This scope and sequence document was developed to assist teachers with the implementation of the Louisiana Student Standards for Science. This tool is not full curriculum and will need to be further built out by science educators. It has been designed to help in the initial transition to the new standards.

This document is considered a "living" document, as we believe that teachers and other educators will find ways to improve it as they use it. Please send feedback to classroomsupporttoolbox@la.gov so that we may use your input when updating this tool.

About the Sample Scope and Sequence Tools

The Louisiana Student Standards for Science represent the knowledge and skills needed for students to successfully transition to postsecondary education and the workplace. The standards call for students to:

- Apply content knowledge
- Investigate, evaluate, and reason scientifically
- Connect ideas across disciplines

This scope and sequence document is designed to assist teachers, schools, and districts with the development of instructional resources that align with the Louisiana Student Standards for Science. This scope and sequence is only a sample; it does not illustrate the only appropriate sequence to teach the standards or the only possible ways to bundle the standards. The bundles can be reorganized around different phenomenon, including phenomenon specific to Louisiana or to a region in Louisiana.

Based on the instructional shifts, this tool uses phenomena to drive 3-dimensional science instruction. The incorporated phenomena are observable events that occur in the universe and can be explained by science. They establish the purpose for learning and help students to connect their learning to real-world events.

- The standards are bundled into units.
- The units are built around an anchor phenomenon.
- One unit has been built out further to contain a series of investigative phenomena, which have been sequentially organized to reinforce one another and build toward the performance expectations.

Throughout each unit, students should have multiple opportunities to apply the science and engineering practices, make sense of the crosscutting concepts, and develop a deep understanding of disciplinary core ideas.

Building out the Science Scope and Sequences for Classroom Instruction

How to Use the Anchor and Investigative Phenomena[1]

1. Explore the anchor phenomenon
2. Attempt to make sense of the phenomenon
3. Identify related phenomena
4. Develop questions and next steps
5. Explore investigative phenomena to help make sense of the anchor phenomenon
6. Communicate scientific reasoning around the anchor phenomenon

Instructional Process

Choosing an Anchor Phenomenon

Students should be able to make sense of anchoring phenomenon, but not immediately, and not without investigating it using sequences of the science and engineering practices. With instruction and guidance, students should be able to figure out, step by step, how and why the phenomenon works. [2]

A good anchor phenomenon[3]:

- ☐ is too complex for students to explain or design a solution for after a single lesson.
  - The explanation is just beyond the reach of what students can figure out without instruction.
  - Searching online will not yield a quick answer for students to copy.
- ☐ can be a case (pine beetle infestation, building a solution to a problem), something that is puzzling (why isn't rainwater salty?), or a wonderment (how did the solar system form?).
- ☐ has relevant data, images, and text to engage students in the range of ideas students need to understand. It should allow them to use a broad sequence of science and engineering practices to learn science through first-hand or second-hand investigations.
- ☐ will require students to develop an understanding of and apply multiple performance expectations while also engaging in related acts of mathematics, reading, writing, and

[1] adapted from How do we bring 3-dimensional learning into our classroom?

[2] Using Phenomena

[3] Qualities of a Good Anchor Phenomenon

communication.

- ☐ is observable to students. "Observable" can be with the aid of scientific procedures (e.g., in the lab) or technological devices to see things at very large and very small scales (telescopes, microscopes), video presentations, demonstrations, or surface patterns in data.

Choosing Investigative Phenomena

Students should be able to make sense of investigative phenomenon, but not immediately, and not without investigating it using sequences of the science and engineering practices. With instruction and guidance, students should be able to figure out, step-by-step, how and why the phenomenon works.[4]

A good investigative phenomenon:

- ☐ helps students make sense of one or two parts of the anchor phenomenon.
- ☐ has relevant data, images, and text to engage students in the range of ideas students need to understand.
- ☐ can be understood or explained by students using the science and engineering practices.

