. Briefly discuss important conceptual differences you notice between old and new practices.

Out with the Old and in with the New

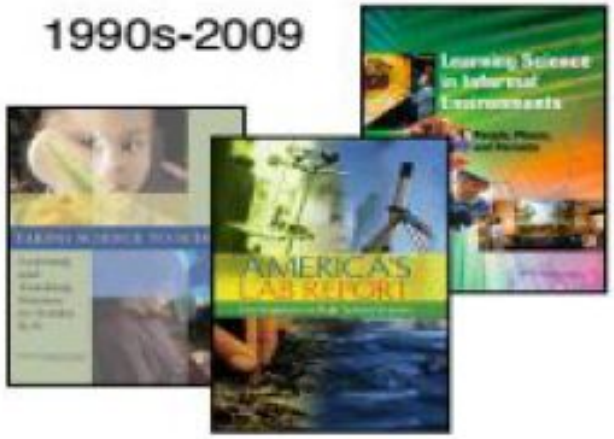
Stand up, hand up, pair up with a person not in your group and share how the philosophy behind the Louisiana Science Standards differs from previous practices.

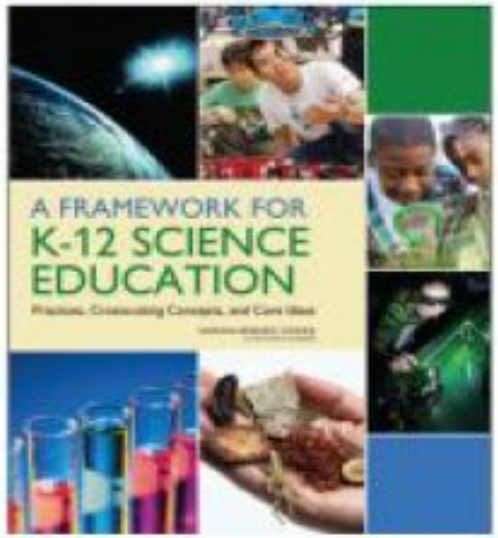
Building on the Past; Preparing for the Future

