Science Standards on the Geaux for Grades 3-5

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Link to Google Drive: https://goo.gl/3z9rmA

Meet Your Presenters

Jessica Church

- 16+ Years
- Science Specialist at NSU Elementary Lab School
- PLTW Launch Lead Instructor
- Served on Science Standards Workgroup

K. Renae Pullen

- 15+ Years
- Science Specialist in Caddo Parish
- Champion of Science Education for Young Children
- Served on Science Standards Workgroup

WHY NEW STANDARDS?

*"Science is not just a body of knowledge that reflects current understanding of the world; it is also a set of practices used to establish, extend, and refine that knowledge. Both elements —**knowledge** and **practice** —are essential." (NRC 2012)*

Session Goals

- Understand why we have new Louisiana Student Standards for Science (LSSS)
- Explore the Framework of the LSSS
- Investigate phenomena-based instruction
- Identify the Instructional Shifts

Agenda

- **Discuss the LDOE Implementation Timeline**
- Share an Overview of the Science Standards
- Analyze the Framework for the New Louisiana Student Standards for Science
- Explore Three-Dimensional Learning
- Investigate a Model Lesson
- Identify the Instructional Shifts
- LDOE Implementation Resources and Support

Louisiana Student Standards for Science

The State Department will provide multiple phases of support as districts and teachers work to implement the Louisiana Student Standards for Science.

PHASE	TIMELINE	FOCUS
Phase 1	*Spring – Summer 2017*	• Framework and make-up of the standards • Shifts in science instruction • Progressions of learning
Phase 2	*Fall 2017*	• Educators begin implementation of the new standards, practice implementing aligned tasks, pilot 3-dimensional lessons • LDOE releases scope and sequence documents, revised instructional tasks, sample EAGLE items
Phase 3	*Spring –Summer 2018*	• Quality curriculum piloted • Suite of assessment items/item sets released on EAGLE • Field test in grades 3-8

Quick Question

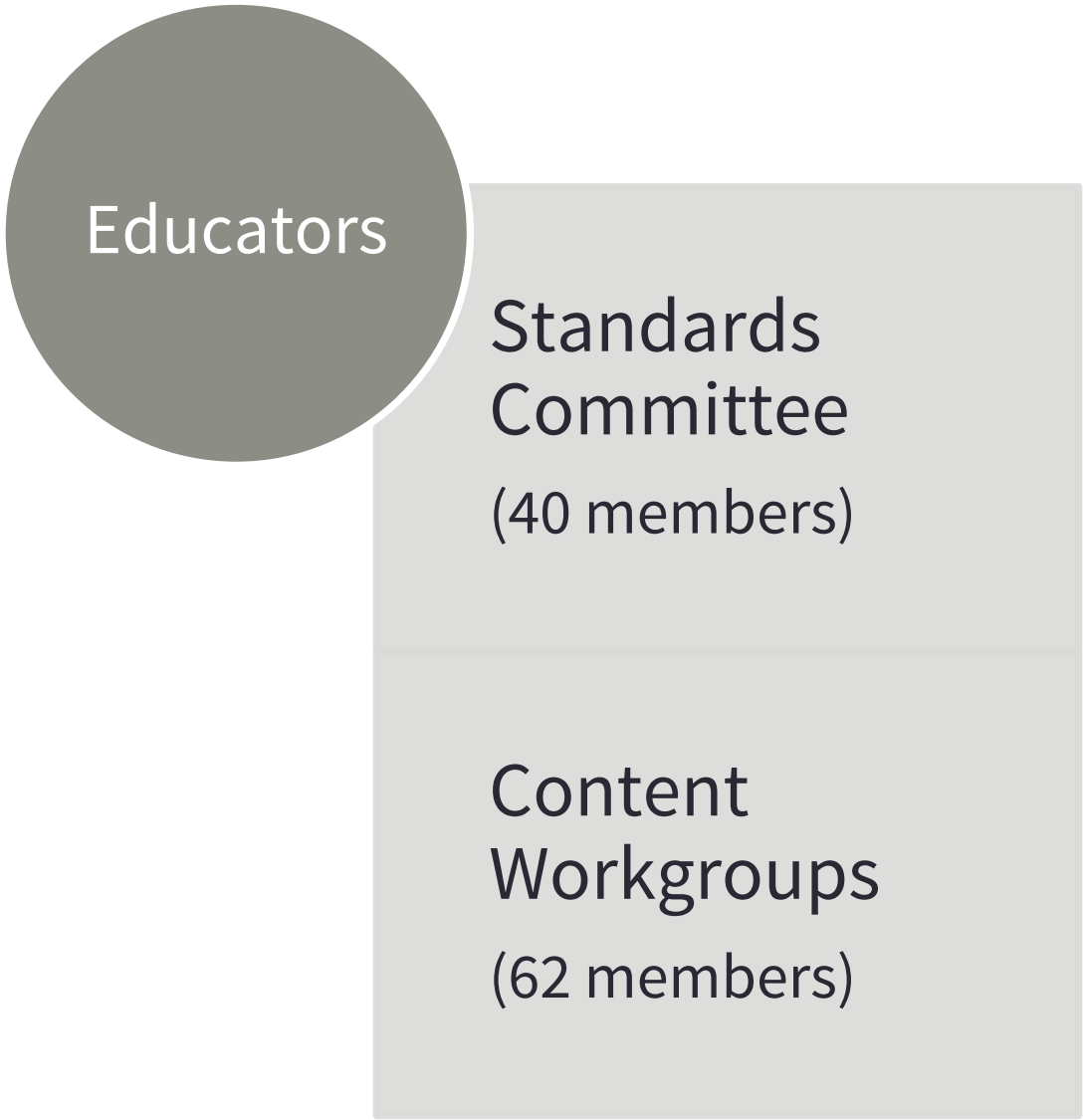
Why do we need student standards for science?