Investigating the Phenomena

When a phenomenon is introduced, whether anchor or investigative, students should have the opportunity to make observations, discuss current understandings, and pose questions about the phenomenon. Once questions are compiled, it may be helpful to categorize questions as follows:

- Questions that can be investigated by our class
- Questions that can be investigated but not with our current resources and equipment
- Questions that can be researched
- Questions that cannot be answered (due to current technologies or scientific limitations)

Other Useful Questions When Designing a Sequence of Learning[5]

- How do we kick off investigations in a unit?
- How do we work with students to motivate the next step in an investigation?
- How do we help students use practices to figure out the pieces of the science ideas?
- How do we push students to go deeper and revise the science ideas we have built together so far?
- How do we help students put together pieces of the disciplinary core ideas and crosscutting concepts?

[4] Using Phenomena

[5] Questions to Guide the Development of a Classroom Culture That Supports "Figuring Out"

Kindergarten Science Standards Overview

The kindergarten science course focuses on the study of motion and stability: forces and interactions, energy, from molecules to organisms: structures and processes, Earth's systems, and Earth and human activity.

	Science and Engineering Practices									
Crosscutting Concepts		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	All Domains
	Patterns				K-LS1-1 K-ESS2-1					
	Cause and Effect	K-ESS3-2		K-PS2-1 K-PS3-1	K-PS2-2		K-PS3-2		K-ESS3-3	
	Scale, Proportion and Quantity									
	Systems and System Models		K-ESS3-1					K-ESS2-2		
	Energy and Matter									
	Structure and Function									
	Stability and Change									

Overview of Sample Units

	Unit 1 Weather	Unit 2 Animals and Energy	Unit 3 Plants	Unit 4 Earth and Human Activity	Unit 5 Forces and Interactions
Anchor Phenomenon	Portions of South Louisiana experienced significant flooding in 2016. **Multidisciplinary Opportunity:** Louisiana Guidebook Weather Unit	Fennec foxes stay underground during the day.	The flowers on sunflower plants face a different direction during different times of the day. **Multidisciplinary Opportunity:** Louisiana Guidebook From Seed to Plant Unit	Sea turtles choke on plastic bags found in oceans.	Sled dogs are used for transportation in some parts of the world. **Multidisciplinary Opportunity:** Louisiana Guidebook From The Year at Maple Hill Farm Unit
Standards	K-ESS3-2 K-ESS2-1	K-PS3-1 K-PS3-2 K-ESS2-2	K-LS1-1 K-ESS3-1	K-ESS3-3	K-PS2-1 K-PS2-2

Unit 1: Weather

About the Standards

Performance Expectations

- K-ESS2-1 Earth's Systems: Use and share observations of local weather conditions to describe patterns over time.
- K-ESS3-2 Earth and Human Activity: Ask questions to obtain information about the purpose of weather forecasting to prepare for and respond to severe weather.

Disciplinary Core Ideas

DCI	Partial Unpacking of the DCI
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (DCI: LE.ESS2D.a; PE: K-ESS2-1)	• Sunny, windy, snowy, and rainy are ways to describe the weather • Snow is frozen ice crystals that fall from clouds when the temperature is below freezing • Rain is water that falls from the clouds when the temperature is above freezing • Hail and sleet are also forms of frozen precipitation • Wind is moving air and can be weak or strong; the strength of wind can be measured using an anemometer • People observe and measure things about the weather • Temperature is the measurement of heat in the air • We measure temperature with a thermometer using Fahrenheit or Celsius as the unit • Looking at the records of weather over time can help us find patterns • Weather doesn't always follow a pattern
Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (DCI: LE.ESS3B.a; PE: K-ESS3-2)	• Severe weather includes hurricanes, tornados, blizzards • Severe weather often has consequences for people • Heavy rains can also have consequences (flooding), even though we usually don't think of rain as a severe weather event • Weather scientists are called meteorologists; they record and predict weather based on patterns, observations, and data • Predicting weather can help people better prepare for it • Some areas experience severe hurricanes (tornados, blizzards) more often than others

Science and Engineering Practices

- Use observations to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
- Ask questions based on observations to find more information about the natural and/or designed world(s).

Crosscutting Concepts

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
- Events have causes that generate observable patterns.