1990s



1990s-2009





1/2010 - 7/2011

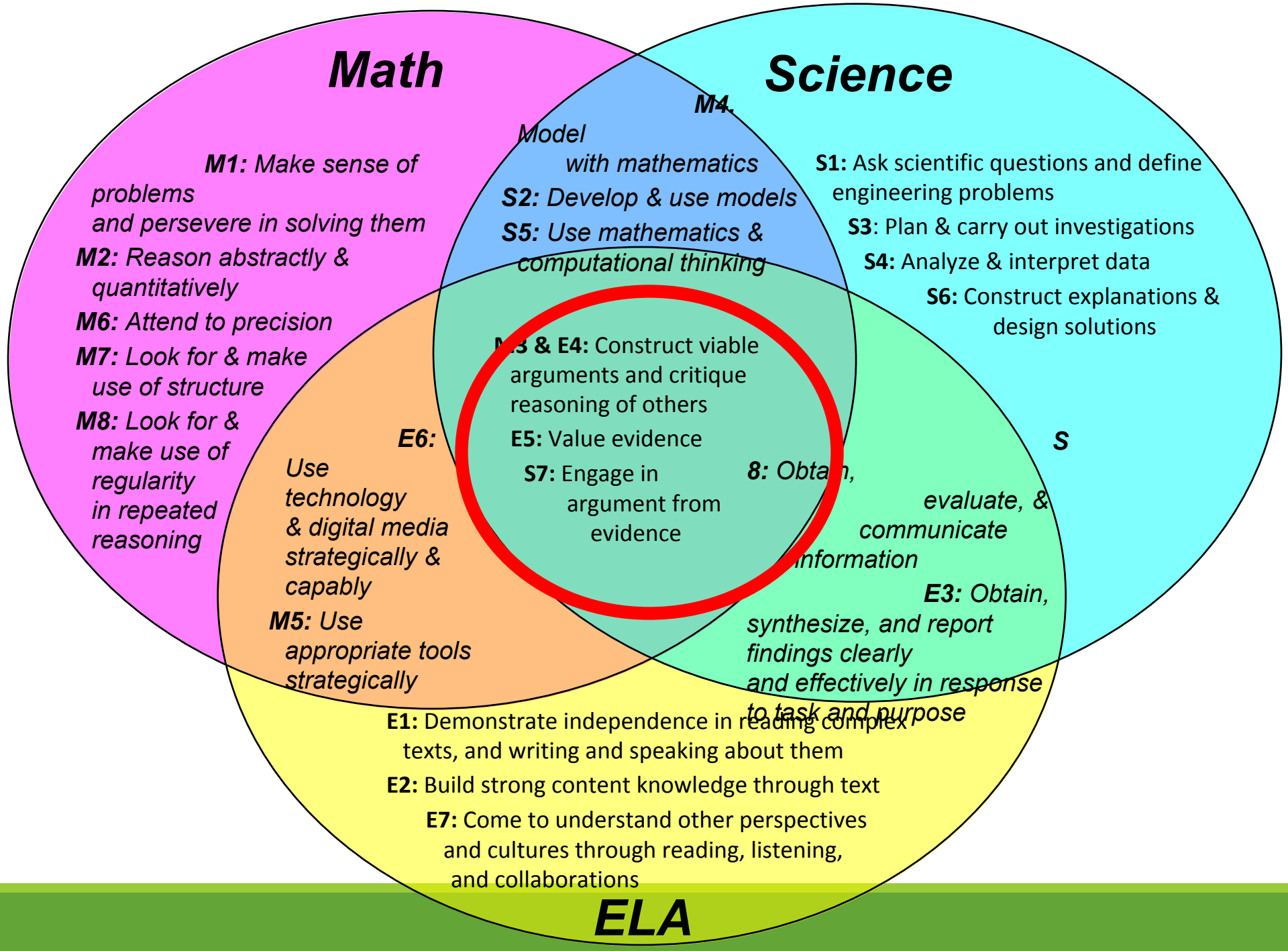
Louisiana
STUDENT
STANDARDS
SCIENCE

2017

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 Press.


Math
Science
ELA
M1: Make sense of problems and persevere in solving them
M2: Reason abstractly & quantitatively
M6: Attend to precision
M7: Look for & make use of structure
M8: Look for & make use of regularity in repeated reasoning
M4. Model with mathematics
S2: Develop & use models
S5: Use mathematics & computational thinking
S1: Ask scientific questions and define engineering problems
S3: Plan & carry out investigations
S4: Analyze & interpret data
S6: Construct explanations & design solutions
M3 & E4: Construct viable arguments and critique reasoning of others
E5: Value evidence
S7: Engage in argument from evidence
E6: Use technology & digital media strategically & capably
M5: Use appropriate tools strategically
8: Obtain, evaluate, & communicate information
S
E3: Obtain, synthesize, and report findings clearly and effectively in response to task and purpose
E1: Demonstrate independence in reading complex texts, and writing and speaking about them
E2: Build strong content knowledge through text
E7: Come to understand other perspectives and cultures through reading, listening, and collaborations

Understanding the Louisiana Science Standards is a piece of cake

Performance Expectation

Baking Tools & Techniques

Science & Engineering Practices

Cake

Disciplinary Core Ideas

Frosting

Crosscutting Concepts

Adapted from NSTA

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Louisiana STUDENT STANDARDS SCIENCE