Why New Science Standards

Louisiana state law RS 17:24.4 requires BESE to adopt academic content standards, **which are defined in the law as statements that define what a student should know or be able to accomplish at the end of a specific time period, grade level or at the completion of a course.**

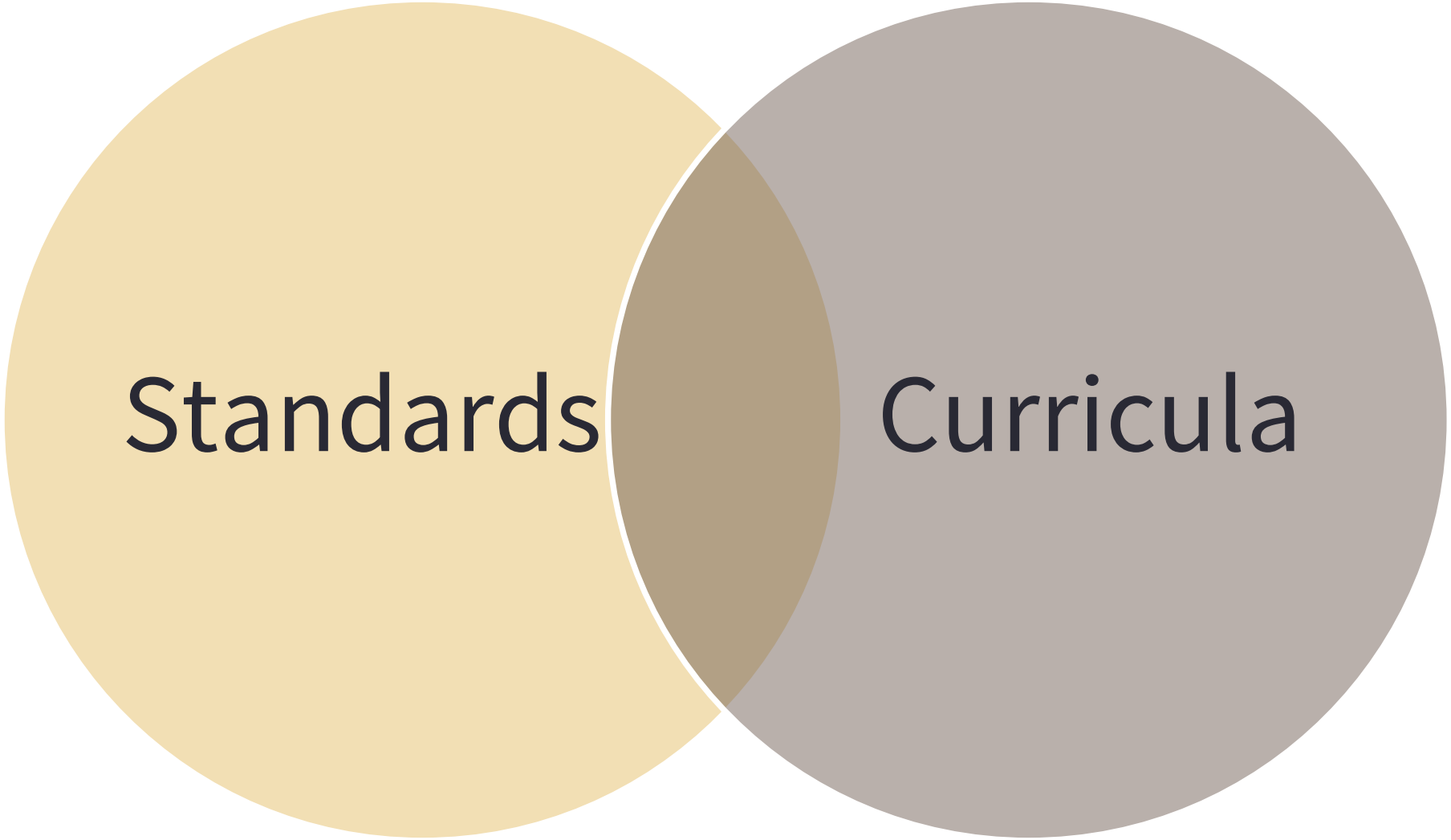
The law sets forth an expectation that standards be rigorous and that they represent the knowledge and skills needed for students to successfully transition to postsecondary education and the workplace, as determined by content experts, elementary and secondary educators and school leaders, postsecondary education leaders, and business and industry leaders. BESE Bulletin 741, §2301 states, ***"The Louisiana content standards shall be subject to review and revision to maintain rigor and high expectations for teaching and learning."***

Review Process of New Standards



- The content workgroup members worked from August to February.
- The workgroup spent an average of 70+ hours meeting in person as groups and 15+ more independently researching and reviewing drafts of standards.
- The Standards Committee reviewed the process along the way and approved the final draft of the new Louisiana Student Standards for Science.

Activity: Standards vs. Curricula?



About the Science Standards

They are quality standards that:

1. Define what a student should know or be able to accomplish at the end of a specific time period, grade level, or completion of a course.
2. Provide focus on fewer topics with more opportunity for students to engage deeply.
3. Identify key student knowledge and skills that students should demonstrate by the end of the year.
4. Connect learning within and across grades.