Putting the Standards into Practice

Sample Anchor Phenomenon: Portions of South Louisiana Experienced Significant Flooding in 2016*

Explore the anchor phenomenon

*Note: Teachers in North Louisiana may choose to use the March 2016 flood event while teachers around New Orleans may choose to use the flooding due to Hurricane Katrina.

Resources: A number of resources regarding the flooding are linked here. Teachers should screen the resources and pull photos, quotes, and data that are appropriate to share with Kindergarten students. These resources may not be appropriate to be given to students as they are due to the length, content, or accessibility of the content.

CBS News Pictures of Flooding
CNN Louisiana Flooding by the Numbers
LSU Law Center: Why was the Louisiana flood of August 2016 was so severe?
Graphs of rainfall in 3 different years in August in Baton Rouge (Appendix A)
U.S. Climate Data Website

Questions students may pose that could be used for future learning or investigations:

Try to make sense of the anchor phenomenon

- Why did it rain so much on August 12, 2016, in Baton Rouge?
- What causes rain?
- Why didn't the water drain out of the rivers faster?
- Does it rain as much at other times of the year?
- Has it ever rained 11 inches in one day in Louisiana before?
- Was there a hurricane on August 12, 2016?
- Did wind make it flood?
- How long did it take for the water to dry up?
- How did the water dry up?
- How do we know how much it rained on those days?
- What did people do when their houses started flooding?
- Did some people leave their houses before it started flooding? How did they know to leave?
- Has South Louisiana flooded before?

Teachers should provide Investigative Phenomenon based on student observations, questions, and the Characteristics of Quality Investigative Phenomenon.

Sample Investigative Phenomena

Sample 1: When water is poured (or rained) on different materials (plastic tray, dirt, grass, rock, sponge), it "acts" differently.

Sample questions for students to investigate:

- How does the movement of air change how the water "acts" when poured on different materials?
- Does the temperature of the air impact how water "acts" when poured on different materials?
- How might the different structures in Baton Rouge and the surrounding areas have impacted the flooding? What solutions could you design to help people prevent future flooding?

3-D learning opportunities:

SEP: Asking questions; Design a solution; Planning and carrying out an investigation; Constructing explanations

DCI: LE.ESS2D.a

CC: Patterns

Sample 2: The sun is shining but there is a water/mud puddle on the playground.

Sample questions for students to investigate:

- Why hasn't the water soaked into the ground?
- How long will the water stay there?
- Do larger puddles last longer than smaller puddles?
- Does temperature of the air impact how long the puddle lasts? How could we investigate that?
- Will all of the water "disappear" at the same time?

3-D learning opportunities:

SEP: Asking questions; Planning and carrying out an investigation; Analyzing and interpreting data; Using mathematics and computational thinking; Constructing explanations

DCI: LE.ESS2D.a

CC: Patterns

Sample 3: When water evaporates, it travels up into the air.

Sample questions for students to investigate:

- How can we watch water evaporate?
- How high does the water go into the air?

3-D learning opportunities:

SEP: Asking questions; Planning and carrying out an investigation;

• Does the water float into space? • What happens to the water? • What makes water evaporate? • Did some of the floodwater evaporate?	Obtaining, evaluating, and communicating information DCI: LE.ESS2D.a CC: Patterns

Sample 4: People predict the weather based on patterns, observations, and data.