Domain

Grade Level

1-PS4-1

Performance Expectation Number

Topic Number

WAVES AND THEIR APPLICATIONS

Performance Expectation	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
Clarification Statement	Examples of vibrating materials that make sound could include tuning forks or plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound or holding an object near a vibrating tuning fork.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
1. Asking questions and defining problems 2. Developing and using models 3. **Planning and carrying out investigations:** Planning and carrying out investigations to answer questions (science) or test solutions (engineering) to problems in K-2 build on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	**WAVE PROPERTIES** Sound can make matter vibrate, and vibrating matter can make sound. (LE.PS4A.a)	**CAUSE AND EFFECT** Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Baking Tools and Techniques

Science & Engineering Practices

Learning Goals-SEPs

- Utilize materials and tools to become familiar with the titles of the eight Science and Engineering Practices (SEPs)
- Evaluate documents to develop an understanding that new science practices are the tools and techniques scientist and engineers use.

Completed Cake

Performance Expectation

MS-CB1 Dessert making

Students who demonstrate an understanding can:

MS-CB1-1. Plan and conduct a series of steps to bake a delicious cake that causes their friends to exclaim, *"Wow! That's tasty!"*

Baking Tools & Techniques	Cake	Frosting
Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

“What ideas come to mind when you hear the words scientist vs. engineer?”

- Create venn diagram using your sticky notes and chart paper.
- Hang your poster near your table.
- Gallery walk
- Things to think about:
  - Are there words that show up a lot? What are they?
  - Were there words on other posters that you didn’t think of? Anything surprising?
  - What else do you notice?

- http://www.online-stopwatch.com/countdown-timer/

Baking Tools and Techniques

Science & Engineering Practices

Science and Engineering Practices

The 8 science and engineering practices are:

1. Ask questions (science) and define problems (engineering)
2. Develop and use models
3. Plan and conduct investigations
4. Analyze and interpret data
5. Use mathematical and computational thinking
6. Construct explanations (science) and design solutions (engineering)
7. Engage in scientific argument from evidence
8. Obtain, evaluate, and communicate information

Science and Engineering Practices Station Rotation

Baking Tools and Techniques

Science & Engineering Practices

Learning Goals for this station rotation:

- Engage in activities which align with the Science and Engineering Practices.
- Construct an argument based on evidence as to how one activity can be focused on different practices, depending on the educator's intentions.

http://www.online-stopwatch.com/countdown-timer/

SEP Key

Practice	Station 1		Station 2 FLOWER	Station 3 ICE MELTS	Station 4 EGG EARTH	Station 5 YEAST	Station 6		Station 7 DIVER
	SOILS A	SOILS B					CRICKETS A	CRICKETS B	
Asking questions and defining problems						5: asking questions			
Developing and using models			2: models if drawing is for understanding		4: models				
Planning and carrying out investigations	1A: investigations								
Analyzing and interpreting data		1B: data if chart is for analysis					6A: data		
Using mathematics and computational thinking								6B: math	
Constructing explanations and designing solutions				3: explanations					
Engaging in argument from evidence									7: argument
Obtaining, evaluating, and communicating information		1B: communicating if chart is to share info	2: communicating if drawing is to share info						

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Sentence Strip Terminology

1. In 4 minutes or less develop an evidenced based sentence that accurately describes the component for student learning of the Science and Engineering practices.

Science and Engineering Practices-Definition

- Describe the major practices that scientists employ as they investigate and build models and theories about the world and a key set of engineering practices that engineers use as they design and build systems.

Completed Cake

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Baking Tools & Techniques	Cake	Frosting
Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

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Learning Goals

- Collaborate with others to make evidenced observations concerning the philosophy underlying the structure of the Disciplinary Core Ideas (DCIs)
- Use materials to explain *how* the DCIs are structured and interpret the DCI coding.
- Use information from several sources to analyze the progression of DCIs across K - 12

Cake

Disciplinary Core Ideas

Louisiana Science Standards Disciplinary Core Ideas (DCIs)

Cake

Disciplinary Core Ideas

Now that we've touched on the philosophical underpinnings of the DCIs, let's explore how they are structured.