Comparing GLEs to LSS for Science

Grade	Number of GLEs	Number of LSS for Science
Kindergarten	32	10
3rd Grade	62	15
6th	87	18
HS Biology	58	20
HS Chemistry	63	13
HS Physics	51	12

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Framework for the Louisiana Student Standards for Science

Performance Expectation: States what students should be able to do to demonstrate that they have met the standard. **Performance expectations** are built on the foundation of the **science and engineering practices**, **disciplinary core ideas**, and **crosscutting concepts**.

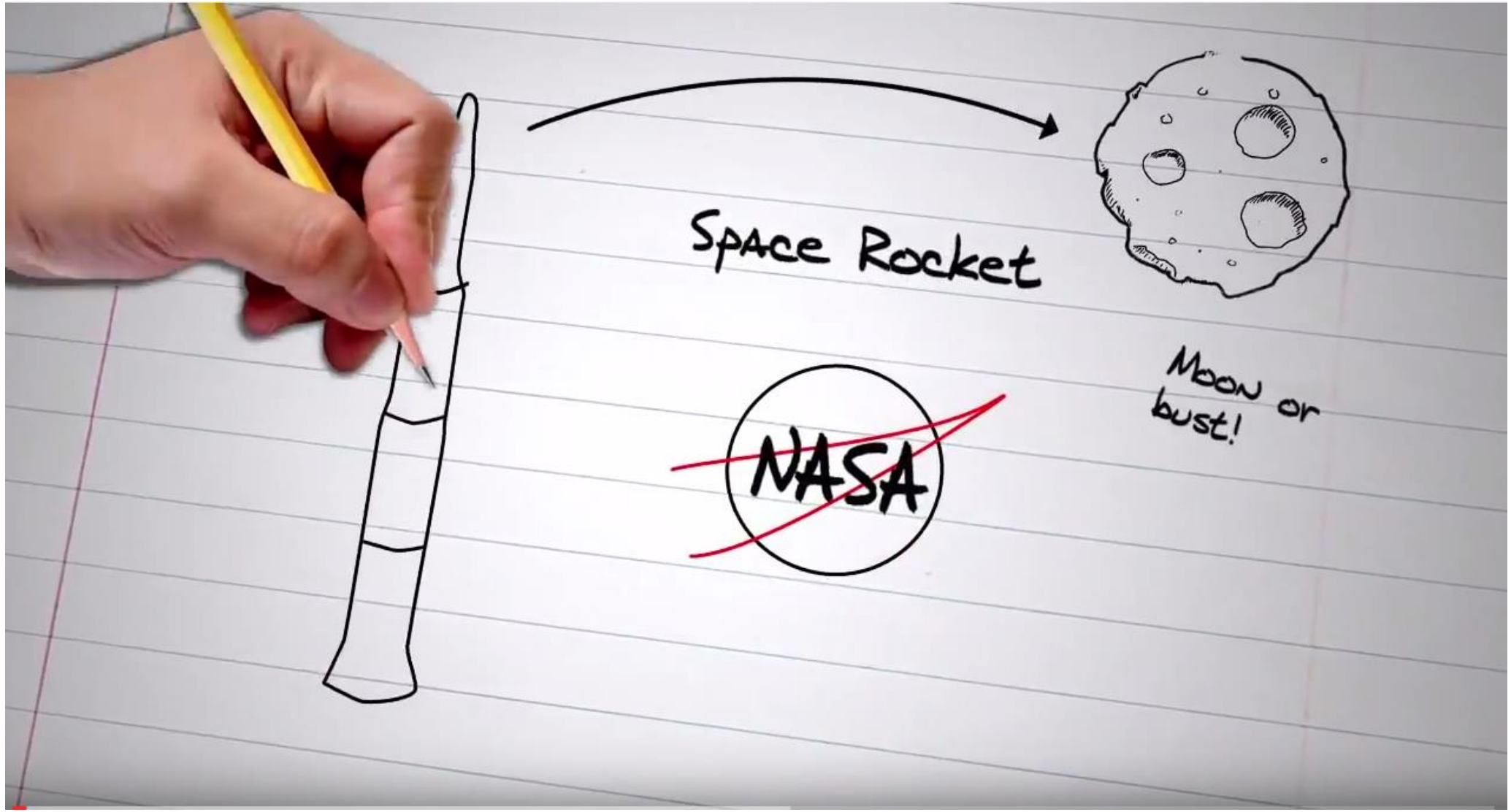
Clarification Statement: Provides examples or additional clarification of the performance expectation.

Science and Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Detail the behaviors that students should engage in that mimic those of scientists and engineers.	Describe the most essential ideas (content) in the major science disciplines.	Ideas that have applications across all areas of science.

Gallery Walk: Understanding the Standards

1. Read your article about one of the components of three-dimensional learning.
2. Work as a team to discuss what you read.
3. In your teams, use your resources to create a display that summarizes the dimension of learning you researched.
4. Display your team's poster and participate in the Gallery Walk.