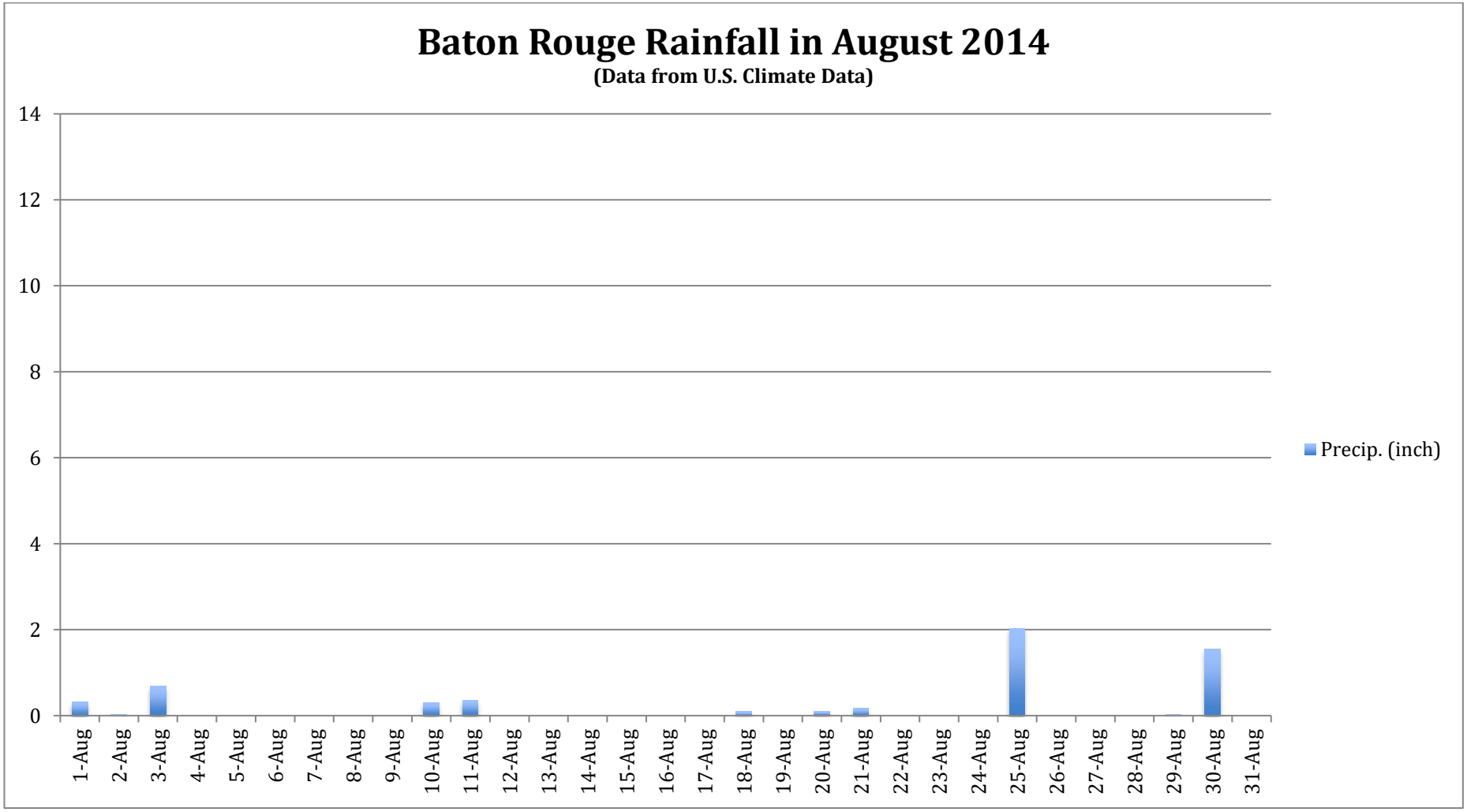
Sample questions for students to investigate:	**3-D learning opportunities:**
• What could we do to become better weather predictors? • What information do we need to gather about the weather? • What tools can we use to gather the information? • What tools could we build to measure different parts of the weather? • Are there some things that we can't predict? • How does predicting the weather help people? • When is it really important to make good predictions about the weather? When does it not matter as much? • How do "patterns" help to predict the weather? • How did the weather predicting during the August 2016 flood impact people?	SEP: Asking questions; Planning and carrying out an investigation; Analyzing and interpreting data; Designing a solution; Obtaining, evaluating, and communicating information DCI: LE.ESS3B.a CC: Patterns