It looks complex at first glance, but they do have a strategic structure. Let's explore it one layer at a time…

SCIENCE!

PS	LS	ESS	ETS	EVS

Domains

SCIENCE!

PS	LS	ESS	ETS	EVS
PS1	LS1	ESS1	ETS1	EVS1
PS2	LS2	ESS2	ETS2	EVS2
PS3	LS3	ESS3		EVS3
PS4	LS4			

Disciplinary Core Ideas

DCIs

SCIENCE!

PS				LS				ESS			ETS		EVS		
PS1	PS2	PS3	PS4	LS1	LS2	LS3	LS4	ESS1	ESS2	ESS3	ETS1	ETS2	EVS1	EVS2	EVS3
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	EVS1.A EVS1.B	EVS2.A EVS2.B EVS2.C	EVS3.A

Component Ideas

Disciplinary Core Ideas (DCIs)

Physical Sciences (PS)	Life Sciences (LS)	Environmental Sciences
PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy PS4: Waves and Their Applications in Technologies for Information Transfer	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	EVS1: Resources and Resource Management EVS2: Environmental Awareness and Protection EVS3:Personal Responsibilities
Earth & Space Sciences (ESS)	**Engineering & Technology (ETS)**	
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	

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

Disciplinary Core Idea

Cake

Disciplinary Core Ideas

- There is no way we can look at each of these component ideas in the time that we have together.
- Instead, we will zoom in and focus on one component idea as an example.
- Let's examine the progressions handout.
- You will work in small groups to explore and discuss this progression.
- Examine how it builds from the lower grades to the upper grades.
- Is there anything else you notice and wonder about the progression document?

Completed Cake

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Baking Tools & Techniques	Cake	Frosting
Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

Louisiana STUDENT STANDARDS SCIENCE

Domain

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1-PS4-1

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Learning Goals

- Use resource materials to interpret where the Crosscutting Concepts (CCCs) originated.
- Construct an argument with evidence that students can use the CCCs as a conceptual framework for organizing new information

Frosting

Crosscutting Concepts

Why are Crosscutting Concepts (CCCs) important?

Turn and Talk to your shoulder partner about the importance of the Crosscutting Concepts.

How will the CCCs help students learn science?