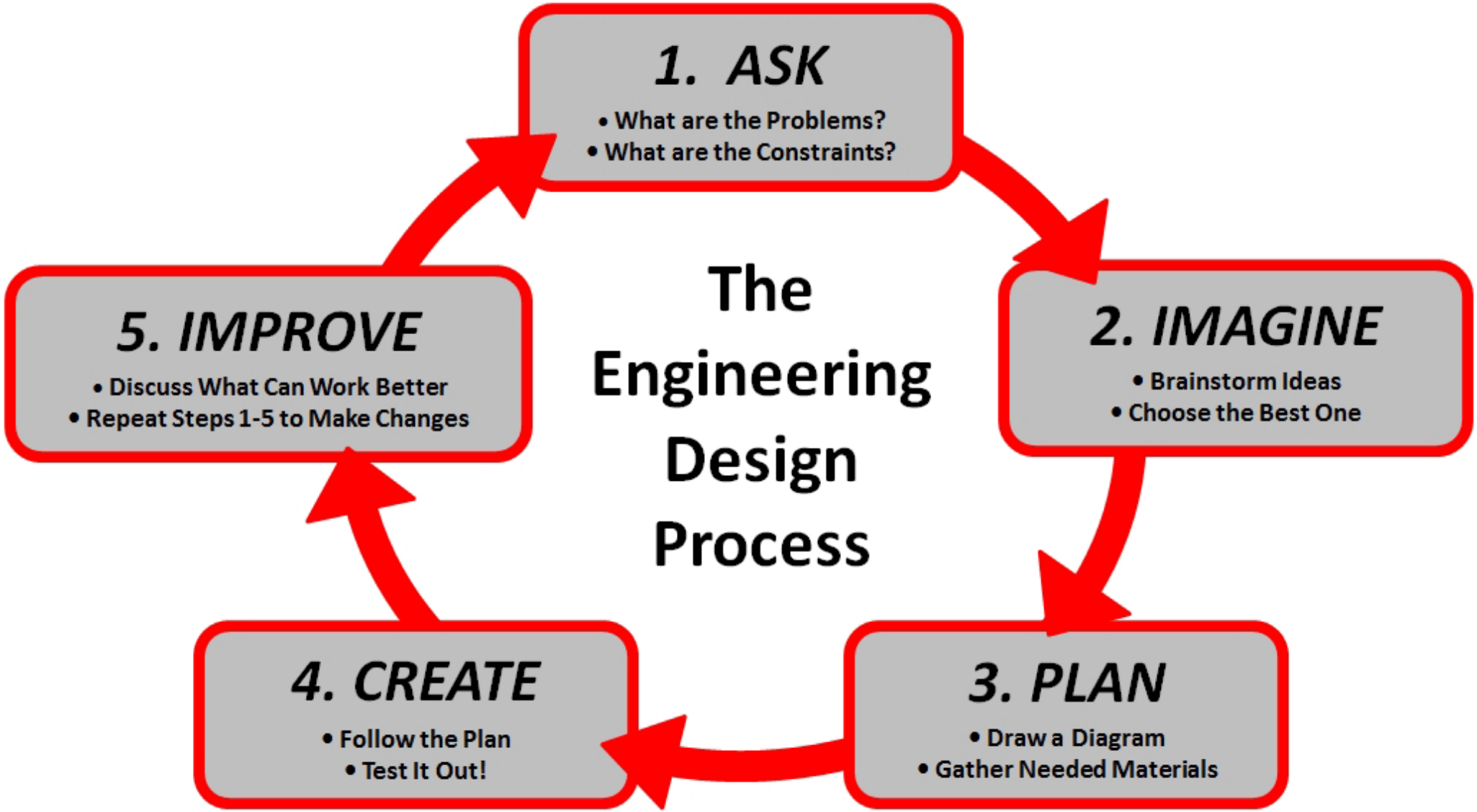
What Is Engineering?



What Is Science and Engineering?

Science...	Engineering ...
is the body of knowledge of the physical and natural worlds.	is the application of knowledge in order to design and build solutions.
seeks to describe and understand the natural world and its physical properties.	seeks to design solutions for societal problems, needs, and wants.
uses varied approaches—scientific methods such as experiments, explorations, or observational studies—to generate knowledge.	uses varied approaches—for example, *engineering design*—to solve problems and design solutions.
can be used to make predictions.	aims to produce the best solutions to real-world problems.

Overview of Engineering Design



Square Peg in Round Hole

Fuzzy Skyscraper

Construction Expectation:

Design the tallest fuzzy skyscraper.

Details:

- Skyscraper must be free standing.
- You can only use the materials available to you.
- You must design and build this structure in 8 minutes.

Science and Engineering Practices

1. Asking questions (science) and defining problems (engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (science) and designing solutions (engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

Physical Science	PS1: Matter and its interactions PS2: Motion and stability: Forces and Motions PS3: Energy PS4: Waves and their applications in technologies for information transfer
Life Science	LS1: From molecules to organism: Structures and processes LS2: Ecosystems: Interactions, energy, and dynamics LS3: Heredity: Inheritance and variation of traits LS4: Biological evolution: Unity and diversity
Earth and Space Science	ESS1: Earth's place in the universe ESS2: Earth's systems ESS3: Earth and human activity
Engineering, Technology, & Applications of Science	ETS1: Engineering Design ETS2: Links among engineering, technology, science, and society
Environmental (high school only)	EVS1: Resources and resource management EVS2: Environmental awareness and protection EVS3: Personal responsibilities

Disciplinary Core Ideas: Earth and Space Science – Earth's Systems (ESS2)

	K-2	3-5	6-8	9-12
ESS2.A: Earth Materials and Systems	UE.ESS2A.a Wind and water can change the shape of the land.	UE.ESS2A.a Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. UE.ESS2A.b Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.	MS.ESS2A.a All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. MS.ESS2A.b The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.	HS.ESS2A.a Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. HS.ESS2A.b Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a viscous mantle and solid crust. HS.ESS2A.c Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. HS.ESS2A.d The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, hydrosphere circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.

Cross Cutting Concepts

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

Can you match the task to the concept?

Define a simple problem that can be solved by applying scientific ideas about magnets.
3-PS2-4

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

Can you match the task to the concept?