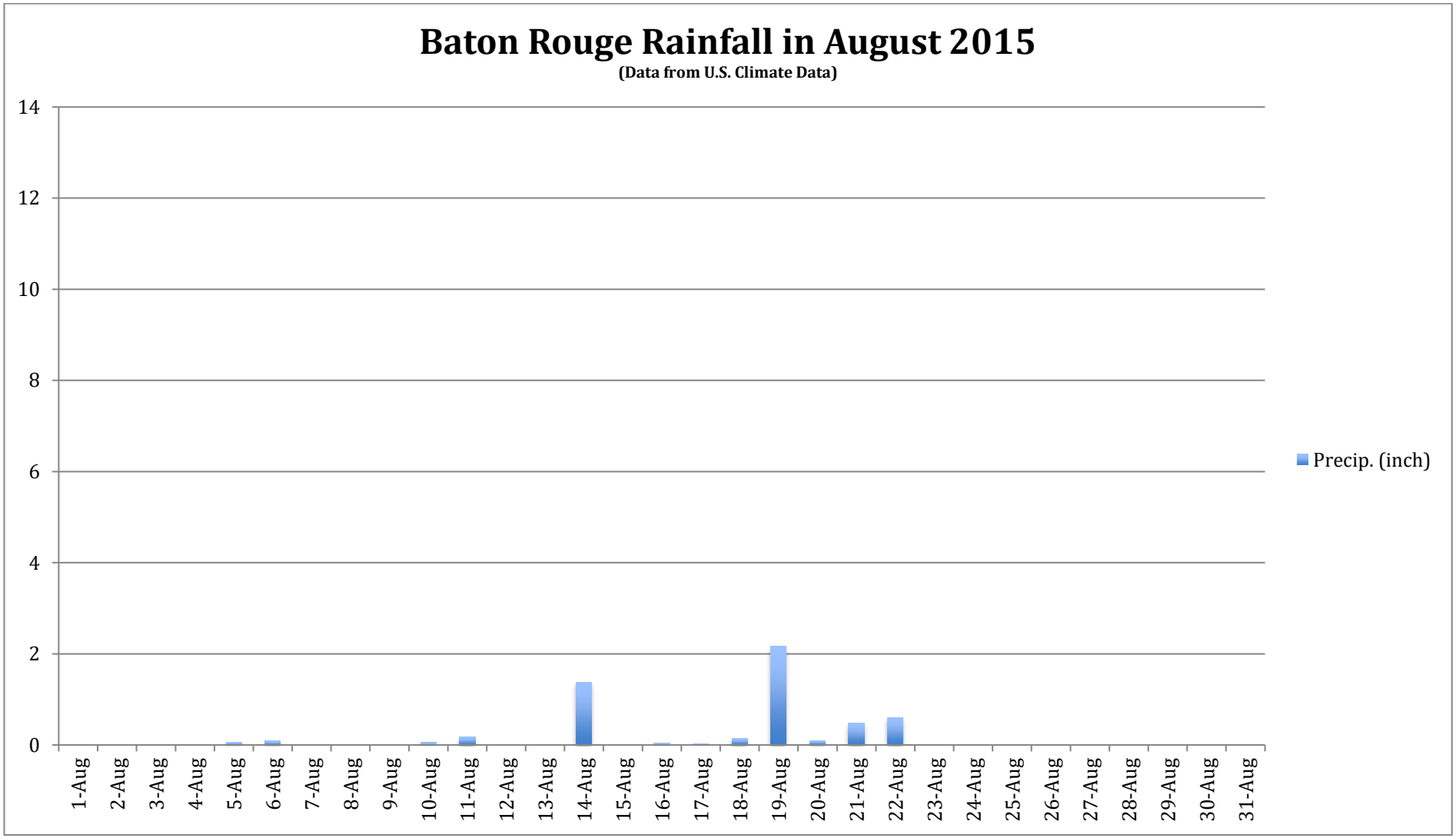
Sample Anchor Phenomenon Reflections

- How did the weather during the Louisiana flood of August 2016 follow the typical patterns of Louisiana weather? How did it not follow typical patterns?
- How did weather forecasting help prevent damage to people during the flood? What questions do you still have about the weather forecasting during this major weather event?