Frosting

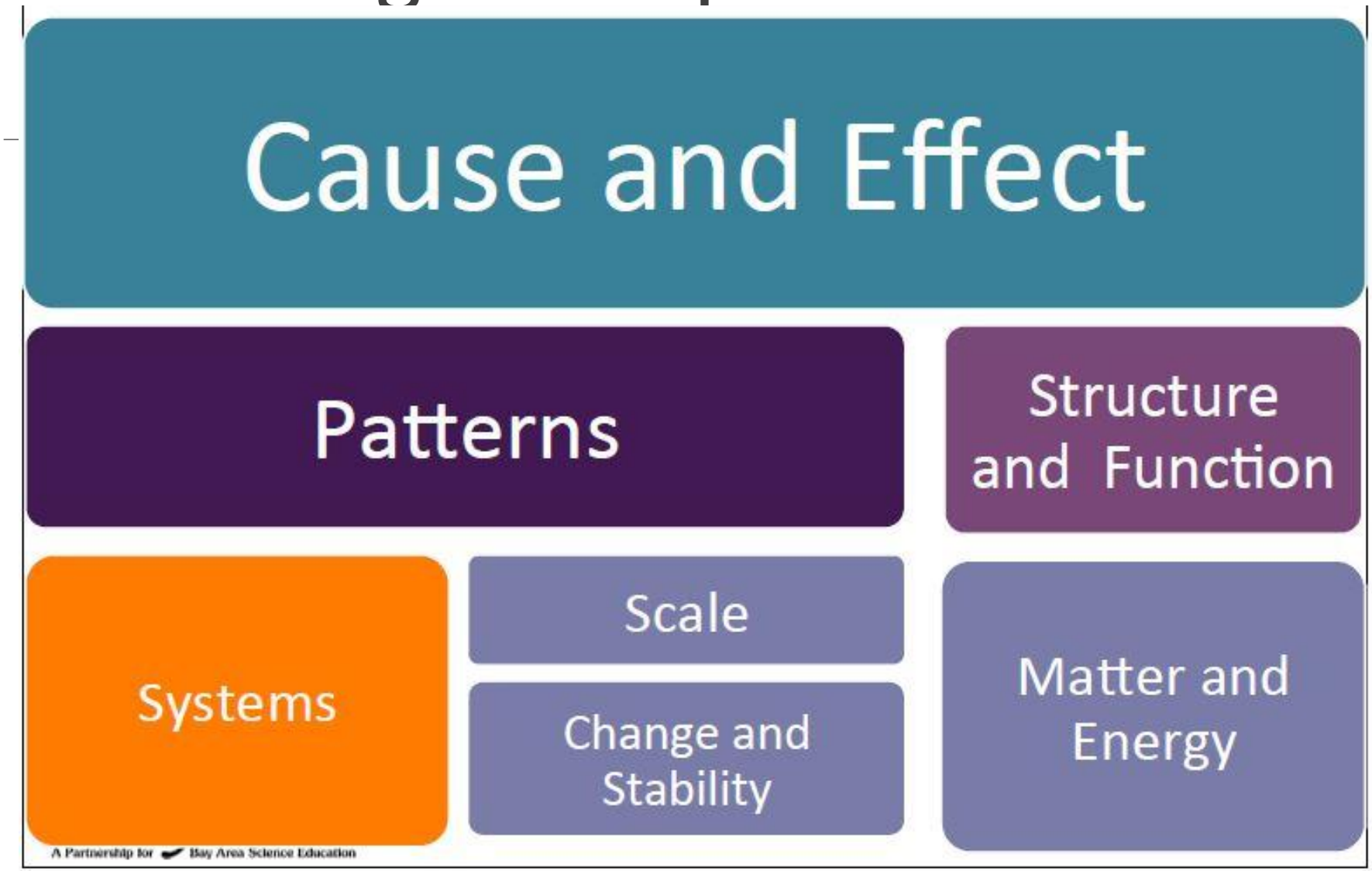
Crosscutting Concepts

1. A conceptual framework helps students make sense of new content and tackle novel problems

2. Allows students to be more flexible and creative with their science and engineering ideas

3. Helps students to develop their ideas over time

Crosscutting Concepts



Frosting

Crosscutting Concepts

Crosscutting Concept Mix and Match

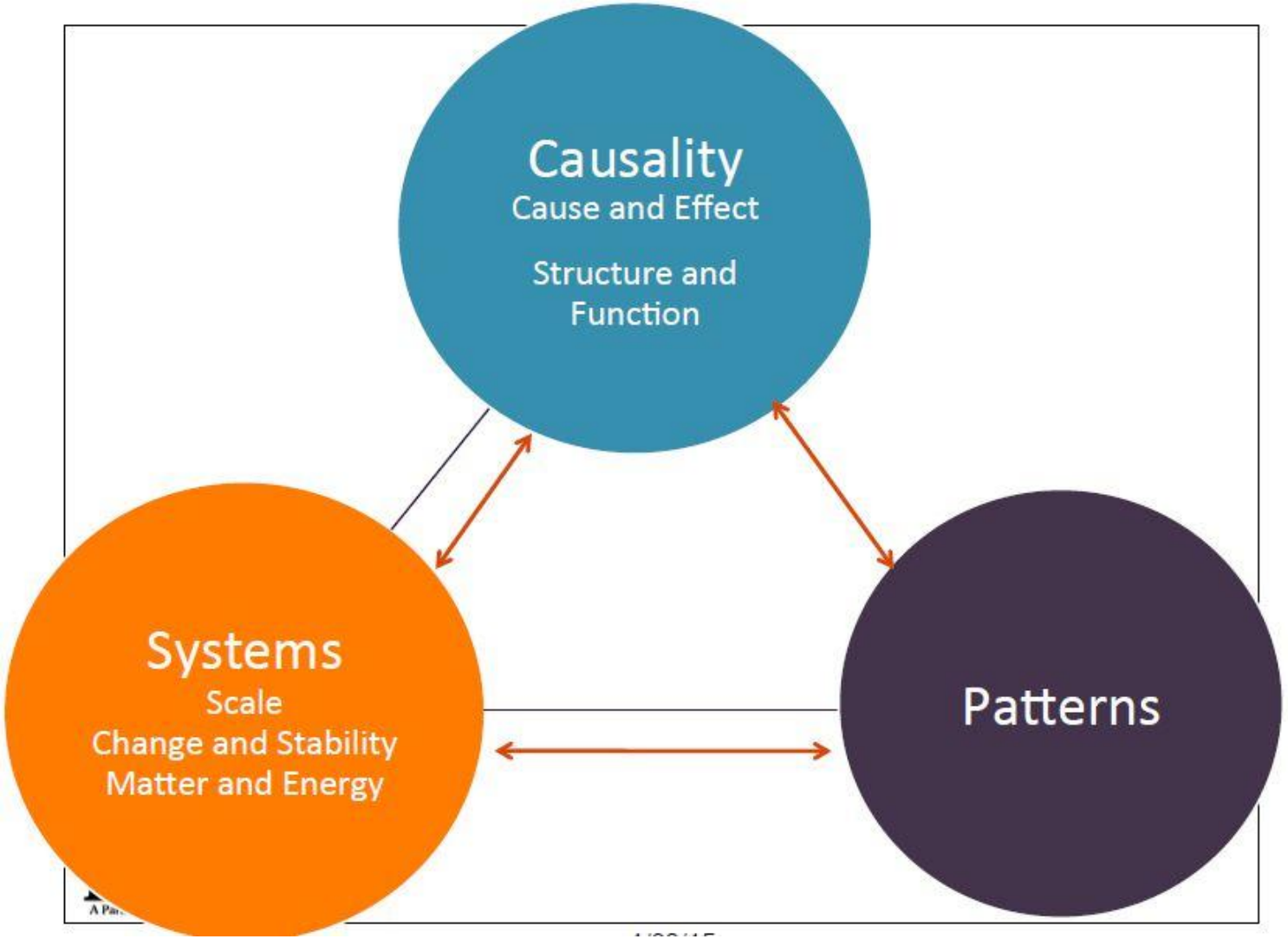