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
4-PS3-2

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

Can you match the task to the concept?

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
5-LS2-1

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

Performance Expectations

Do Not	Do
Specify every intermediate piece of knowledge needed to demonstrate the performance expectation	Leave room for teachers and curriculum writers to support student understanding
Prescribe the instructional steps	Describe what students should know and be able to do to demonstrate at the conclusion of instruction
Encourage students to read a textbook and answer questions at the end	Encourage students to read multiple sources, including science journals and magazines, and web-based resources.
Encourage “lecture” classrooms or asking students questions with a right/wrong answer.	Encourage students to perform investigations, solve problems, and engage in open-ended discussion.

Louisiana Science Standards

Code and Descriptor: 4-ESS2-1 EARTH'S SYSTEMS

Performance Expectation: Plan and conduct investigations on the effects of water, ice, wind and vegetation on the relative rate of weathering and erosion.

Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.

Science and Engineering Practices:

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 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
4. Analyzing and interpreting data
A5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Disciplinary Core Ideas:

EARTH MATERIALS AND SYSTEMS

Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, gravity break rocks, soils, and sediments into smaller particles and move them around.

BIOGEOLOGY

Living things affect the physical characteristics of their environment.

Crosscutting Concepts:

CAUSE AND EFFECT

Cause and effect relationships are routinely identified, tested, and used to explain change.

Activity: Analysis of a Standard

- Identify what students should know and be able to do for standard *4-ESS2-1 Earth's Systems*
- Explain the intermediate and/or background knowledge needed for students to meet the standard

Think About: How are the three-dimensions and the performance expectations connected?

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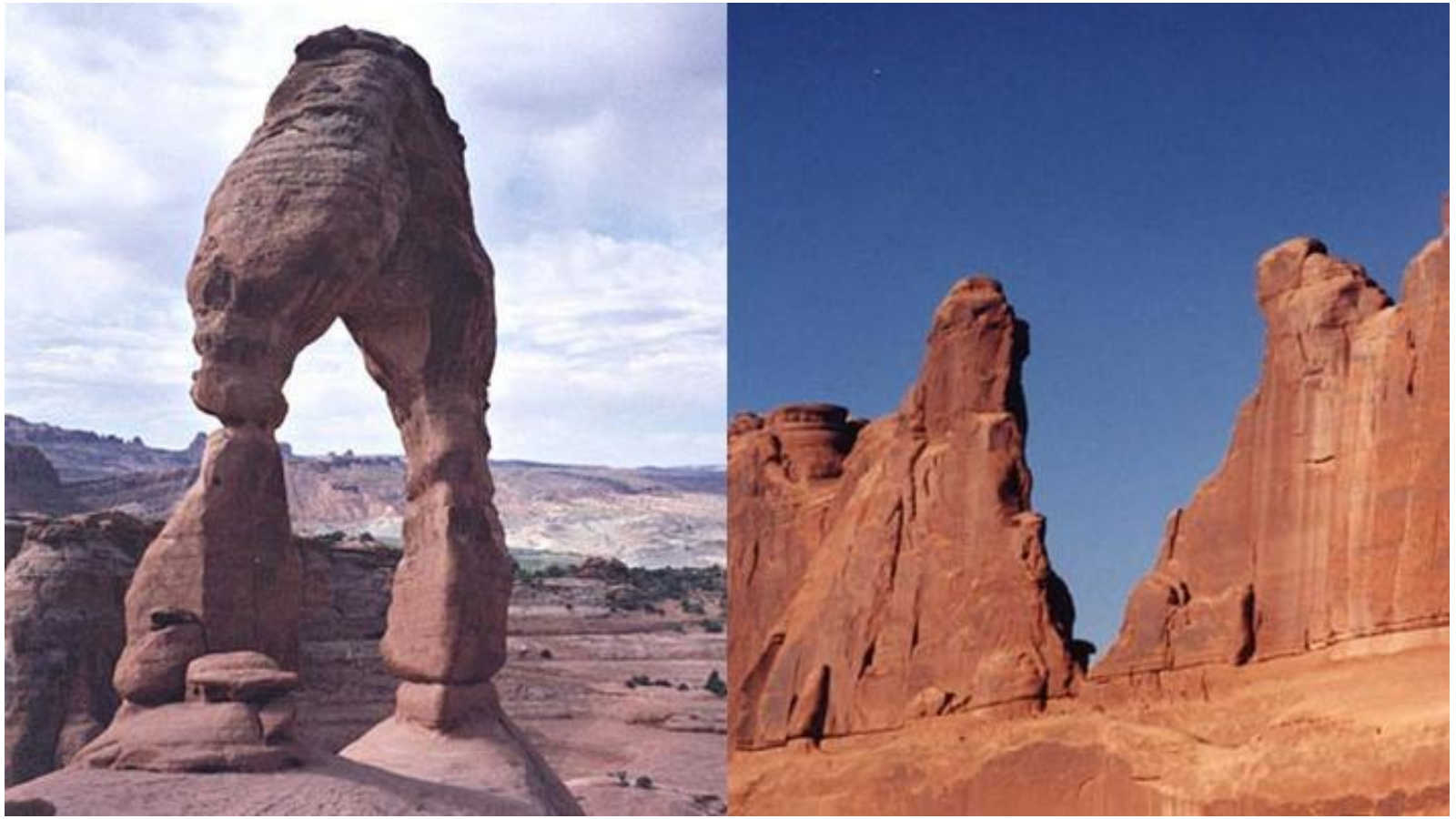
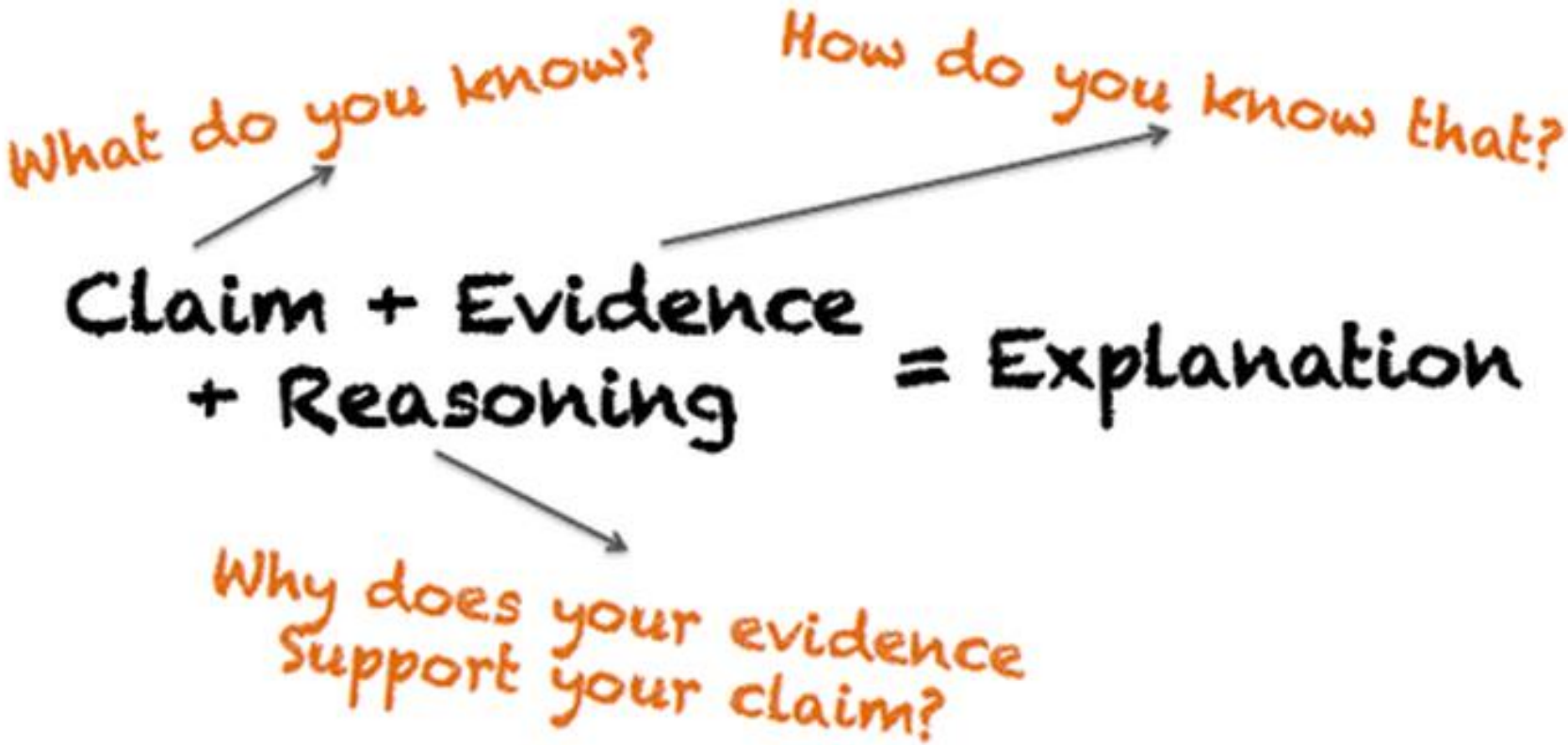
Putting It All Together: Explore a Model Lesson