Communicate scientific reasoning around the anchor phenomenon

Appendix A: August Rainfall Data




Baton Rouge Rainfall in August 2015
(Data from U.S. Climate Data)
14
12
10
8
6
4
2
0
1-Aug
2-Aug
3-Aug
4-Aug
5-Aug
6-Aug
7-Aug
8-Aug
9-Aug
10-Aug
11-Aug
12-Aug
13-Aug
14-Aug
15-Aug
16-Aug
17-Aug
18-Aug
19-Aug
20-Aug
21-Aug
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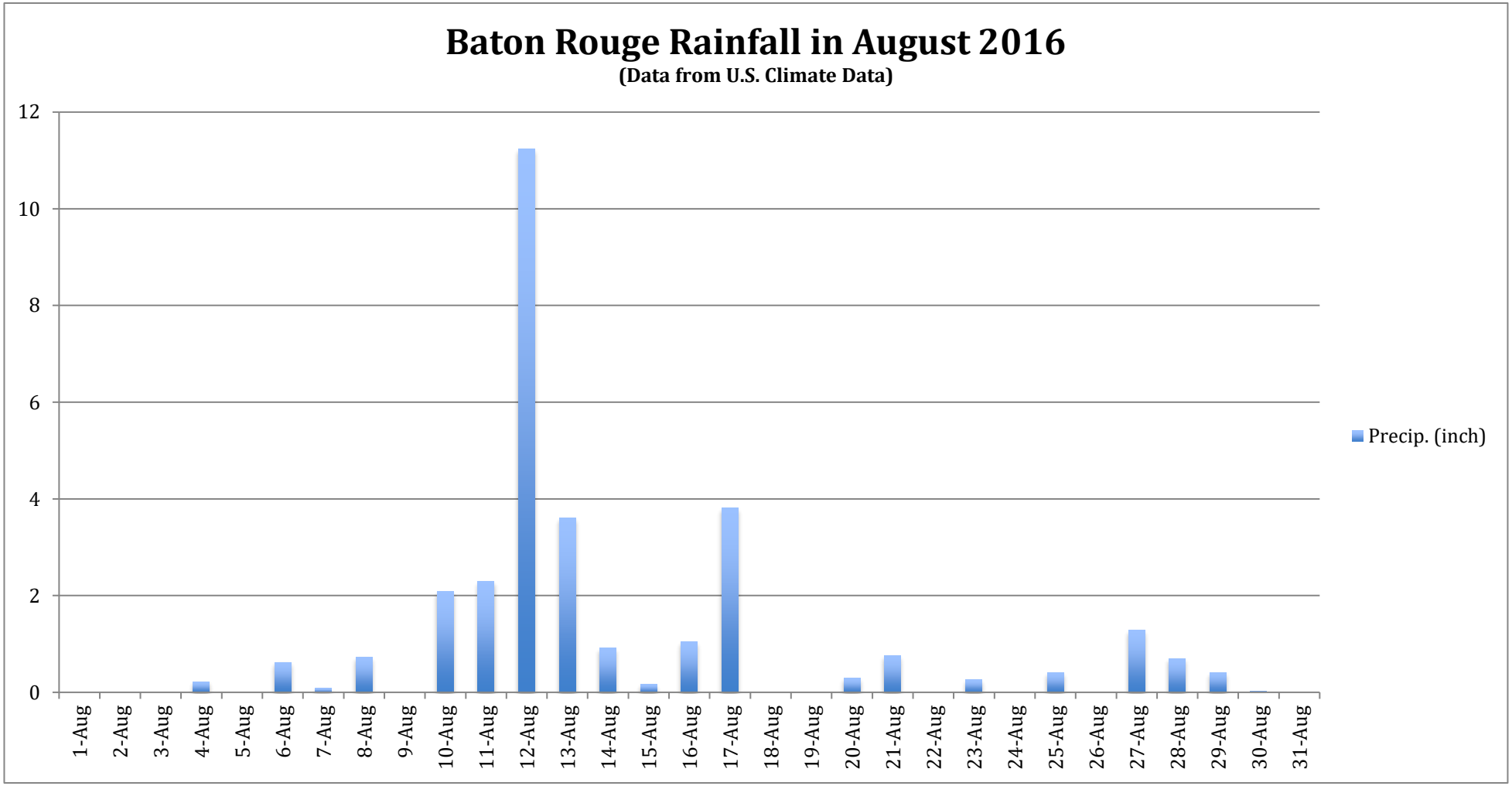
26-Aug
27-Aug
28-Aug
29-Aug
30-Aug
31-Aug
Precip. (inch)