Frosting

Crosscutting Concepts

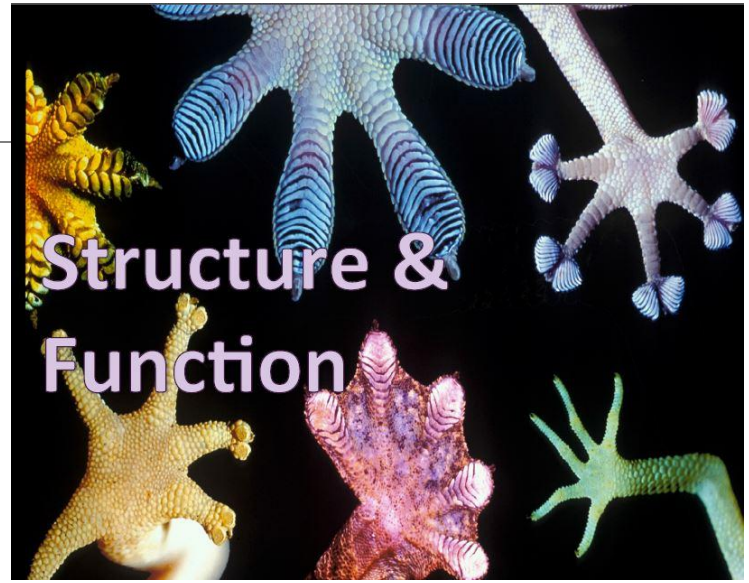
- Let's take a closer look at the definitions of the Crosscutting Concepts.
- Choose one card. You will have either the title of a Crosscutting Concept (e.g.; Patterns, Cause and Effect, etc.) or a Crosscutting Concept definition.
- Mingle around the room and find your match. Once you have correctly paired up, discuss why you think your match is correct.