5 E Model Lesson for 4th Grade ESS2-1



Claims, Evidence, and Reasoning Instructional Model

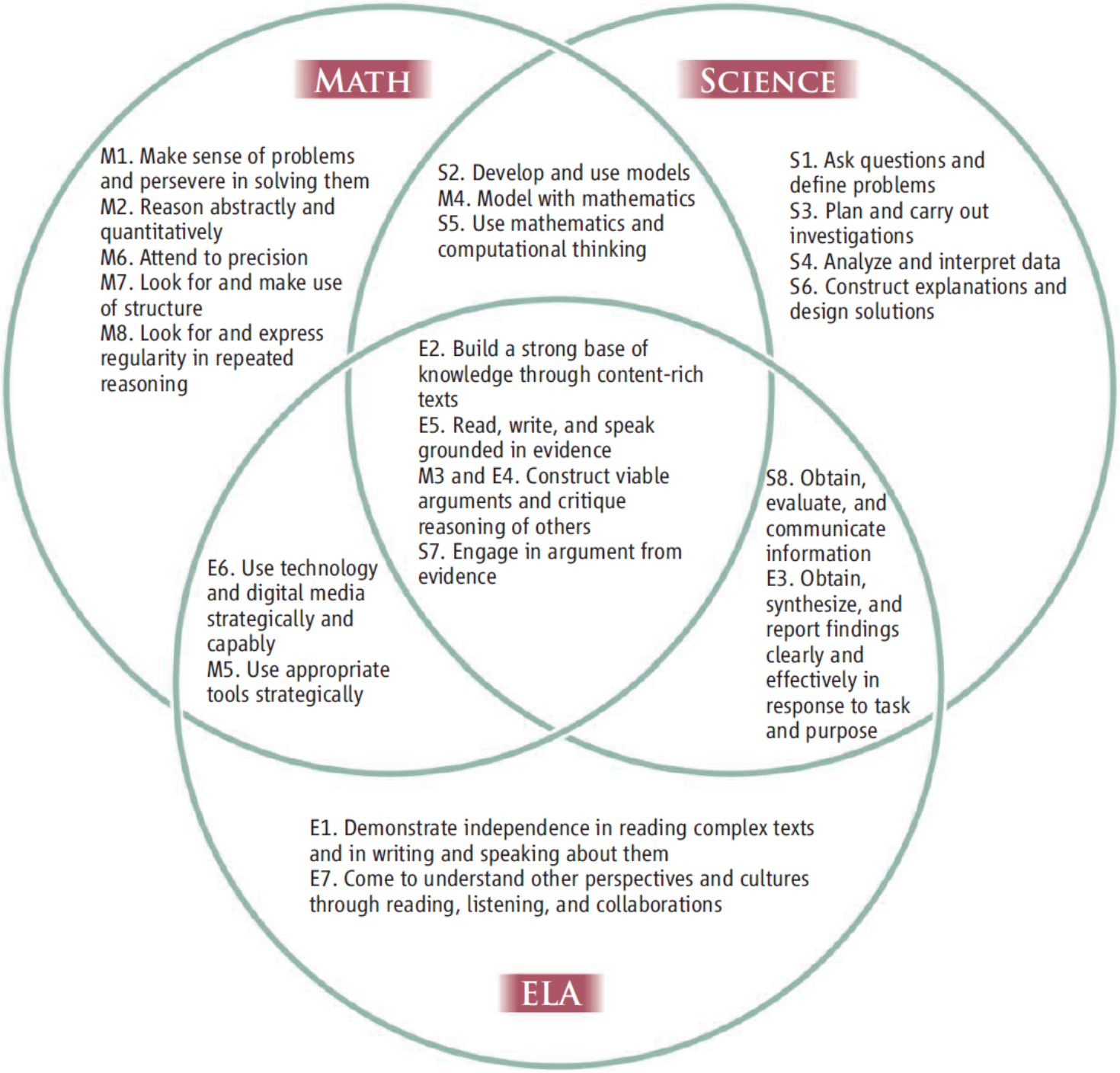


Cross Curricular Connections in the Model Lesson

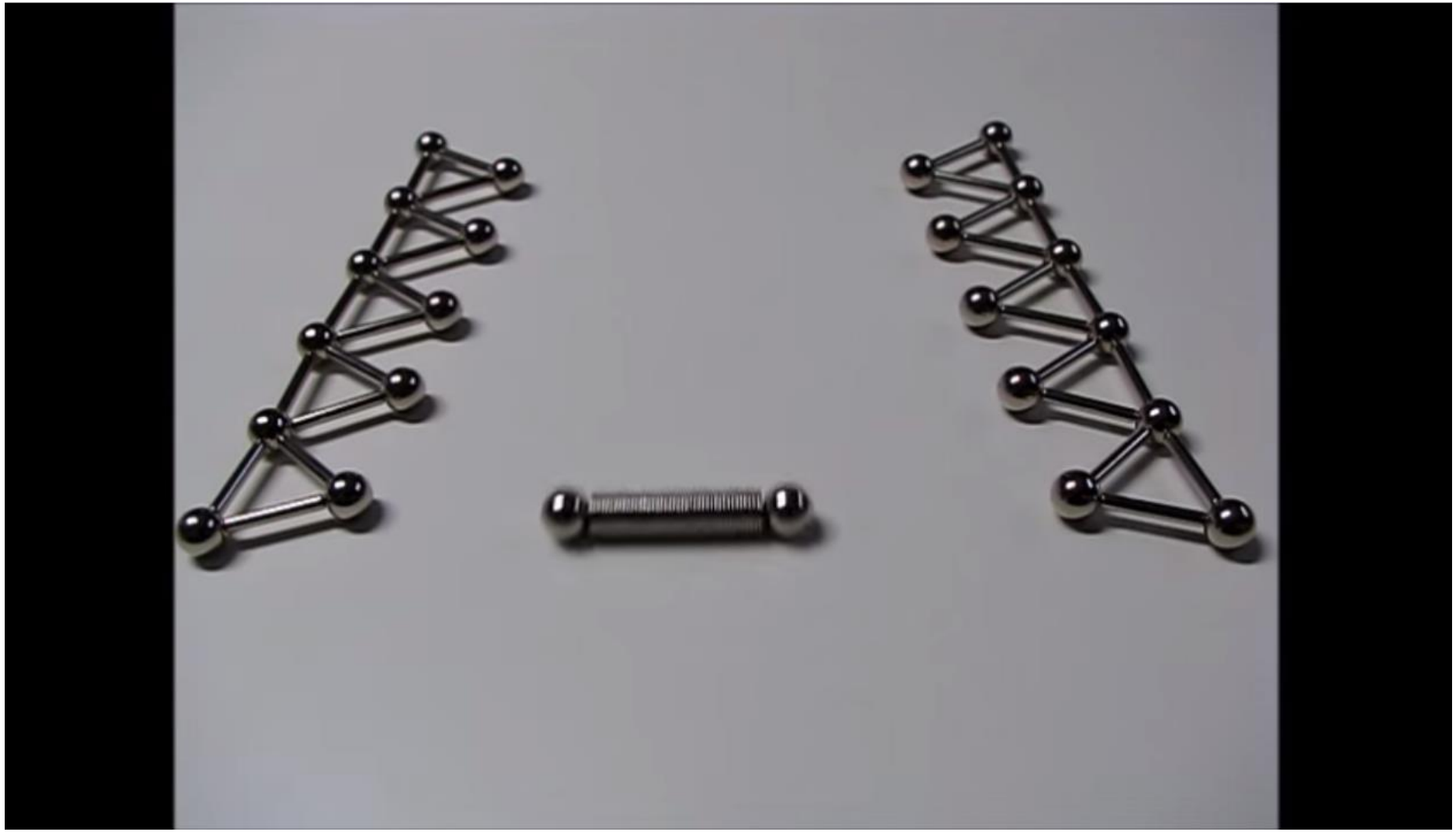
- How can ELA, math, social studies, and art be integrated into the model lesson?
- How could you use ***Appendix B:*** *Connections to ELA and Math* to make connections to ELA and math?