Baton Rouge Rainfall in August 2016
(Data from U.S. Climate Data)
12
10
8
6
4
2
0
1-Aug
2-Aug
3-Aug
4-Aug
5-Aug
6-Aug
7-Aug
8-Aug
9-Aug
10-Aug
11-Aug
12-Aug
13-Aug
14-Aug
15-Aug
16-Aug
17-Aug
18-Aug
19-Aug
20-Aug
21-Aug
22-Aug
23-Aug
24-Aug
25-Aug
26-Aug
27-Aug
28-Aug
29-Aug
30-Aug
31-Aug
Precip. (inch)

Unit 2: Animals and Energy

About the Standards

Performance Expectations

- K-PS3-1 Energy: Make observations to determine the effect of sunlight on Earth's surface.
- K-PS3-2 Energy: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.
- K-ESS2-2 Earth's Systems: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

Science and Engineering Practices

- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Construct an argument with evidence to support a claim.

Crosscutting Concept

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Systems in the natural and designed world have parts that work together.

Putting the Standards into Practice

Sample Anchor Phenomenon: Fennec foxes stay underground during the day.

Explore the anchor phenomenon

Resources: A number of resources are linked here. Teachers should screen the resources and pull photos, quotes, and data that are appropriate to share with Kindergarten students. These resources may not be appropriate to be given to students as they are due to the length, content, or accessibility of the content.

Read Works: Cool in the Desert
National Geographic: Fennec Fox
BBC: Desert Fox Hunts a Lesser Jerboa
Seven Fun Facts About the Fennec Fox

Questions students may pose that could be used for future learning or investigations:

Try to make sense of the anchor phenomenon

- Where do Fennec foxes live?
- Why do Fennec foxes live underground?
- Does the climate of where Fennec foxes live influence them to live underground?
- Why do Fennec foxes hunt for food at night?
- What special characteristics do Fennec foxes have?
- What other animals live underground?
- What other animals hunt for food at night?
- Do all animals that live underground live the same type of environment?
- Do all animals that live underground do so for the same reason?
- What effect does the sun have on sand? On other materials?

Teachers should provide Investigative Phenomenon based on student observations, questions, and the Characteristics of Quality Investigative Phenomenon.

Sample Anchor Phenomenon Reflections

Communicate scientific reasoning around the anchor phenomenon

- Describe the effect of sunlight on different parts of Earth's surface.
- Design and build a structure that will reduce the warming effect of sunlight on an area.
- Construct an argument supported by evidence for how Fennec foxes change the environment to meet their needs.

Unit 3: Plants

About the Standards

Performance Expectations

- K-ESS3-1 Earth and Human Activity: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
- K-LS1-1 From Molecules to Organisms: Structures and Processes: Use observations to describe patterns of what plants and animals (including humans) need to survive.

Science and Engineering Practices

- Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).
- Use observations to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.

Crosscutting Concept

- Systems in the natural and designed world have parts that work together.
- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

Putting the Standards into Practice

Sample Anchor Phenomenon: The flowers on sunflower plants face a different direction during different times of the day.

Explore the anchor phenomenon

Resources: A number of resources are linked here. Teachers should screen the resources and pull photos, quotes, and data that are appropriate to share with Kindergarten students. These resources may not be appropriate to be given to students as they are due to the length, content, or accessibility of the content.

Sunflower Time-Lapse
National Geographic: Sunflowers Track the Sun, Like Solar Panels
Read Works: Bright As the Sun
Read Works: Plants

Questions students may pose that could be used for future learning or investigations:

Try to make sense of the anchor phenomenon

- What do sunflowers need to grow and survive?
- Can sunflower plants or other plants grow without sunlight and water?
- Why do the flowers on sunflower plants move in different directions throughout the day?
- What direction do sunflower blooms move?
- Do insects or animals feed on sunflower plants?

Teachers should provide Investigative Phenomenon based on student observations, questions, and the Characteristics of Quality Investigative Phenomenon.