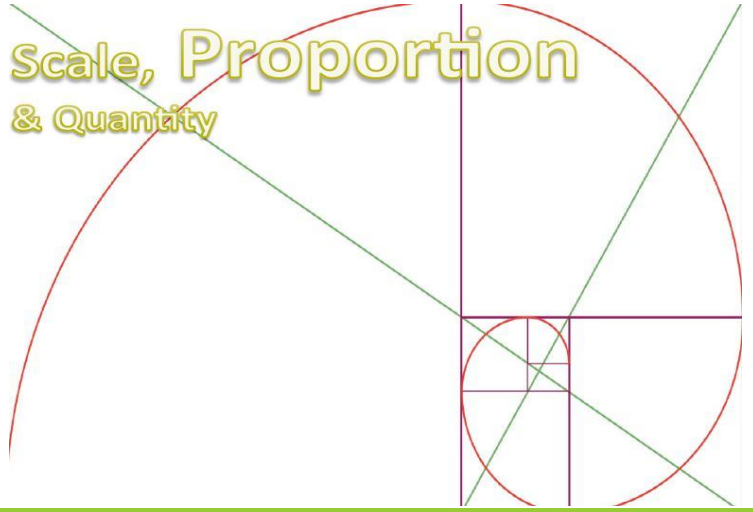
Frosting

Crosscutting Concepts



Crosscutting Concepts Jigsaw





Name that Crosscutting Concept

Frosting

Crosscutting Concepts

- Travel around the room to each of the stations.
- Use your recording sheet to identify the CCC that unifies all of the examples at the station. Record your conclusions.

CCC Rotation Answers

Frosting

Crosscutting Concepts

Patterns

- Moon phases
- Monthly precipitation, San Francisco, United States and Perth, Australia
- Fibonacci sequence

CCC Rotation Answers

Frosting

Crosscutting Concepts

Cause and effect

- Rachel and Alex juice story
- Population changes of predator and prey species over time
- Diagram of a Rube Goldberg machine

CCC Rotation Answers

Frosting

Crosscutting Concepts

Scale, proportion and quantity

- Solar system and football field
- Statistically, conclusions based on a large sample size are more reliable than conclusions based on small sample size
- 4 females participants for every 1 male participant

CCC Rotation Answers

Frosting

Crosscutting Concepts

Systems and system models

- United States Government
- Human circulatory system
- Water cycle

CCC Rotation Answers

Frosting

Crosscutting Concepts

Energy and matter

- Trophic levels in an ecosystem
- Fire images
- E=mc2

CCC Rotation Answers

Frosting

Crosscutting Concepts

Structure and function

- Predator and prey skulls
- The Academy’s Sustainable Design
- Bridges around the world

CCC Rotation Answers

Frosting

Crosscutting Concepts

Stability and change

- Rock cycle diagram
- Insect life cycles
- Temperature and CO2 from Antarctic ice cores over the past 400,00 years