Relations and convergences in literacy, math, and science and engineering practices.

- Science standards and Louisiana State ELA and math standards are aligned
- Explore *Connections to ELA and Math* document from LDOE (Appendix B)



I Wonder...



Encouraging Wonder from Phenomena

- What is phenomena?
- What portion of the sample lesson was an example of phenomena?
- Why would it be important to use phenomena in the science classroom?
- Create a list of phenomena you already use or have seen used in daily lessons.

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What Will Instruction Look Like?

Past Science Instruction	Louisiana Student Standards for Science
Focus on content acquisition	Students develop and apply knowledge in new situations
Many topics, little depth	Fewer topics, more depth
Teacher dominated discourse and instruction	Students engage in developmentally appropriate experiences using similar behaviors as a scientist and engineers

Activity: Sifting through the Changes

1. Read your assigned article to '*get the gist*'.
2. Read the article again to '*dig deeper*'. You can annotate to get a better understanding of the text.
3. After you've read the text closely, answer the essential question in your science notebook.

Louisiana Student Standards for Science

The new standards call for changes in the science classroom.

Key shifts called for by the Louisiana Student Standards for Science:

Apply content knowledge	Content knowledge is critical and evident in the standards in the Disciplinary Core Ideas, the key ideas in science that have broad importance within or across multiple science or engineering disciplines. However, simply having content knowledge is not enough. Students must investigate and apply content knowledge to scientific phenomenon.
Investigate, evaluate, and reason scientifically	Scientists do more than learn about science; they "do" science. Science instruction must integrate the practices, or behaviors, of scientists and engineers as they investigate real-world phenomenon and design solutions to problems.
Connect ideas across disciplines	For students to develop a coherent and scientifically-based view of the world, they must make connections across the domains of science (life science, physical science, earth and space science, environmental science, and engineering, technology, and applications of science). The crosscutting concepts have applications across all domains.

Three Dimensional Learning: the integration of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in science instruction

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■ **LDOE Implementation Resources and Support**

Louisiana Student Standards for Science

Area	Support and Timeline
Curriculum and Resources	**Instructional Materials Review** ● Rubric released and call for submissions ● TLA's: hiring (applications due June 13) and training (June 28-29) ● First review released - *Fall 2017* **New Standards Tools** ● Connections to ELA and math standards* ● Key shifts and instructional implications* ● Middle School sample transition plan - *June 2017* ● Sample scope and sequence documents - *Summer 2017* *To access standards tools, click on the links above, click "download" next to "K-12 Louisiana Student Standards for Science (2017)," then open the zip file that downloads on your computer.

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Louisiana Student Standards for Science

Area	Support and Timeline
Professional Development	**Self-paced Learning** Live and recorded webinars on new standards - *June - July 2017* • Monday, June 19 @ 9:00 a.m. - LSS Science Series Part 1: Overview of the Louisiana Student Standards for Science • Monday, June 26 @ 9:00a.m. - LSS Science Series Part 2: 3-Dimensional Learning • Monday, July 10 @ 9:00 a.m. - LSS Science Series Part 3: Learning Progressions • Monday, July 17 @ 9:00 a.m. - LSS Science Series Part 4: Using Phenomenon to Engage Students in Learning • Monday, July 24 @ 9:00 a.m. - LSS Science Series Part 5: Evaluating Science Tasks **Summer Opportunities** • Louisiana Tech will provide intensive four-day summer training institutes this summer in both north and south Louisiana • LSU Cain Center will provide summer training in an intensive two-day workshop to be held in June in Baton Rouge **Collaborations** • Sessions at 2017-2018 collaborations

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Louisiana Student Standards for Science

Area	Support and Timeline
Assessment **Email assessment@la.gov with questions**	**Previous RFP secured vendor for assessment development** ● Field test for grades 3-8 – *Spring 2018* ● Operational test – *Spring 2019* ● Platform the same as ELA, Math, Social Studies, and EAGLE **EAGLE Assessment Tool** ● Teacher Leader Advisors, who will help create sample assessment items, hired and trained Summer 2017 ● EAGLE items created throughout the 2017-2018 school year

Resources

- LDOE: http://www.louisianabelieves.com/resources/library/academic-standards
- NSTA: http://ngss.nsta.org/Classroom-Resources.aspx
- Teach Engineering: https://www.teachengineering.org/
- Try Engineering: http://tryengineering.org/
- PBS Learning Media: https://lpb.pbslearningmedia.org/
- NSTA 4ESS2-1 Resources: http://ngss.nsta.org/DisplayStandard.aspx?view=pe&id=83
- Phenomena: https://www.ngssphenomena.com/
- Claims, Evidence, and Reasoning: http://bit.ly/2roIPvi

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