Sample Anchor Phenomenon Reflections

Communicate scientific reasoning around the anchor phenomenon

- Describe the relationship between the sunflower plan and where it lives.
- Use observations to describe the patterns of the sunflower plant's "behavior."

Unit 4: Earth and Human Activity

About the Standards

Performance Expectations

- K-ESS3-3 Earth and Human Activity: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Science and Engineering Practices

- Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.

Crosscutting Concept

- Events have causes that generate observable patterns

Putting the Standards into Practice

Sample Anchor Phenomenon: Sea turtles choke on plastic bags found in oceans.

Explore the anchor phenomenon

Resources: A number of resources are linked here. Teachers should screen the resources and pull photos, quotes, and data that are appropriate to share with Kindergarten students. These resources may not be appropriate to be given to students as they are due to the length, content, or accessibility of the content.

WWF: Sea Turtle
NOAA Fisheries: Sea Turtles
National Geographic: See a Sea Turtle Devour a Jellyfish
National Geographic: Sea Turtles Return to the Sea
National Geographic: How We Can Keep Plastics Out of Our Ocean
Read Works: Recycling (article set)
Ocean Plastic and Sea Turtles

Questions students may pose that could be used for future learning or investigations:

Try to make sense of the anchor phenomenon

- What do sea turtles need to live?
- Why do sea turtles eat plastic bags?
- What do sea turtles normally eat?
- How do plastic items get into oceans?
- What can we do to eliminate plastic in our oceans?
- Can plastic bags and other trash hurt other animals?
- Do sea turtles go to the veterinarian when they are hurt or sick?
- Are animals around our house or school impacted by people?
- What can we do to lessen our impact on the environment around us?

Teachers should provide Investigative Phenomenon based on student observations, questions, and the Characteristics of Quality Investigative Phenomenon.

Sample Anchor Phenomenon Reflections

Communicate scientific reasoning around the anchor phenomenon

- Design and share a solution that will reduce the impact of humans on sea turtles.
- Describe how humans impact local animals and three ways our class can help reduce that impact.

Unit 5: Forces and Interactions

About the Standards

Performance Expectations

- K- PS2-1 Motion and Stability: Forces and Interactions: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object
- K-PS2-2 Motion and Stability: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

Science and Engineering Practices

- With guidance, plan and conduct an investigation in collaboration with peers.
- Analyze data from tests of an object or tool to determine if it works as intended.

Crosscutting Concept

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Putting the Standards into Practice

Sample Anchor Phenomenon: Sled dogs are used for transportation in some parts of the world.

Explore the anchor phenomenon

Resources: A number of resources are linked here. Teachers should screen the resources and pull photos, quotes, and data that are appropriate to share with Kindergarten students. These resources may not be appropriate to be given to students as they are due to the length, content, or accessibility of the content.

CBS Sunday Morning: Raising Sled Dogs at Denali National Park
Denali National Park: Kennels
Denali National Park: Webcam: Sled Dog Puppies
Human Planet: Arctic: Greenland Sled Dogs
National Geographic: Sled Dogs: More Than Meets the Eye

Questions students may pose that could be used for future learning or investigations:

Try to make sense of the anchor phenomenon

- What are sled dogs?
- Why do people that live in cold regions use sled dogs for transportation?
- How do sled dogs know which direction to pull a sled?
- What is a pull? Why do sled dogs pull sleds instead of pushing them?
- When pulling a sled in the snow, will a team of four sled dogs have a stronger pull than a team of two sled dogs?
- When pulling a sled in the snow, how does the strength of the pulls on a sled impact the movement of the sled?
- When pulling a sled in snow, how does the direction of the pulls on a sled impact the movement of the sled?
- What other modes of transportation rely on a push or push?
- How can I design a test to determine what effect a push or pull has on an object?

Teachers should provide Investigative Phenomenon based on student observations, questions, and the Characteristics of Quality Investigative Phenomenon.

Sample Anchor Phenomenon Reflections

Communicate scientific reasoning around the anchor phenomenon

- Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object
- Design something that changes the speed or direction of an object's movement. Determine your design solution works as intended.