Completed Cake

Performance Expectation

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Baking Tools & Techniques

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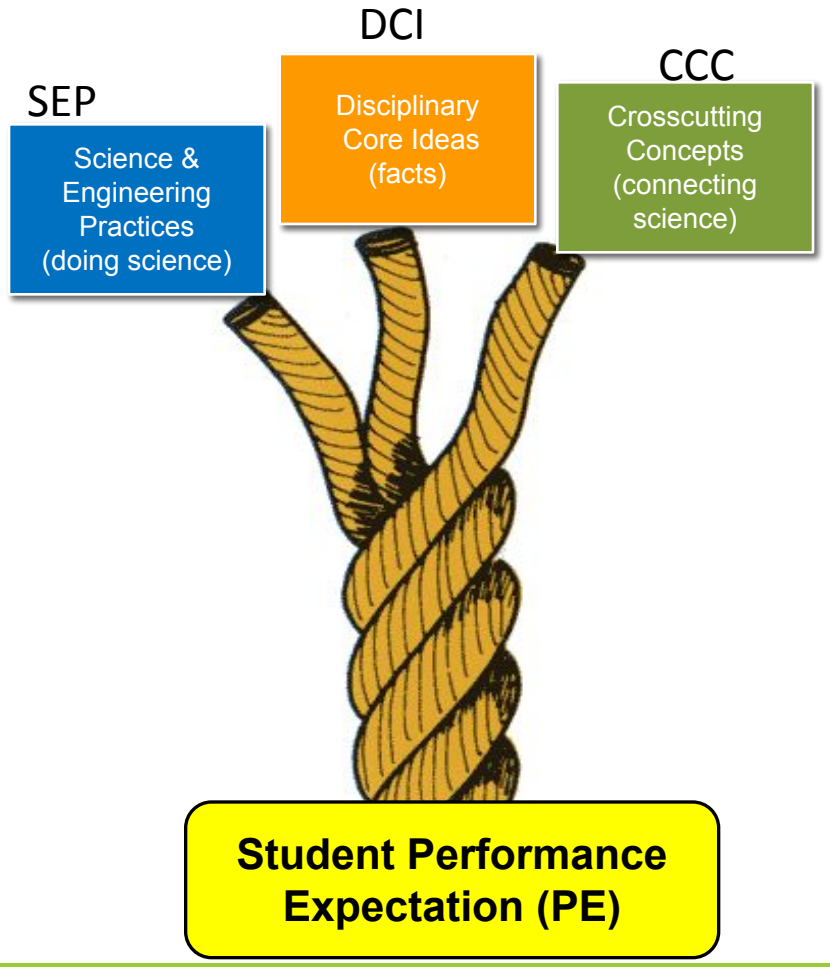
Learning Goals-PEs

1. Ask questions to obtain information that explain how Performance Expectations (PEs) are statements of what students should be able to do at the end of instruction.
2. Communicate clearly with others providing evidence from multiple sources supporting that PEs incorporate the Science and Engineering Practices, the Disciplinary Core Ideas, and the Core Cutting Concepts.
3. Use a simple model to represent how PEs do not describe a lesson or instructional strategy.
4. Be able to communicate through collaborative conversation, evidence of understanding for the format of the Louisiana Science Standards.

What are Performance Expectations?

"Performance expectations **combine practices, core ideas, and crosscutting concepts** into a single statement of ***what is to be assessed***.

They are not instructional strategies or objectives for a lesson."



All four of these components equal ONE standard.

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

Deconstructing Performance Expectations (PEs)

1. Move to the assigned grade band tables
   a. K-1
   b. 2-3
   c. 4-5
2. Look at the performance expectations for your grade band
3. Color code SEP,DCI, and CCC

Example: 1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

NGSS Lead States (2013). *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.

Reflecting on Concepts of Performance

1. Use the grade level PE cards at your table
2. Meet someone new
3. Follow the directions on the handout **“Reflecting on the Shifts”** provided
4. Record your discussion answers on the page
5. Please be sure to return the PE cards to the correct tray at your table :-)

Standard Analogy

- Using the baking theme as your guide, create your own Louisiana Science Standards analogy.
- Be sure to include all of the essential pieces of the standard.
- Post your creation to the Padlet.
- https://padlet.com/shauna_leblanc/lsssanalogy